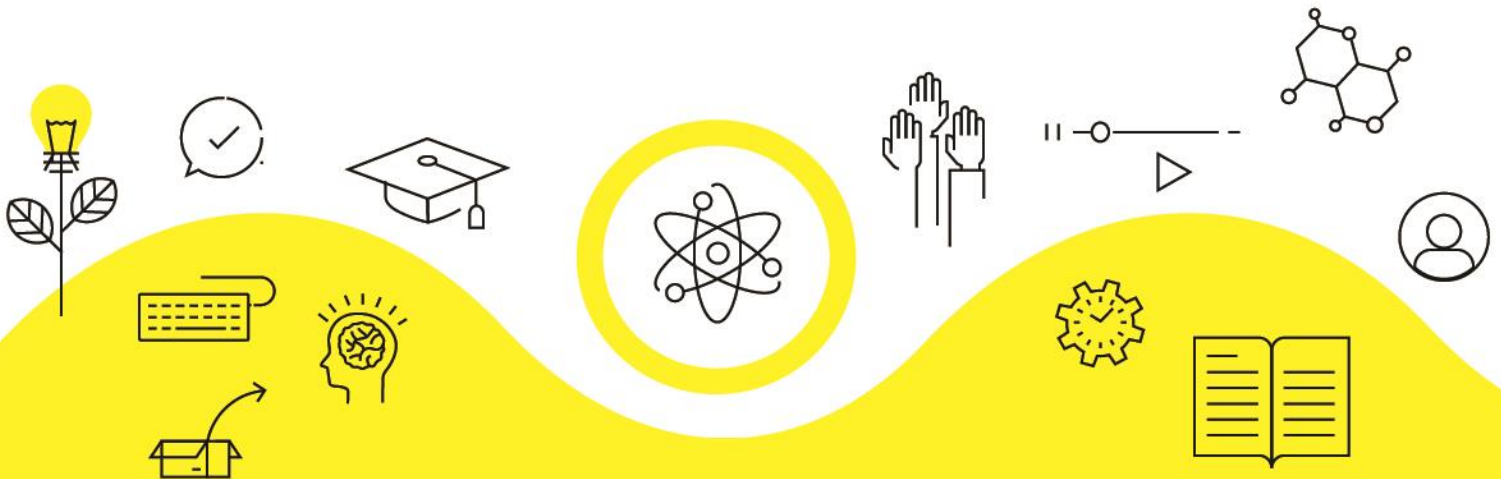


# SUSTAINABILITY CAN'T WAIT!

## VII. BBU International Sustainability Student Conference

The book of full paper



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# Economic drivers of firms' purpose driven choice of climate change disclosures: evidence from listed Nigerian firms.

Folayemi Omolade Akintunde<sup>1</sup>, Hakim Ben-Othman<sup>2</sup>

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## ABSTRACT

The extreme impact of climate change in developing countries may cause business managers to withhold climate information. This paper examines the economic drivers of firms' goal-driven choice of 'climate change disclosure quality' backed by legitimacy, signaling, stakeholder, and voluntary disclosure theories.

We consider firms' level of climate change disclosure choices by testing the association of ownership structure with economic drivers of climate change reporting. We adopt logistic regression model and our result show that climate change disclosure is linked to business ownership structure.

Our findings suggest that firms with a higher level of withholding information are likely to choose 'high-quality climate disclosures' rather than 'low-quality disclosures'.

**Keywords:** 'Climate change disclosure', Transparency, 'Legitimacy theory', 'Voluntary disclosure theory', 'Signaling theory', 'Business ownership structure', Nigeria

## 1. Introduction

The effect of global warming is climate change which disrupts the general weather patterns and the balance of nature (Pour et al., 2020; Wang et al., 2014). The two major considerations that are significant for climate change responses are '**mitigation**' and '**adaptation**'. Whilst the adaptation to climate change is referred to as a form of natural system of adjustment to climate impact which lessens the danger and takes advantage of the available beneficial opportunities (IPCC, 2007), climate change mitigation involves the implementation of policies for the reduction of carbon emissions (UN HABITAT: IPCC, 2007). The mitigation is also seen as the human intervention to reduce the sources of carbon emissions (UN HABITAT: UNFCCC,

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1997) to achieve the decarbonization goal, and this require corporations to embrace environmental disclosures on the amount of carbon emitted during their industrial activities which has a negative effect on the climate (Solikhah et al., 2020) (Vastrelli et al., 2024).However, many firms are keener about the cost and benefits of reporting climate activities of their company (Cornier & Magnam, 1999). Regulatory bodies and initiatives i.e. the ‘Global Reporting Initiatives’ (GRI), ‘Carbon Disclosure Project’ now known as ‘CDP’, ‘Task Force on Climate-related Financial Disclosure’ (TCFD), ‘Greenhouse gas (GHG)’ protocol, institutional regulators, stakeholders (Lakhiani &Herbert, 2022 :IFRS Foundation 2021; Impact Management Project, World Economic Forum & Deloitte 2020) and equity investors are shedding more lights of encouragement on corporations to strengthen their efforts toward climate performance and are demanding a more transparent climate change disclosures (Fedorova &Martynova, 2021). Many big corporations have leveraged on climate related disclosures to improve their market share and have combined the reports such that it benefit the bottom line of their organizations even though many of the reports lack transparency, accuracy, completeness and truthfulness of environmental concern (Kalu J.U et al.,2016) (Sun& Shi, 2022). More so, despite corporation’s awareness and compliance to publish their climate activities; equity investors still experience financial losses that is relatively linked to climate risks ; for example the climate–risk related financial losses in the case of ‘bankruptcies in the US coal industry’, the fall of the share value for the ‘California utility PG&E’ (Griffin &Jaffe,2022) (Kalu J.U et al., 2016) as a result of incomprehensive disclosures and inaccuracies of environmental reports which are part of the leading effects of climate change that continues to linger on in different continents of the world with sub-Saharan Africa as the worst hit continent in all (Czechowski,2020) (Jedwab et al., 2023) (Sasu, 2023).

This study will not lay more emphasis on the importance of climate change disclosure but it will focus on examining the economic drivers that determines the purpose driven choice of climate change disclosures in sub-Saharan Africa. Prior literatures have addressed the determinants of climate disclosure ; Cormier & Magnan (1999), Amran et al.,(2011), Amran et al.,(2014), Kalu et.al., (2016), Halkos&Skouloudis,(2016),Baalouch et al.,(2019),Caby et al.,(2020), Desai,(2022), Mou Ruiqin & Ma Tao (2023), Vithanage &Shamil,(2022), Mehedi et al.,(2023),both in financial institutions and non-financial firms ; they have maintained the position that size, profitability, leverage, market value ,strategy and vision, diversity in boards including board size, dual listing, and environmental performance are major determinants of carbon disclosures quality for firms. However, some of the studies regarding the economic determinants of climate change disclosures present results that were not conclusive; most of the

studies lack endogeneity and experiences measurement error problems, making it difficult to interpret the findings (Healy & Pelepu, 2001). Although climate change disclosures is still on its journey to fully mature and imbibe the required standards of reporting with consistency, accuracy and comparability as it is obtained in financial reports which follows the required rigorous standards of accuracy, consistencies and comparability; prior studies have not fully explored the impact of business ownership structures on environmental disclosures to stakeholders (Achenbach, 2021).

Furthermore, Calza et al., (2016), explored the association between various firms' 'ownership structures' and their pro-active environmental performance, to examine if certain types of shareholders act as a reviving factor for firms' environmental activities. Nguyen et al., (2024), revealed what determines the disclosure of carbon emissions by examining the 'influence' level of different categories of 'ownership structure' on climate related disclosures but did not fully explore all the categories of business structure. The categories of business ownership considered includes; 'long term and short term institutional' owned businesses, 'managerial' owned businesses, 'block holders', and government ownership. Md Zaini et al., (2020) considered family owned businesses in Malaysia but did not explore all the other categories of corporate ownership structure. Wei et al., (2024) present the impact of business ownership structure (with emphasis on institutional owned business, state owned and managerial owned business) on environmental disclosure in China. Prior studies on the various effects of business ownership structure (the managerial, institutional and foreign owned businesses) on environmental disclosures in emerging economies has produced mixed results (see Wei et al., 2024). More so, there is limited research study on the 'impact of family owned business structure and foreign owned firms on the choice of climate related disclosure in sub-Saharan Africa' (Razaq et al., 2023) (Munisi, 2023). This work aims to fill this gap by testing the association of business ownership structure on the economic drivers of firms' choice of climate change disclosures quality with focus on family owned businesses and foreign owned companies that are listed on Nigeria stock exchange market. It suggest possible roadmap to achieving a more accurate and reliable climate reports; it addresses three main questions; what are the economic drivers of firm's choice of 'climate change disclosures'? What is the effect of transparency on the choice of 'climate change disclosures'? How can regulatory institutions achieve a more reliable, consistent and accurate climate change reporting from corporations?

Firm's choice of climate change disclosure quality is backed by 'legitimacy theory', 'signaling theory', 'stakeholder theory' and 'voluntary disclosure theory'. This study contributes to literature by closing the existing research gaps of the economic drivers of firms' choice of climate disclosure levels. It confirm the empirical findings of existing studies regarding the factors that determines the choice of environmental disclosures, and we also test the association of business ownership structure on climate change reporting by adopting Logistic Regression Model. Our findings affirm that climate change disclosure is linked to corporate ownership structure. It indicate that family controlled businesses and foreign owned businesses have negative correlation on the choice of climate change disclosure. This implies that the ownership of a firm have the capacity to influence its management on what extent they approve the reporting of climate information. For firms to achieve a more reliable and accurate climate change disclosures; this work suggest the adoption of blockchain enabled reporting framework by regulatory institutions to improve investors' decision making processes.

This research study involves large multinational companies in the manufacturing, chemical, consumer goods and petroleum industries, including non-financial indigenous companies that are listed on the Nigeria Stock Exchange Market contributing significant amount of carbon emissions to the country. Multinational companies are selected due to their presence in major countries of the world and are usually adopted by researchers for the purpose of validation and expansion of existing theories (Roth&Kostova, 2003).This study will be beneficial to the emerging economies in sub-Saharan Africa and globally in the aspect of transparency in firms' climate risk disclosures through the following ways: it will reduce corruption by ensuring that companies are held accountable in the management of their environmental activities; it will restore confidence in the Stock Exchange market; and it will bring new opportunities for innovations in businesses by developing possible solutions to reducing the 'environmental impact of their operations'. This study will be helpful to both developed and emerging economies; it presents an important practical implications for investors, regulators, and policy makers that withholding climate change information does not necessarily link to low climate disclosure quality. Generalizations may be applicable regarding this research findings since the multinational companies represented in the sample have their presence in other countries of different continents but with diverse yet similar organizational cultures.

This study has some limitations however; the sample selection is only focused on Nigeria economy although most of the sample firms are multinationals with their presence in different



countries of the world where generalizations of research findings may be applicable. More so, the data was manually collected from annual reports and sustainability reports of the sample firms based on the climate disclosure guide that was solely focused on TCFD reporting framework to determine the emission score for each selected company. The remainder of this paper is arranged as thus; the next section present the contextual background on the frameworks for ‘climate change disclosure’ and metrics; it emphasize the importance of accuracy of ‘climate change disclosures’ alongside the effects of climate risks on firms’ portfolios. The literature review the theories underpinning climate change disclosures; further section discusses the methodology, statistical analysis, empirical findings and discussion of the research gap including anticipated contributions to literature and we conclude.

## **2. Background, Literature Review**

Climate change disclosure is a risk management tool and a template that organizations have to use to decide on the allocation of resources and human capital development (Cline 2020) (Kotsantonis et al., 2016).The analysis of investment portfolio of an organization is incomplete without the integration of climate reporting, this will determine its attractiveness to access private equity.

Investors are now considering not only the financial criteria of investment analysis, but are keen about the non-financials as well (Seker &Sengur, 2021) (Atan et al., 2016: Crifo&Forget, 2013).Furthermore, companies that do not acknowledge climate change issues has more tendencies to experience bad performance due to lack of access to private equity (Atan et al., 2016: Crifo &Forget 2013).

### *2.1 Frameworks, Standards and Protocols for Climate Change Disclosure.*

The widely used reporting ‘frameworks’ are the ‘SASB-Sustainability Accounting Standard Board’, ‘TCFD-Task Force for Climate Related Financial Disclosure’, ‘GRI-Global Reporting Initiative’, ‘UN.SDGs –United Nations Sustainable Development Goals’, ‘CDSB- Climate Disclosure Standard Board, Climate Disclosure Project’, and ‘IR –Integrated Reporting’ (Dye et al., 2021)(Global Reporting Initiative,2023) (TCFD Handbook 2021) (CDP Climate Change 2022 Reporting Guidance, 2022),(Gahramanova & Furtuna,2023) (Luo et al.,2012) (Integrated reporting 2012) (Cheng et al., 2014).The ‘International Accounting Standard Board (IASB)’ and ‘International Sustainability Standard Board (ISSB)’ are regulated under the independent foundation known as the ‘International Financial Reporting’ Standard ‘(IFRS) foundation’. The

ISSB incepted two latest reporting standards; 'IFRS S1' and 'IFRS S2' in June 2023 (IFRS Sustainability, 2023) (ISSB in depth, 2023). Furthermore, the 'Corporate Sustainability Reporting Directive (CSRD)' is also a recent disclosure standard established for European businesses to disclose environmental related information regarding risks and opportunities and the impact of their business operations on the environment (Fasan, 2024).

### *2.1.1 Climate change disclosure metrics*

The metrics and targets for climate disclosures are an integral element in communicating a company's transition plan regarding climate information and tracking the progress of its strategies (Peixoto et al., 2023) (TCFD 2021). It requires that organization should disclose their 'Scope 1', 'Scope 2' and if necessary 'Scope 3' emissions. The '**Scope 1 Emissions**' are emissions that emanates from the organization's financially controlled operations which is referred to as the carbon-dioxide equivalents. '**Scope 2 Emissions**' are indirect emissions that are generated from 'purchased electricity' that is consumed by operations owned or controlled by the organization which is also described as the sources of primary emissions and '**Scope 3 Emissions**'; are generated from the value chain of the organization as a result of business activities which is an estimate of material for example; emissions from transportation etc. (TCFD, 2022) (Latham & Watkins, 2022).

### *2.2 Business Ownership Structure and Transparency in Climate Change Disclosures*

The extreme impact of climate change in developing countries may cause business managers to withhold information which could result in manipulated financial results and climate risk disclosures (Khalifa et al., 2023). **Firms' ownership structure** influences its management on what extent they approve the disclosure of climate information. The reasons are not far-fetched; most of the shareholders consider their own interest before that of the stakeholders. Many businesses that are **family controlled firms** tend to minimally put pressure on managers to publicly present information concerning their environmental related activities because it is voluntary and most of the information is readily available to the shareholders (Wei et al., 2024). Furthermore, the lack of consistency and comparability in environmental disclosures will prevent stakeholders from assessing the effect of emissions on the financial future processes and the prospect of the company (Gahramanova & Kutlu, 2023). Whilst **Government** is perceived as important stakeholder for business with the capability to improve corporate strategy and overall performance of an organization, **Institutional owned** businesses are more experienced and sophisticated concerning access to information on firms' activities compare to

other shareholders (Acar et al.,2021). However, transparency is one of the major determinants of a firm's attractiveness to investors and the level of reliability and comparability in voluntary disclosures depends on manager's willingness to correct any form of deviations from actual information that is useful for capital market participants whose activities depends solely on clarity in disclosures (Mohammadi & Nezhad ,2015).In promoting transparency, accuracy and reliability in financial disclosures; Khalifa et al., (2023) posit that "accounting conservatism" could help in improving the quality of financial reporting however, this form of conservatism may be extended towards 'non-financial' disclosures concerning climate risks . Furthermore, linking both financial and non-financial disclosures in an integrated fashion will result in an improved assessment of an organization's performance and impacting the quality of information being reported to equity investors. This form of reporting serves as an instrument to enhance the decision making processes regarding resource allocation (Tlili et al., 2019: Eccles et al, 2010).More so, the higher the level of disclosure in terms of accuracy, transparency and reliability in the annual reports/sustainability reports/CSR reports, the higher the stock market liquidity and improved forecast accuracy (Akrout&Ben-Othman, 2016) (Muslu et al., 2019). An **enterprise size** affects the quality of climate disclosures (Eleftheriadis & Anagnostopoulou, 2014). Furthermore, a company's financial performance (**Profitability**) has significant association with voluntary climate change disclosures (Sobhy&Megeid, 2004: Nikolaou et al., 2015),

### *2.3 Theories Underpinning Climate Change Disclosures; A Literature Review*

The explanations of these theories in organizational disclosure practices suits or may overlap one another (Lakhani & Herbert 2022: Haji &Anifowose, 2016) (Lakhani & Herbert 2022: Fuhrmann, 2020).The theories underpinning climate change disclosures are explained as follows; '**Legitimacy theory**' enables clear disclosures regarding a company's environmental activities. It explains the reasons behind the increase of these environmental disclosures in the annual reports of many companies (Mousa & Hassan, 2015). **The 'stakeholder's theory'** placed emphasis on the survival of an organization which is also intertwined with legitimacy theory. It suggests that for an organization to survive and thrive, it must be able to effectively manage the dealings with various stakeholders alongside their different expectations (Lakhani &Herbert, 2022: Chen& Roberts, 2010) (Haque & Islam, 2015) (de Grosbois& Fennell, 2022). However, Dye et al., (2021) posit that the stakeholder theory affirms climate disclosure as a communication tool rather than a reflection of true performance of organizations. '**Voluntary disclosure theory**' declare that organizations have motivation to report their beneficial news in order to alleviate an unfavorable preference by the stakeholders (Park et al., 2023: Verrenchia, 1983).Managers will likely provide additional information when the benefits to the

organization outweighs the cost (Cornier & Magnam, 1999), (Rouf & Siddique, 2023), (Guo et al., 2022; Verrenchia, 1983). It implies that organizations will rather not disclose environmental information that will cause damage to its reputation even if it will be beneficial to the stakeholders and the larger society. **The ‘socio-political economic theory’** was the framework upon which the legitimacy theory and the stakeholder theory were built. Both theories connect via the political economic theory (Hahn et al., 2015; Gray et al., 1995). In **‘signaling theory’**, organizations engage in environmental disclosure mainly to build a good reputation and enhance the public perception of their brand (Kalu et al., 2016). It also affirms that companies that provide adequate disclosure are offered lower cost of capital as incentives by the market (Guo et al., 2022; Healy & Pelepu, 2001) (Matisoff et al., 2013; Lyon & Kim, 2011; Barber, 2007). Firms’ choice of climate change disclosure is backed by legitimacy theory, signaling theory, stakeholder theory and voluntary disclosure theory. The formulation of Hypothesis is based on the findings and empirical evidence of the aforementioned studies on Institutional, Signaling, Legitimacy, Stakeholder holder and Voluntary Disclosure Theory.

**H<sub>1</sub>** Climate change disclosure quality is associated with firm’s ownership structure

### **3. Method**

In assessing the quality of the climate change disclosures; the evaluation criterion is such that we analyze the contents of ‘annual reports and sustainability reports’ of selected ‘companies’. We adopt the climate change disclosure index that was based on the contents of the TCFD recommendation framework. We review each disclosure item in the index using evaluation criteria based on disclosure quality levels and we apply equal weighting on each of the item according to their disclosures. The detail description of the environmental disclosure guide is presented in the appendix. We collect data manually from the content analysis of each company’s environmental disclosures in the ‘annual reports’ that was published alongside the ‘sustainability reports’ by the selected firms that are listed on Nigerian Stock Exchange market.

We collect data on our sample firms to ascertain the type of corporate ownership structure each sample firm is operating from the annual reports and ‘Securities and Exchange Commission (SEC)’ report in Nigeria. The population of this study comprises of ‘non-financial sector’ multinational companies (large corporations), and other publicly owned indigenous businesses listed on the Nigeria Stock Exchange (NSE) as at December 2023. The sample size was made up of 50 firms that are publicly listed on the Nigerian Stock Exchange market and have published their annual reports and sustainability reports for three years between 2020-2022. The selected firms consist of 32 multinational companies, and 18 publicly owned indigenous

businesses that span across 6 sectors of the economy namely the Agriculture, Mining & Quarrying, Manufacturing, Electricity, Gas Supply, Construction and Transportation.

The independent variable is the **business ownership structure** which consist of the institutionally owned firms (PINST), managerial owned companies (MOWN), state owned business structure (STATE), family owned(FAM); foreign owned businesses(FOR) including firms with percentage of shares held by shareholders is 5% or more in total number of shares(BLOCK). From the analysis of the sample firms' ,34% of the sample consist of shareholders with percentage number of shares held is 5% or more in total number of shares, family controlled businesses consist of 8% of the total sample,28% are foreign owned businesses ,24% are institutionally owned businesses and 6% of the total sample firms are owned by government. We control for **size** (firm's total asset), **profitability** (annual net income), and **liability**. The companies selected experienced both losses and profits; 24% of the selected companies made losses and 76% of the companies made profits 'at the end of the year' 2022. The 'variables' alongside its definitions and measurements is shown in the appendix.

The dependent variable is categorical because it presents three categories of disclosure quality with non-disclosures (ND) denoted as 0, Low quality climate disclosures (LQCD) denoted as 1 and high quality climate disclosures (HQCD) denoted as 2. These variables are based on numeric scores we assigned to each sample firms' climate disclosure quality. We adopt the logistic regression model and the logistic function is of the form

$$Y = e^{(\beta_0 + \beta_1 X)} / (1 + e^{(\beta_0 + \beta_1 X)}) \quad (1)$$

Where X is a vector of independent variable, Y is the choice of climate change disclosure CCCD.

$\beta_0$  = intercept term,  $\beta_1$  = the coefficient for the single input value (x). Re-writing the equation; we have;

$\ln\left(\frac{Y}{1-Y}\right) = (\beta_0 + \beta_1 X)$  and substituting for X and Y;

$$\ln\left(\frac{CCCD}{1-CCCD}\right) = (\beta_0 + \beta_1 X_1 + \dots + \beta_n X_n) \quad (2)$$

Choice of climate change disclosure CCCD could either be high quality climate disclosure HQCD or low quality climate disclosure LQCD .ND denotes no disclosure .Therefore;

$$\ln\left(\frac{Pr(LQCD)=1}{Pr(ND)=0}\right) = \beta_{01} + \beta_1(SZ) + \beta_2(PR) + \beta_3(LB) + \beta_4(PINST) + \beta_5(MOWN) + \beta_6(FAM) + \beta_7(BLOCK) + \beta_8(FOR) + \beta_9(STATE) \quad (3)$$

$$\ln\left(\frac{Pr(HQCD)=2}{Pr(ND)=0}\right) = \beta_{02} + \beta_{10}(SZ) + \beta_{11}(PR) + \beta_{12}(LB) + \beta_{13}(PINST) + \beta_{14}(MOWN) + \beta_{15}(FAM) + \beta_{16}(BLOCK) + \beta_{17}(FOR) + \beta_{18}(STATE) \quad (4)$$

#### 4. Empirical Results

We adopt the logistic regression analyses and paired-sample t-tests on the variables in this study. The logistic regression analyses were used to determine the ‘association’ of corporate ‘ownership structure’ on the economic drivers of firms’ choice of climate change disclosures (CCCD) quality with a focus on family-owned businesses (FAM) and foreign-owned companies (FOR) that are listed on Nigeria stock exchange market. The firm’s ownership structure is proxied by FAM, FOR, PINST, MOWN, BLOCK and STATE. Other economic determinants of CCCD such as SZ, PR, and LB are also included as variables in the logistic regression model. However, the paired-sample t-tests were used to test the mean difference between, LQ and HQ, LQ and HQ vs. LQ, and HQ and HQ vs. LQ.

**Table 4.1:** *Category of Choice of Climate Change Disclosure (CCCD)*

CCCD	Freq	Percent	Cum
Non-Disclosure	20	40	40
LQCD	13	26	66
HQCD	17	34	100

Table 4.1 report the results of the category of the Choice of Climate Change Disclosure (CCCD) in terms of frequency, percentage, and cumulative frequency respectively. Based on these results, it is found that Non-Disclosure (ND), Low-Quality Climate Disclosure (LQCD), and High-Quality Climate Disclosure (HQCD) constitute 40%, 26%, and 17% respectively. In other words, of all the sampled firms, 40% did not disclose their climate change information, 13% disclosed very little information about their climate change activities and 17% disclosed full information in their climate reports.

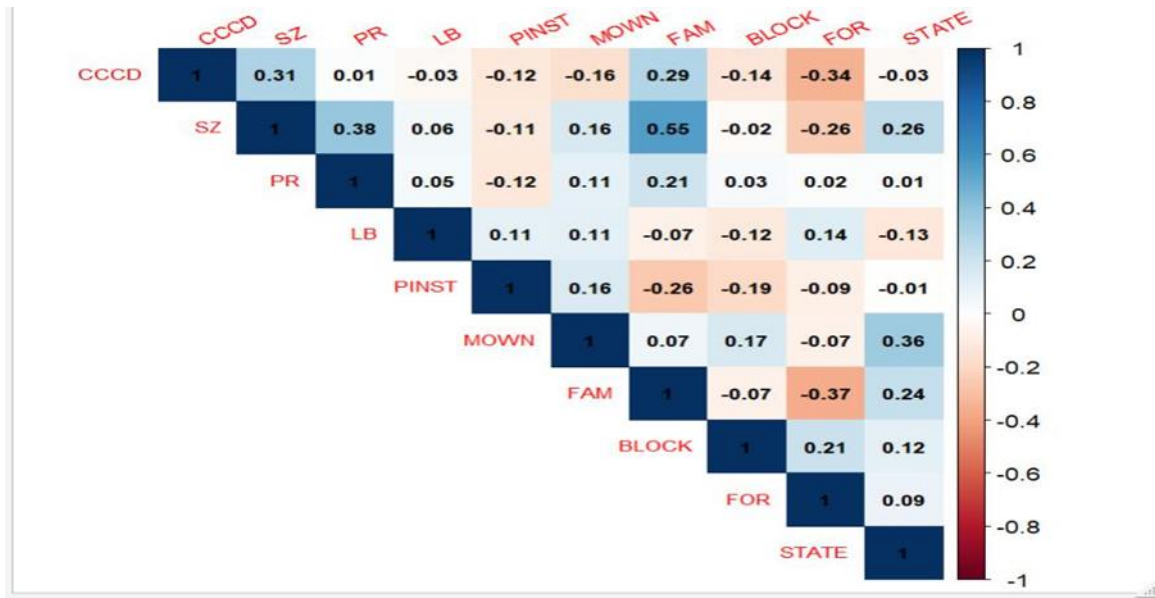
**Table 4.2:** *Descriptive Statistics of Variables*

Variable	Obs	Mean	Std.Dev	Min	Max
CCCD	50	0.94	0.8668498	0	2
SZ	50	44793.2	117915.1	0.083	465769.5
PR	50	422490.4	2956803	-12326.99	2.09E+07
LB	50	14.63232	334.5964	-2123.529	413.272
PINST	50	39.875	24.92051	2.89	85
MOWN	50	9.282367	8.471688	0.00389	41.6
FAM	50	75.3192	7.127589	56.4	85.5
BLOCK	50	53.8066	28.84853	5	98.2
FOR	50	67.2068	23.03798	0.12	94
STATE	50	28.2008	29.89174	0.06	93

*FAM=Family owned business, BLOCK=Shares of 5% and above held by individuals, FOR=Foreign owned businesses, STATE= Business ownership by government, PINST=Institutional owned business, MOWN=Businesses owned by members of the board. SZ=Size, PR=Profitability, LB=Liability, CCCD=Choice of climate change disclosure*

The summary of descriptive statistics in Table 4.2 show the statistical properties or behaviors of the dependent and independent variables used in the study. According to these statistics, the average or mean values of CCCD, SZ, PR, LB, PINST, MOWN, FAM, BLOCK, FOR, and STATE are 0.94, 44793.2, 422490.4, 14.63232, 39.875, 9.282367, 75.3192, 53.8066, 67.2068 and 28.2008 respectively. Furthermore, CCCD, FAM, and MOWN revealed fewer dispersions (0.94, 7.127589, and 8.471688) from their respective means or averages. Besides, FOR, PINST, BLOCK, STATE, LB, SZ, and PR revealed wider variations which means that these variables are quite dispersed from their respective means.

**Figure 4.1:** Correlation matrix for the variables



**Table 4.3:** Estimates of the correlation matrix for the variables

Note: the bold values represent the relevant pair-wise correlations in the study. FAM=Family owned business, BLOCK= Shares of 5% and above held by individuals, FOR=Foreign owned businesses, STATE= Business ownership by government, PINST=Institutional owned business, MOWN=Businesses owned by members of the board. SZ=Size, PR=Profitability, LB=Liability, CCCD=Choice of climate change disclosure

	CCCD	SZ	PR	LB	PINST	MOWN	FAM	BLOCK	FOR	STATE
CCCD	1									
SZ	0.3093	1								
PR	0.0119	<b>0.3839</b>	1							
LB	-0.0338	0.0557	0.0486	1						
PINST	<b>-0.1233</b>	-0.1136	<b>-0.1239</b>	<b>0.1051</b>	1					
MOWN	<b>-0.1635</b>	<b>0.1625</b>	<b>0.1093</b>	<b>0.1143</b>	<b>0.1567</b>	1				
FAM	<b>0.2933</b>	<b>0.5519</b>	<b>0.2085</b>	-0.0736	<b>-0.2644</b>	0.067	1			
BLOCK	<b>-0.1384</b>	-0.0203	0.031	<b>-0.1187</b>	<b>-0.195</b>	<b>0.1671</b>	-0.0749	1		
FOR	<b>-0.3429</b>	<b>-0.2557</b>	0.0155	<b>0.1396</b>	-0.0878	-0.0701	<b>-0.3659</b>	<b>0.2145</b>	1	
STATE	-0.0345	<b>0.2559</b>	0.0104	<b>-0.1252</b>	-0.0067	<b>0.3584</b>	<b>0.2368</b>	<b>0.1188</b>	0.0851	1

The correlation matrix in Figure 4.1 and estimates of correlation analysis presented in Table 4.3 was used to analyze the pairwise correlation or ‘relationship between’ each ‘independent variable’ concerning the ‘dependent variable’ CCCD only. There exists a moderately low correlation of 0.31 between CCCD and SZ ( $r_{\text{CCCD.SZ}} = 0.31$ ) while there exists a very little or zero positive correlation between CCCD and PR ( $r_{\text{CCCD.PR}} = 0.01$ ).

More so, there exists a minute negative correlation of -0.03 between CCCD and LB ( $r_{\text{CCCD.LB}} = -0.03$ ). Of all the six ownership structure variables used in this study, four (i.e. PINST, MOWN, BLOCK, and FOR) of them exhibit very low negative pairwise correlations between



them and CCD ( $r_{\text{CCCD.PINST}} = -0.12$ ,  $r_{\text{CCCD.MOWN}} = -0.16$ ,  $r_{\text{CCCD.BLOCK}} = -0.14$ ), FAM exhibits a small positive pairwise correlation of 0.29 with CCCD ( $r_{\text{CCCD.FAM}} = 0.29$ ) and STATE exhibit very little or negligible negative pairwise correlation of -0.03 between itself and CCCD ( $r_{\text{CCCD.STATE}} = -0.03$ ). Consequently, this suggests that the firm's ownership structure is linked to the purpose-driven choice of climate change disclosure quality which is proxied as CCCD. Hypothetically, a firm's ownership structure is linked to the purpose-driven choice of climate change disclosure quality.

**Table 4.4:** *Estimates and Standard Errors of Choice of Climate Change Disclosure (CCCD)*

*Residual Deviance: 69.43327 AIC: 109.4333, FAM=Family-owned business, BLOCK= Shares of 5% and above held by individuals, FOR=Foreign owned businesses, STATE= Business ownership by government, PINST=Institutional owned business, MOWN=Businesses owned by members of the board. SZ=Size, PR=Profitability, LB=Liability, CCCD=Choice of climate change disclosure*

Table 4.4 presents the estimates and standard errors of the estimated logistic regression model. It will be difficult to determine the impacts of the ownership structure variables and other

Coefficients:						
Category	(Intercept)	SZ	PR	LB	PINST	MOWN
1	5.408462	0.006489291	-9.39E-05	0.01077281	-0.047521	-0.077543
2	4.580979	0.006494796	-9.43E-05	0.00377269	-0.019579	-0.082816
Category	FAM	BLOCK	FOR	STATE		
1	-0.04444431	-0.00208076	-0.0250391	0.01625195		
2	-0.02324326	-0.00357492	-0.0333455	0.00459574		
Std. Errors:						
Category	(Intercept)	SZ	PR	LB	PINST	MOWN
1	3.47E-05	0.00294968	0.00026243	0.00260363	0.0010701	0.0003172
2	3.06E-05	0.002949767	0.00026243	0.00284434	0.0014027	0.0002404
Category	FAM	BLOCK	FOR	STATE		
1	0.002563104	0.002268694	0.00246319	0.00181057		
2	0.002252342	0.001842639	0.00202319	0.00088741		

included variables on the categorical dependent variable CCCD since the p-values of the respective estimated regression coefficients are excluded from the same Table 4.3.

From Table 4.3, the estimated multinomial logistic regression equations for the Low-Quality Climate Disclosure (LQCD) and High-Quality Climate Disclosure (HQCD) categories under CCCD are stated as equations (4.1) and (4.2)

$$\ln \left( \frac{\text{Pr}(\text{LQCD}=1)}{\text{Pr}(\text{No Disclosure}=0)} \right) = 5.408462 + 0.006489291(\text{SZ}) - 9.39\text{E} - 05(\text{PR}) + 0.01077281(\text{LB}) - 0.047521(\text{PINST}) - 0.077543(\text{MOWN}) - 0.04444431(\text{FAM}) - 0.00208076(\text{BLOCK}) - 0.0250391(\text{FOR}) + 0.01625195(\text{STATE}) \quad (4.1)$$

$$\ln \left( \frac{\Pr(\text{HQCD}=1)}{\Pr(\text{No Disclosure}=0)} \right) = 4.580979 + 0.006494796(\text{SZ}) - 9.43\text{E} - 05(\text{PR}) + 0.01077281(\text{LB}) - 0.019579(\text{PINST}) - 0.082816(\text{MOWN}) - 0.02324326(\text{FAM}) - 0.00357492(\text{BLOCK}) - 0.0333455(\text{FOR}) + 0.00459574(\text{STATE}) \quad (4.2)$$

**Table 4.5: Regression of the independent variables on CCCD**

	1 (1)	2 (2)
SZ	0.006 (0.003)**	0.006 (0.003)**
PR	-0.0001 (0.0003)	-0.0001 (0.0003)
LB	0.011 (0.003)***	0.004 (0.003)
PINST	-0.048 (0.001)***	-0.020 (0.001)***
MOWN	-0.078 (0.0003)***	-0.083 (0.0002)***
FAM	-0.044 (0.003)***	-0.023 (0.002)***
BLOCK	-0.002 (0.002)	-0.004 (0.002)*
FOR	-0.025 (0.002)***	-0.033 (0.002)***
STATE	0.016 (0.002)***	0.005 (0.001)***
Constant	5.408 (0.00003)***	4.581 (0.00003)***
Akaike Inf. Crit.	109.433	109.433

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 4.5 presents the approximate estimates of the regression model and their respective p-values which will enable us to determine if the ownership structure variables and other included variables significantly impact the CCCD or not. Table 4.4 revealed that the constant terms in regression equations 4.1 and 4.2 are statistically significant (p-values < 0.05) in the model. Furthermore, results of the estimated multinomial logistic regression model presented in the same Table 4.4 established that all ownership structure variables (i.e. PINST, MOWN, FAM, FOR, and STATE positively or negatively impact the choice of climate change disclosures (CCCD) except BLOCK (p-values < 0.01) which does not have any impact on CCCD (p-values > 0.05).

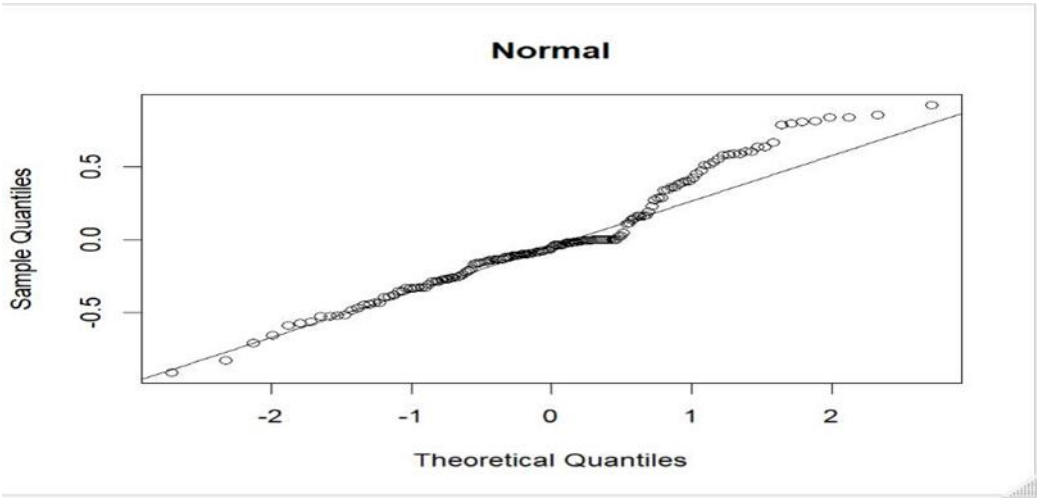
Specifically, PINST, MOWN, FAM, and FOR have negative impacts on both the low quality disclosures LQCD and high quality disclosures HQCD categories of the choice of climate change disclosures CCCD whereas STATE has positive impacts on both the LQCD and HQCD categories of the CCCD. Statistically, PINST, MOWN, FAM, and FOR are said to be negatively statistically significant at a 1% level of significance in the model. SZ, PR, and LB are other economic determinants of CCCD which are also included in the model. Of all these determinants, only PR does not have any significant impact on CCCD (p-value > 0.05) while SZ has positive impacts on the LQCD and HQCD categories of the CCCD.

Lastly, LB only has positive impacts on LQCD category of the CCCD while it does not have any significant impact on the HQCD category of the CCCD. In view of these, it can be said that

the choice of climate change disclosure is linked to firm’s ownership structure which supports our hypothesis.

The normal Q-Q plot in Figure 4.2 suggests that the residuals obtained from the fitted logistic regression model are non-Gaussians since there is a heavy tail at the top of the slope. In other words, the residuals are not normally distributed with zero mean and constant variance ( $\mathcal{E} \sim \text{NIID}(0, \sigma^2)$ ).

**Figure 4.2:** Normal Q-Q plot obtained from the residuals of the fitted model



For suitable confirmation of the normality status of the residuals, the Shapiro-Wilk normality test has been conducted to confirm what is reported by the plot.

**Table 4.6:** Shapiro-wilk normality tests for the residuals of the fitted model

Results of Shapiro-Wilk normality tests in Table 4.6 showed that the null hypothesis of

Data	U1
w=0.95949	p-value=0.0002201

normality has been rejected for the residuals since the p-value (=0.0002201) is less than 5% chosen level of significance  $\alpha$ . Consequently, the residuals from the fitted multinomial model are not normally distributed which fulfils the assumption of non-normality of residuals logistic regression models.

**5. Discussion**

This research study tests the association of business ownership structure on the economic drivers of climate change disclosure choices of multinational and indigenous firms that are listed on the Nigeria stock exchange market. We adopt the climate disclosure index based on TCFD recommendation framework and we performed logistic regression analysis. Our results show that the choice of climate change disclosure quality is linked to corporate ownership structure. It indicates that family-controlled businesses and foreign-controlled businesses have a negative correlation to the choice of climate change disclosure; it implies that the ownership of a firm has the capacity to influence its management on what extent they approve the disclosure of climate information. Our findings support 'voluntary disclosure theory', 'signaling theory', 'legitimacy and stakeholder theory'. However, we did not find in our study that high-quality climate change disclosures indicate full transparency in reporting by organizations.

We interpret our findings with reasons why they support 'signaling theory', 'legitimacy theory', and 'voluntary disclosure theory'; first, it supports 'signaling theory' on the position that companies will likely provide high-quality disclosures because of the possibility to be offered a lower cost of capital as an incentive by the market. This may prompt firms to withhold vital information and report what seems like a high-quality disclosure because of the benefits the market offers in this regard. This further supports voluntary disclosure theory because organizations will rather not disclose information that will cause damage to their reputation even if it is of immense benefits to the stakeholders and the larger society (see Guo et al., 2022; Verrechia, 1983). Furthermore, our empirical results support legitimacy theory in the sense that companies may give the impression of not being involved in what is unacceptable to the public by appearing to be doing what is right whereas this form of appearance may not be the actual standing of the organization concerning their climate change activities (Solikhah et al., 2020). In other words, a company's climate change disclosure is usually separated from their environmental performance (see Liu et al., 2023). Corporations may publish environmental disclosures to secure their legitimacy to operate and ensure their continued existence (Lakhani & Herbert, 2022; Spence et al., 2010). This may compel corporations to publish high-quality climate disclosures by all means which could imply that companies that choose to report high-quality climate activities may have the tendency of withholding vital climate information which supports the 'stakeholder theory' (Lakhani & Herbert, 2022; Chen & Roberts, 2010) (Dye et al., 2021).

This research work contributes to existing literature by providing important theoretical implications; apart from confirming existing theories on the impact of business ownership structure on the drivers of firms' choice of climate change disclosures. It takes on the novel perspective of the fundamental importance of transparency in the choice of climate change disclosures. It implies that transparency; the willingness to withhold information or not is an essential part of firms' decision concerning the choice of climate disclosure quality (See Akrouf&BenOthman, 2016, Muslu et al., 2019). Prior studies on the factors that determines environmental disclosures; Cormier & Magnam (1999), (Amran et al., 2011) Amran et al., (2014), Kalu et.al. (2016), Baalouch et al.(2019),Caby et al.(2020), Desai(2022), Mou Ruiqin & Ma Tao(2023), Halkos&Skouloudis (2016), Vithanage &Shamil(2022), Mehedi et al.(2023) did not pay close attention to how business ownership structure influences transparency concerning the choice of climate disclosure quality. Our work is distinct from prior studies because we considered the association of various types of business ownership structure with the inclusion of **Family Controlled Businesses** and **Foreign Owned Businesses** on the choice of climate change disclosure quality in one study. Our findings which reveal the importance of transparency in climate disclosure quality will be useful to meet the current need of investors, regulators, business managers and the general public regarding climate change reporting. The socio-political theory support the technological advancement processes that will be required for the future needs of climate change disclosures. The theory affirm that the increased probe by stakeholders could result in higher cost of withholding information concerning environmental disclosures (see Mongie &Willows, 2018: Stanny&Ely, 2008).This probe by stakeholders could influence the adoption of emerging technology to mitigate the problem of greenwashing in disclosures. Our research study provides practical implication for business owners by bringing forth the awareness of the impact of transparency on choice of climate disclosures on their businesses .Our results also support the effort of stakeholders, regulators, and investors in encouraging corporations to publicly report their climate information. This will promote reliability in disclosures and this form of public disclosures can be enhanced by adopting a blockchain enabled climate disclosure framework to ensure clarity, accuracy and reliability in reporting .The adoption of IoT blockchain enabled reporting framework will improve the decision making process of investors and regulatory institutions (Drescher, 2017;

Hughes et al., 2019; Yuan&Wang, 2016; Sharif&Ghodoosi, 2022) (Quin et al., 2019; Omohundro, 2014; Dorri et al., 2016; Ferrer 2016).The theoretical and the practical implications of this study is applicable globally although the data for this analysis is derived from firms located in Sub-Saharan Africa however, most of the sample firms(64%) are

multinationals with their presence in multiple countries across the globe. This research study is expected to provide new awareness regarding environmental disclosures at global level in the aspect of advocating for IoT blockchain technology to erase the challenges of greenwashing in climate risk reporting.

## **Conclusion**

Our research work examined the economic drivers of firms' purpose driven choice of climate change disclosures by testing the association of business ownership structure on the choice of climate disclosure quality. The contribution of our study emphasized that corporate ownership structure of Foreign Owned Business, Family Controlled Businesses, Institutional and Managerial Owned firms have negative correlation on the choice of climate change disclosure quality. This evidence is backed by 'legitimacy theory', 'voluntary disclosure theory', 'stakeholder theory' and 'signaling theory'. This study takes on the novel perspective that technological advancement will be required to achieve a transparent high quality disclosures to meet the future needs of climate change reporting. Our work supports the effort of stakeholders, regulators and investors in promoting public disclosures of climate risk reports and this can be enhanced by adopting IoT blockchain technology to ensure clarity and accuracy which is critical for decision making of business managers, regulators, policy makers and investors. Our study experienced limitations regarding the sample size which was quite small because it was focused on Nigeria although part of the sample firms are multinationals. In view of this, future research opportunities should consider cross-countries in this regard.

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## Appendix

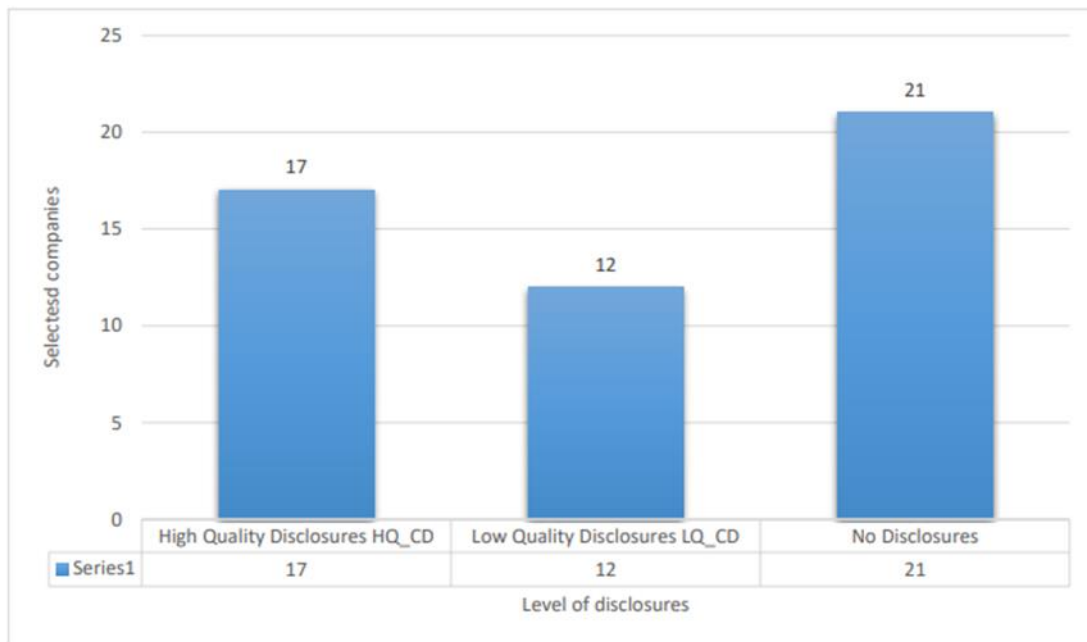
**Table3.1: Climate Change Disclosure Index based on TCFD Recommendation Framework**

TCFD Recommended Disclosure		Low quality disclosure	High Quality Disclosure	No Disclosure
<p><b>Governance</b> Disclose the organization's governance around climate related issues and opportunities based on the following: 1.Board level oversight on climate relate opportunities and risks 2. Detail description of management's role in evaluating and managing climate related risks and opportunities.</p>		<p>A mention of environmental /sustainability committee assigned by the board.</p> <p>A mention of management role with a sentence or some words, regarding general environmental issues.</p>	<p>In-depth explanations on how the committees will work regarding climate change related issues</p> <p>A detailed explanation of management's role and in-depth assessment of the environmental issues</p>	<p>No disclosure</p> <p>No disclosure</p>
<p><b>Strategy</b>  Present the impact of climate related risks and the opportunities for the organizations business, strategy and financial planning where such information is material</p>	<p>Narrate the climate related risks and opportunities the organization has identified over the short ,medium and long term</p>	<p>Stating general disclosures of environmental issues integrated into business strategy</p>	<p>Indicating specific disclosures of climate change issues (e.g. GHG emission issues )integrated into business strategy</p>	<p>No disclosure</p>
<p>.Climate related issues integrated into firm's business objectives and strategy.</p>	<p>1 Recount the environmental impact of climate related risks and opportunities on the firm's businesses, strategy and financial planning 2 Relate the resilience of the organization's strategy, taking into account different climate-related scenarios including a or lower scenarios.</p>			
<p><b>Risk Management</b>  Recount how your organization identify ,assess and manages climate related risks ;  1.What are the processes for identifying, evaluating, and managing risk and opportunities of climate-related issues 2.What are the inherent climate-related risks with the potential to have an impact on business disclosure 3. What are the inherent climate-related opportunities with the potential to have an impact on the business?</p>	<p>"§ Narrate the organization's procedures for identifying and evaluating climate related risks - depth account of the organization's strategy for managing climate related risks organization's processes for identifying, assessing climate related risks that are integrated into the organization's overall risk management"</p>	<p>Stating general disclosures of environmental issues integrated into business strategy; 1 A mention of general environmental Risks and Opportunities. 2. A mention of the risks. 3. A mention of the opportunities.</p>	<p>Indicating specific disclosures of climate change issues (e.g. GHG emission issues )integrated into business strategy</p> <p>1.An explanation of the procedures(methodology) 2. A detailed explanation of the risks or numeric disclosure. 3. Comprehensive explanation of the opportunities or a quantitative disclosure.</p>	<p>No disclosure</p> <p>No Disclosure</p> <p>No Disclosure</p> <p>No Disclosure</p>

<p><b>Metrics and Targets</b></p> <p>Disclose the metrics and target used to assess and manage relevant climate related risk and opportunities where such information is material</p> <p>"Report Scope 1, Scope 2 and if necessary Scope3 GHG emissions and the related risks.</p> <p>"</p> <p>Recount the targets set by the organizations to manage climate related risks and opportunities and performance against targets</p>	<p>Disclose the metrics adopted by the firm for the assessment of climate related risks and opportunities in line with its strategies and risk management processes.</p>	<p>Disclosure of scope 1 and scope 2 emission including scope 3 emission if necessary. Just a mention of net zero targets.</p>	<p>Progress against previous year for scope 1, scope 2 and if necessary scope 3 GHG emission data. Detail description of net zero emission targets and aims.</p>	<p>No disclosure</p> <p>No disclosure</p>
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Source: The Taskforce on Climate Related Financial Disclosures (TCFD) Good Practice Handbook (2021).

**Figure 3.1:** Level of Climate Change Disclosures of Selected Companies



**Table3.2: Classification of Companies' Economic Activities using the ISIC Codes and their 2022 Climate Change Disclosure Quality**

Sector	Group	Class	Description	LQ_CD	HQ_CD	No Disclosure
<b>Agriculture</b>						
	011	0111	Growing of cereals (except rice), leguminous crops and oil seeds			✓
	012	0127	Growing of beverage crops			✓
<b>Mining and Quarrying</b>						
	071	0710	Mining of non-ferrous metal ores	✓		
	072	0729	Mining of other non-ferrous metal ores			✓
	089	0893	Extraction of salt		✓	
<b>Manufacturing</b>						
	106	1061	Manufacture of grain mill products		✓	
	107	1071	Manufacture of bakery products	✓		
		1072	Manufacture of sugar		✓	
		1073	Manufacture of cocoa, chocolate and sugar confectionery			✓
		1073	Manufacture of cocoa, chocolate and sugar confectionery			✓
		1074	Manufacture of macaroni, noodles, couscous and similar farinaceous products	✓		
	108	1080	Manufacture of prepared animal feeds			✓
	110	1101	Distilling, rectifying and blending of spirits	✓		
		1103	Manufacture of malt liquors and malt	✓		
		1103	Manufacture of malt liquors and malt	✓		
		1103	Manufacture of malt liquors and malt			✓
		1103	Manufacture of malt liquors and malt			✓
	192	1920	Manufacture of refined petroleum products			✓
	201	2013	Manufacture of plastics and synthetic rubber in primary forms			✓
	202	2022	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	✓		
		2022	Manufacture of paints, varnishes and similar coatings, printing ink and mastics			✓
		2023	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations.		✓	
		2023	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations		✓	
		2029	Manufacture of other chemical products n.e.c		✓	

	210	2100	Manufacture of pharmaceuticals, medicinal, chemical and botanical products			✓
	210	2100	Manufacture of pharmaceuticals, medicinal chemical and botanical products			✓
	231	2310	Manufacture of glass and glass products		✓	
	239	2393	Manufacture of other porcelain and ceramic products			✓
		2394	Manufacture of cement, lime and plaster	✓		
		2394	Manufacture of cement, lime and plaster		✓	
		2395	Manufacture of articles of concrete, cement and plaster			✓
		2395	Manufacture of articles of concrete, cement and plaster		✓	
	242	2420	Manufacture of basic precious and other non-ferrous metals			✓
	243	2431	Casting of iron and steel		✓	
	273	2732	Manufacture of other electronic and electric wires and cables	✓		
		3250	Manufacture of medical and dental instruments and supplies			✓
	329	3290	Other manufacturing n.e.c.			✓
<b>Electricity, gas, steam, air- con supply</b>						
	351	3510	Electric power generation, transmission and distribution			✓
		3510	Electric power generation, transmission and distribution	✓		
		3510	Electric power generation, transmission and distribution		✓	
	352	3520	Manufacture of gas; distribution of gaseous fuels through mains			✓
			Manufacture of gas; distribution of gaseous fuels through mains		✓	
			Manufacture of gas; distribution of gaseous fuels through mains		✓	
			Manufacture of gas; distribution of gaseous fuels through mains		✓	
			Manufacture of gas; distribution of gaseous fuels through mains	✓		
			Manufacture of gas; distribution of gaseous fuels through mains		✓	
			Manufacture of gas; distribution of gaseous fuels through mains		✓	
<b>Construction</b>						
	421	4210	Construction of roads and railways	✓		
<b>Transportation and storage</b>						
	522	5223	Service activities incidental to air transportation			✓

Source: International Standard industrial classification of all Economic Activities (ISIC)  
Revision 4. (2008).

**Table 3.3: Variables; Definitions and Measurements**

<b>Variables</b>	<b>Descriptions</b>	<b>References</b>
CCCDQ	Choice of climate change disclosure quality .This includes (LQ_CD) Low quality climate change disclosure and (HQ_CD) High quality climate change disclosure.	Park et al. (2023).
PINST	Percentage of shares held by institutional investors  % of shares held by long term institutional investors  % of shares held by short term institutional investors	Garcia-meca& Purcheta-martinez (2018), El-Difflar et al.(2017), Ilhan et al.(2022)
MOWN	Percentage of shares held by members of the board. Managerial Ownership	Eng&Mak(2003), Matoussi & Chakroun (2014), Sugathadas Kaushalya (2019).
FAM	Family owned businesses. % of equity owned by family.(majority of the ownership of the business is controlled by at least one family	Md Zaini et al. (2020).
BLOCK	The shareholders own a minimum of 5% total number of shares or more.	Zheng et al. (2014), Sugathadas Kaushalya (2019).
FOR	Foreign owned businesses. (S&P 500 companies).% of equity owned by foreigners;	Khanna et al.(2004)
STATE	Government owned businesses; largest % of shares is held by government	Lee et al.(2017)
SIZE	Total assets	Park et al. (2023), Borghei,2021
PRO	Total net income of sample firms	Park et al.,2023
LIAB	Firms' financial obligations including debt	

# Green Bonds: Introduction and regulatory framework

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## ABSTRACT

In the past few years, the consequences of climate change have increasingly led to an immediate need for action. Fortunately, the public has largely shaped the necessary awareness when it comes to the urgency of the issue. Therefore, effective measures must be taken in order to face the various challenges of climate change. Significant institutions like the United Nations and the European Union have taken the lead by developing initiatives and action plans that define which measures are to be implemented to overcome these challenges. Some of them include the UN SDGs 2030 Agenda, the Paris Agreement, the EU Action plan and the EU Green Deal. They all build the fundament for the future sustainable development path. One crucial question in this regard is how the various initiatives and projects in the sustainable development context will be financed. Here capital markets play a crucial role. By shifting more capital in green projects, sustainability can be promoted and eventually significantly improved. In the past few years one of the emerged financial instruments with this objective are green bonds. However, despite their popularity investors are faced with the challenge of a lack of transparency. Nevertheless, policymakers have taken this issue seriously which is why new solutions have been introduced. Regulation plays a crucial role when it comes to ensuring transparency in the market.

This paper offers an introduction to green bonds, their significance, and their challenges and lastly it gives an overview of the regulatory framework. Overall, it is important to clarify that despite its challenges the green bond market shows to be an essential tool in the capital markets when it comes to promoting sustainable development which is why discussing proper and effective regulatory solutions is so crucial.

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## List of Abbreviations

CBI	Climate Bonds Initiative
ESMA	European Securities and Markets Authority
EU	European Union
EU Action plan	EU Action plan on financing sustainable growth
EU GBR	Regulation on European Green Bonds
EU GBS	European Green Bond Standard
GBP	Green Bond Principles
GSS bonds	Green, social and sustainability bonds
ICMA	International Capital Market Association
SBG	Sustainability Bond Guidelines
SBP	Social Bond Principles
SDGs	Sustainable Development Goals
SFDR	Sustainable Finance Disclosure Regulation
SLBP	Sustainability-Linked Bond Principles
SLBs	Sustainability-linked bonds
Taxonomy Regulation	European Taxonomy Regulation
UN	United Nations

## 1. Introduction and course of analysis

Nowadays our planet is facing one of the worst challenges of all time: climate change. The consequences thereof can be seen in numerous extreme weather conditions and disasters – from flood, through heat waves, storms, etc. (Gregg et al., 2023, p. 846).

In the light of the urgency of the issue in question as well as its effect on the whole planet, it is not possible anymore to postpone the development of proper measures. Since policy makers and experts are aware of this, many initiatives and regulatory frameworks have already been introduced and enforced in the past few years. Furthermore, they are constantly being reevaluated and adjusted. In the face of the necessary sustainable development and especially its necessary financing, the capital markets play a crucial role. Therefore, more sustainable projects and initiatives should be promoted.

For this reason, many new financial instruments with a sustainable character have emerged. One of them are green bonds (Institut der deutschen Wirtschaftsprüfer, 2021, p. 3).

*„The emergence of green bonds represents a landmark moment in financial innovation which is fundamental to supporting the energy transition, by redirecting public and private capital towards green projects/assets” (Maino, 2022, p. 30).*

This paper deals with the question of *what role green bonds play in the capital markets, which challenges is the green bonds market facing and what solutions exist for these issues.*

Firstly, this paper introduces green bonds and their challenges. Secondly, it discusses regulation as the main solution for the improvement of the green bonds market. This includes the extensive sustainable finance regulatory framework consisting of, among others, the European Taxonomy Regulation, and the Sustainable Finance Disclosure Regulation. In addition to that, other regulatory standards which are specific for green bonds are presented. The focus lies here on the European Green Bond Standard.

The hypothesis is that green bonds are valuable financial instruments when it comes to promoting sustainable development and that a solid regulatory framework can solve the current challenges in the green bonds market.



## 2. Green transformation of capital markets

In order to address some of the most severe global issues such as combating poverty, world hunger and dealing with human crises, different regulatory frameworks have been introduced. The central framework stems from the United Nations (UN) which is the *UN Agenda 2030* that has been introduced in 2015. This agenda contains 17 objectives, the so-called *Sustainable Development Goals* (SDGs) which are accepted by all countries (UN, 2015). The following *figure 1* presents the UN SDGs.

**Figure 1:** *UN Sustainable Development Goals*

### UN SDGS:

<b>1</b>	No poverty	<b>10</b>	Reduced inequality
<b>2</b>	Zero hunger	<b>11</b>	Sustainable cities and communities
<b>3</b>	Good Health and well-being	<b>12</b>	Responsible consumption and production
<b>4</b>	Quality education	<b>13</b>	Climate action
<b>5</b>	Gender equality	<b>14</b>	Life below water
<b>6</b>	Clean water and sanitation	<b>15</b>	Life on land
<b>7</b>	Affordable and clean energy	<b>16</b>	Peace, justice, and strong institutions
<b>8</b>	Decent work and economic growth	<b>17</b>	Partnership for the goals
<b>9</b>	Industry, innovation, and infrastructure		

*Source:* Own representation based on UN, 2023

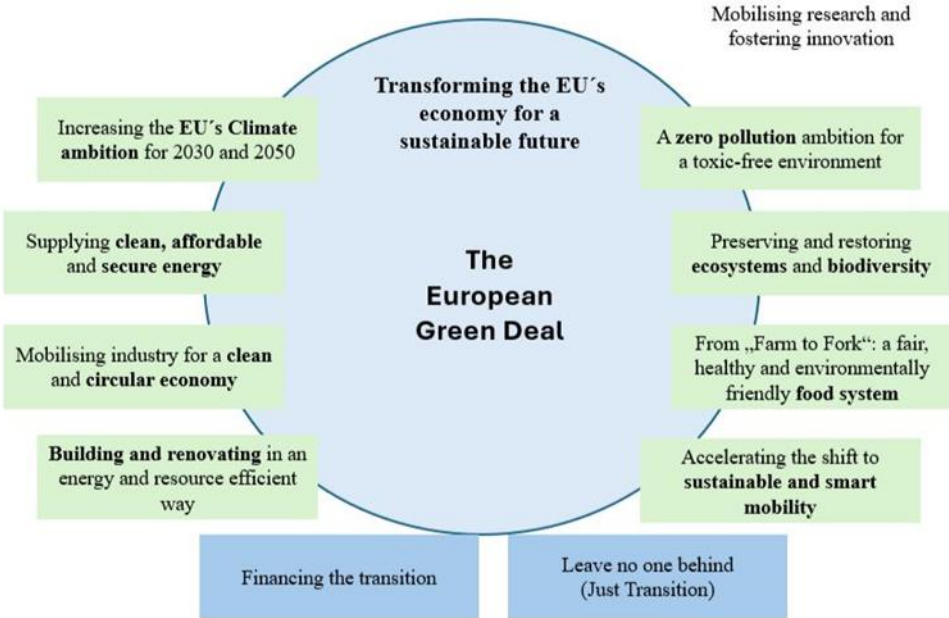
In the context of the *UN Agenda 2030* in December 2015 195 countries signed the first global climate deal: the *Paris Agreement* (European Union, 2018). This treaty on climate aims to limit the increase of global temperature to 1.5° compared to the pre-industrial level (UNFCCC, 2015, p. 4).

The European Union (EU) has also taken the lead in facing the challenges of climate change. Thus, in 2018 the EU defined the *EU Action plan on financing sustainable growth* (in short: EU Action plan). This strategic plan entails ten action steps. The first one is the establishment of an EU classification system for sustainable activities, which was later implemented in the form of the European Taxonomy Regulation (see chapter 4.1). The second one deals with the creation of a European Green Bond Standard, which will be presented in detail in chapter 4.3. The third action item revolves around shifting capital towards more sustainable projects. To achieve the goals in alignment with the *UN Agenda 2030*, the EU has established a yearly gap

of approximately €180 billion. Since the public capital is not sufficient, the key objective is to mobilize private capital towards sustainable projects (European Union, 2018, p. 2). For this reason, institutional investors play a significant role (Maino, 2022, p. 26).

Hence, to make sustainable investments more attractive to private people, transparency is essential. In order to enhance the overall transparency for the market participants a strong regulatory framework needs to be established (European Union, 2018). With this regard the EU has introduced a measurement package, the so-called *European Green Deal*. Its objective is to achieve climate neutrality for Europe by 2050, thus making it the first climate-neutral continent (European Commission, n.d.). The following *figure 2* shows various aspects covered by the *European Green Deal*.

**Figure 2: The European Green Deal**



Source: Based on European Commission, 2019, p. 3

**3. Green bonds**

**3.1 Definition of green bonds**

The World Bank defines a green bond as “(...) a debt security that is issued to raise capital specifically to support climate-related or environmental projects” (World Bank, 2015, p. 23).

**Figure 3: Sustainability-linked and use-of-proceeds bonds**

<b>1. SLBs</b>	Any type of instrument for which the financial or structural characteristics can vary <b>depending on</b> whether the issuer <b>achieves predefined sustainability objectives</b>
<b>2. Use-of proceeds bonds</b>	Any type of instrument where the <b>net proceeds</b> (or an equivalent amount to the net proceeds) are exclusively used to finance or refinance, in part or in full, new and/or existing eligible <b>green and/or social projects</b> .
<b>2.1 Green bonds</b>	Instruments that raise funds for projects with <b>environmental benefits</b> including renewable energy, green buildings, and sustainable agriculture.
<b>2.2 Social bonds</b>	Instruments that raise funds for projects that address or mitigate a specific <b>social issue</b> and/or seek to achieve position <b>social outcomes</b> , such as improving food security and access to education, healthcare, and financing, especially but not exclusively for target populations
<b>2.3 Sustainability bonds</b>	Instruments that raise funds for projects with <b>both environmental and social benefits</b> .

*Source:* Own shortened representation based on S&P Global, 2023, p. 6

Based on this “green” label investors can draw the conclusion that the associated proceeds are invested in projects having a positive impact on the environment (Institut der deutschen Wirtschaftsprüfer, 2021, p. 3). How much truth this necessarily beholds will be discussed in chapter 3.3.

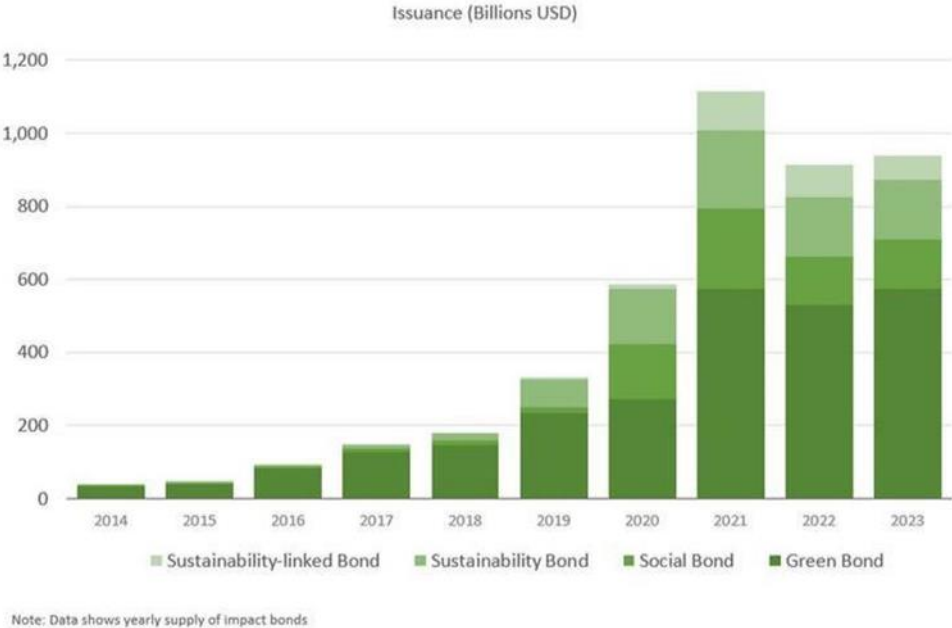
As shown in *figure 3* the International Capital Market Association (ICMA) differentiates between the *use-of-proceeds* and *sustainability-linked bonds (SLBs)*. There are three subcategories of the *use-of-proceeds bonds* which are *green, social* and *sustainability bonds* (in short: GSS bonds) (S&P Global, 2023, p. 6).

However, when it comes to their financial structure there are no significant differences between green and conventional bonds. The sole difference lies in the disclosure of information regarding the environmental impact of the proceeds from green bonds (Cochran, 2016, p. 8).

### ***3.2 Significance of the green bonds market***

Since the first climate awareness bond issued by the European Investment Bank in 2007, followed by the first green bond issued by the World Bank in 2008, the market for GSS bonds, has been increasing ever since (Institut der deutschen Wirtschaftsprüfer, 2021, p. 4). From then on within only ten years the emission volume of green bonds rose from \$1 billion to \$143 billion (Flammer, 2019 as cited in Al-Mheiri; Nobanee, 2020, p. 3). In 2023 that volume almost reached \$600 billion whereas the total volume of GSS bonds almost reached \$1 trillion. *Figure 4* shows the exact development of the issuance of GSS bonds (Bloomberg, 2024).

**Figure 4:** Issuing volume of GSS bonds from 2014 and 2023



Source: Bloomberg, 2024

The increase in issuance of green bonds is probably connected to the benefits they offer. Indeed, green bonds have been shown to provide numerous benefits for various actors. The following *figure 5* shows some of the benefits for issuers, investors, and policymakers (Cochran, 2016, p. 4).

**Figure 5: Benefits of green bonds for different actors**

<b>Actor</b>	<b>Benefits</b>
<b>Issuers</b>	<ul style="list-style-type: none"> <li>▪ Helping issuers communicate the sustainability strategy</li> <li>▪ Improving relationships with debt providers and broadening the “investor base”</li> <li>▪ Creating internal synergies between financial and sustainability departments</li> </ul>
<b>Investors</b>	<ul style="list-style-type: none"> <li>▪ Helping investors to develop better-informed investment strategies</li> <li>▪ Facilitating the smooth implementation of long-term climate strategies</li> <li>▪ Helping responsible investors broaden their restricted investment portfolios</li> </ul>
<b>Policymakers</b>	<ul style="list-style-type: none"> <li>▪ Indirectly supporting the implementation of the low-carbon transition by better matching green issuers and investors</li> </ul>

*Source:* Based on Cochran, 2016, p. 4

### **3.3 Challenges**

Since the market for green bonds is still developing, it is quite understandable that market participants are confronted with different challenges. One of the great challenges is the lack of transparency. This relates to the potential misunderstanding when it comes to the environmental integrity of green bonds, such as their underlying objectives and strategy. Due to different possible expectations of what green bonds mean and what kind of impact they are supposed to have or not have, there is moreover a risk that the communication of green bonds can be viewed as greenwashing (Cochran, 2016, p. 13).

In the “Progress Report on Greenwashing” (2023) the European Supervisory Authorities<sup>2</sup> define “*greenwashing as a practice where sustainability-related statements, declarations, actions, or communications do not clearly and fairly reflect the underlying sustainability profile of an entity, a financial product, or financial services. This practice may be misleading to consumers, investors, or other market participants*” (European Securities and Markets Authority, 2023, p. 11).

The risk of greenwashing can affect both investors and issuers. On the one hand, the investors are sometimes unable to evaluate the overall objectives of the green bonds due to various specifications from different standards. On the other hand, certain issuers might not be willing to issue any green bonds since they are not willing to risk being blamed for greenwashing (Munoz; Smolenska, 2023, pp. 27-28). There are different scenarios in which the issuing of green bonds can be regarded as greenwashing. In a report KPMG has defined the following events. For instance, the bond proceeds can be used for funding activities which are not regarded as entirely sustainable by the market participants. Moreover, the financing of projects can perhaps be nontransparent, so that it remains unclear what the bond proceeds will fund or whether environmental objectives have been fulfilled. Furthermore, it can be questionable if the issuer of a green bond operates in markets that are not sustainable or is involved in non-sustainable events (KPMG, 2015, p. 10 as cited in Cochran, 2016, p. 14). For instance, in 2022 the Hong Kong Airport Authority used a previously issued green bond for developing a new runway, an event that posed a serious danger to Chinese white dolphins that were already threatened from extinction. This use of green bond proceeds was highly criticized since it imposed a negative impact on the environment and hence was far from being a sustainable project (Financial Times, 2022). This makes one question the “greenness” of the green bond when it comes to what extent sustainability objectives are in the focus. However, since the regulatory authorities are aware of the significance of these issues, they have started introducing definitions and standards with the aim to ensure transparency in the green bonds market.

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<sup>2</sup> These are the European Banking Authority (EBA), the European Securities and Markets Authority (ESMA) as well as the European Insurance and Occupational Pensions Authority (EIOPA) (European Central Bank, 2024).

## 4. Regulatory framework

### 4.1 *European Taxonomy Regulation*

The fundament of the sustainable finance framework builds the European Taxonomy Regulation (in short: Taxonomy Regulation) (European Union, 2020). The aim of the Taxonomy Regulation is to establish a classification system for measuring the sustainability of economic activities (European Union, 2020, p. 4). This is fundamental for sustainable financial products such as herein discussed green bonds.

Article 3 of the Taxonomy Regulation sets the criteria for environmentally sustainable economic activities. Thus, an environmentally sustainable economic activity must contribute to one or more of the environmental objectives defined in Article 9, must not significantly harm any of those objectives and must be in line with the minimum requirements in accordance with Article 18 of the Taxonomy Regulation (European Union, 2020, p. 15). Some of the environmental objectives set in Article 9 of this regulation include pollution prevention, protection and restoration of biodiversity and ecosystems, and transition to a circular economy<sup>3</sup> (European Union, 2020, p. 17).

### 4.2 *Sustainable Finance Disclosure Regulation*

Closely linked to the Taxonomy Regulation is the Sustainable Finance Disclosure Regulation (in short: SFDR) from 2019. This regulation was created as response to lacking disclosure requirements when it comes to sustainability-related impact of financial products aiming to achieve any kind of environmental objectives (European Union, 2019, p. 5, section 24). According to Article 1 of SFDR this regulation affects financial market participants<sup>4</sup> as well as financial advisors<sup>5</sup> through transparency rules when it comes to the consideration of sustainability risks, adverse sustainability impacts, and sustainability-related information regarding financial products.

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<sup>3</sup> According to Article 2 section 9 of the Taxonomy Regulation: "‘circular economy’ means an economic system whereby the value of products, materials and other resources in the economy is maintained for as long as possible (...)" (European Union, 2020, p. 14).

<sup>4</sup> The definition is provided in Article 2 section 1 of the SFDR. According to Article 2 section 1 letter b) an example of a financial market participant is an investment firm providing portfolio management (European Union, 2019, p. 7).

<sup>5</sup> The definition is provided in Article 2 section 11 of the SFDR. According to Article 2 section 11 letter d) a financial advisor can be for instance an investment firm providing investment advice (European Union, 2019, p. 7).

One crucial component of the SFDR is the classification of financial products in Article 6, Article 8, and Article 9 products (European Union, 2019, pp. 10-13).

For all three product categories there are some common requirements. Firstly, entities should disclose information on the integration of sustainability risks. Secondly, they should disclose information according to Article 7 of the SFDR regarding the principle adverse impacts (PAI) considerations (KPMG, 2021). These refer to the principle of “do no significant harm”. Annex I of the Delegated Regulation (EU) 2022/1288<sup>6</sup> contains a table with PAI indicators. Some examples of such indicators include greenhouse gas emissions, carbon footprint and activities negatively affecting biodiversity-sensitive areas (European Union, 2022, p. 42).

For *Article 6 products*, which are more mainstream financial products, there are no specific additional requirements. In contrast to that, *Article 8 products* are products that promote environmental and/or social characteristics. Hence, entities should disclose information on how these characteristics are met. Lastly, *Article 9 products* are products with the aim of achieving a certain sustainable investment objective. Hence, it is necessary to disclose information on how this objective shall be achieved and which impact it has (KPMG, 2021; European Union, 2019, pp. 10-13). While *Article 8 products* are called “light green” financial products, *Article 9 products* are referred to as “dark green” financial products (Brühl, 2022, p. 257).

#### **4.3 Green Bond Principles and European Green Bond Standard**

In 2018 the High-level expert group on sustainable finance (HLEG)<sup>7</sup> published its recommendations in the context of sustainable finance. One of them deals with the development of a European Green Bond Standard (in short: EU GBS). In general, the reason for introducing regulation in this market is to increase the investments in green projects which contribute to UN SDGs by attracting more investors and encouraging new issuer types (HLEG, 2018, p. 31).

Before the European Green Bond Standard was finalized (as it will be discussed later in this chapter) there have been other standards that were previously established in the market; the majority of which being only on the voluntary basis (PwC, 2023, p. 15). The most important ones are the Climate Bonds Standard by the Climate Bonds Initiative (CBI) as well as the Green

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<sup>6</sup> Regulatory technical standards (RTS) of the SFDR (European Union, 2022).

<sup>7</sup> This is an expert group established by the European Commission in 2016 (European Commission, 2016).



Bond Principles by the ICMA (Maino, 2022, p. 17). The extensive regulatory framework by the ICMA consists of the Green Bond Principles (GBP), the Social Bond Principles (SBP), the Sustainability Bond Guidelines (SBG) and the Sustainability-Linked Bond Principles (SLBP) (ICMA, 2021, p. 2). The GBPs offer guidelines on four different dimensions: the use of proceeds, the process for project evaluation and selection, management of proceeds and reporting (ICMA, 2021, p. 3).

These private regulation initiatives emerged due to the absence of public regulation (Banahan, 2019, p. 848 as cited in Pyka, 2023, p. 626). Before the Regulation on European Green Bonds (in short: EU GBR)<sup>8</sup> was published in November 2023 (European Union, 2023), its fundament was already laid down in the *EU Action plan*, as mentioned in chapter 2 (second action item within the EU Action plan) (European Union, 2018 as cited in Pyka, 2023, p. 625).

After considering the received feedback from 100 organizations the EU Technical Expert Group on Sustainable Finance (TEG)<sup>9</sup> published its final report on an EU Green Bond Standard in June 2019 (TEG, 2019, p. 8). In this report the TEG emphasizes introducing a voluntary standard that would enhance transparency, without disrupting the market. Furthermore, the EU GBS should ensure that the green projects financed through the bond proceeds are strictly in line with the Taxonomy Regulation (TEG, 2019, pp. 9-10). The difference between the previously described private regulation measures by the CBI and the ICMA in contrast to the European Green Bond Standard is that the administrative supervision when it comes to the EU GBS is more “far-reaching” (Pyka, 2023, p. 630), especially when it comes to the regulation of external reviewers via a supervisory authority (Munoz; Smolenska, 2023, p. 28).

The decision to issue a European Green Bond instead of a green bond in accordance with the aforementioned private standards consequently means that the issuer has to adhere to the requirements set in the EU GBS (BaFin, 2024). To do so, in accordance with Article 14 EU

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<sup>8</sup> “Regulation (EU) 2023/2631 of the European Parliament and of the Council of 22 November 2023 on European Green Bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds”

<sup>9</sup> The TEG was established by the European Commission in 2018 with the aim of assisting in different areas of the EU Action plan (TEG, 2019, p. 8).

GBR the issuer must draw up a prospectus according to the Regulation on the prospectus<sup>10</sup> before the issuance of the bond (European Union, 2023, p. 18; BaFin, 2024).

According to Article 1 of the EU GBR, the objectives of this standard are explicitly to lay down requirements for issuing European Green Bonds, to establish a system for registration and supervision of external reviewers, and to provide disclosure templates for the European Green Bonds (European Union, 2023, p. 12). Article 4 of the EU GBR states that all proceeds of a European Green Bond must be allocated completely in accordance with the Taxonomy Regulation (European Union, 2023, p. 13). Hence, the proceeds must fulfill the criteria set in Article 3 of the Taxonomy Regulation, as explained in chapter 4.1 of this paper (see also European Union, 2023, p. 12, Article 2). Articles 10 and 11 of the EU GBR specify further requirements considering the pre- and post-issuance stages of European Green Bonds. In accordance with Article 10 EU GBR prior to the issuance of a European Green Bond, the issuer shall provide a factsheet in accordance with Annex I EU GBR and make sure that a pre-issuance review by an external competent authority has taken place. Additionally, according to Article 11 EU GBR the issuer shall publish an allocation report using the templates provided in Annex II EU GBR and ensure that post-issuance reviews by external reviewers have taken place (European Union, 2023, pp. 16-17). Title IV of this regulation deals with requirements for external reviewers. For instance, all external reviewers must be registered with the ESMA in line with Article 22 EU GBR (European Union, 2023, p. 23).

Overall, the EU GBR enhances transparency for the investors by requiring the issuers of European Green Bonds to comply with the strict and extensive specifications laid down in this regulation.

## **5. Conclusion**

This paper shows how the European Union has taken the lead in addressing climate issues and what role do the capital markets and herein discussed green bonds play in combating these challenges. Furthermore, this paper demonstrates the significance of green bonds for different market participants and the overall achievement of the sustainability objectives while also taking into account the challenges that the market participants are facing.

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<sup>10</sup> “Regulation (EU) 2017/1129 of the European Parliament and of the Council of 14 June 2017 on the prospectus to be published when securities are offered to the public or admitted to trading on a regulated market, and repealing Directive 2003/71/ECText with EEA relevance”.

With regard to the question from the beginning of this paper it can be established that the regulation in form of the European Green Bonds Standard plays a crucial role in the market by holding issuers accountable and by establishing transparency for the investors. The European Green Bonds Standard was the missing piece in the constantly increasing EU sustainable finance regulatory framework, contributing to the overall UN SDGs. With this standard the transparency in the market is increased, and as a result the issuance volume of green bonds can be expected to keep growing, hence contributing to the overall green transition.

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A handwritten signature in black ink, appearing to read 'M. J. J.' or similar, written in a cursive style.

Budapest, 1st of April 2024

# How do business enterprises in developing countries comprehend sustainability? Evidence from Mongolia.

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## ABSTRACT

Sustainability is a core concept enabling favorable and sustainable conditions for the next generation; that is why, all governments in the world are trying to adopt measures that provide and create a business environment in which all types of business enterprises can thrive while concerning to preserve and converse the current resources in the world. Likewise other countries, the Government of Mongolia introduced the “Sustainable Development of Mongolia 2030” policy and approved the new legal document “Vision 2050”, which embedded the concept of the UN’s Sustainable development goals to reach sustainability by 2030 partially and by 2050 fully. In this study, we aimed to investigate how companies consider Sustainability and their understanding and practice of sustainability policy. We reviewed the websites of fifty, all types of listed non-mining firms using the content and discourse analysis method and created a list of themes that were highlighted frequently. Our research found out that Sustainability is a new concept in developing countries than in Western countries because of socioeconomic differences, so most business enterprisers in Mongolia perceive Sustainability as a way of financing public activities, ensuring conditions of learning and development for employers, complying with the law, and formulating proper policy and ensuring its implementation, and the participants have limited understanding and knowledge about sustainability in general. In addition, the participants showed a tendency that only firms with financial capabilities are responsible for taking care of the socio-economic-environment issues.

**Keywords:** *Sustainability, BE (business enterprises), Mongolia, developing country, Comprehension of Sustainability*

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## 1. Introduction

Sustainability has been becoming a crucial area both in practice and academics due to rapid globalization, climate change, and an increase in the world population, and all countries have been increasingly considering ways to preserve the current resources efficiently. In developing countries, the global ambition of sustainability has been distant from being met nowadays (2.8, 19).

Numerous studies have shown that all types of business enterprises, especially small and medium Enterprises (SMEs) can create favorable conditions and opportunities for employment, economic growth and development, and economic and social cohesion in a country. In line with the report of the Organization for Economic Cooperation and Development (OECD) in 1997, 95-99% of the total firms in the world fall into the category of SMEs and it individually ensures more than 50% of total employment and 40% of national income (GDP) in emerging countries irrespective of the country's economic development and living standard (3, 12, 17). In all countries, business enterprises are considered contributing engines to GDP growth and job creation, and an attentive sector for policymakers. In addition, businesses contribute to a reduction of poverty through job creation and economic growth, sustaining and supporting citizens, which is considered a solution and sustainable tool to the issues pertinent to poverty and low levels of living standards. Especially, in less developed and developing countries, the importance of business enterprises for job creation is comparatively high (1, 13,15).

Mongolia is a Central Asian developing country, whose economy heavily relies on the mining sector which is considered the most robust sector providing 21.0% of GDP, 70% of the total gross industrial output, and 71% of export revenue. During the past 25 years, the Mongolian economic and political situation has been unstable due to the transitional period of shifting from a centrally planned economy to a market economy, but the mining sector has been not only the stable sector that operates continuously but also the sector has been demanded to be environmentally responsible for the consequence of their actions in a field somewhat wider than that covered by their profit and loss statement. Also, it was the first sector in Mongolia to be demanded to implement sustainability policy and practices (8) **Ganbaatar, T., & Banzragch, B. (2016)**. No one argues that the mining sector has brought, but it has come up with some adverse impacts on culture, environment, and society. That is why, along with the development, reasonable sustainability policy and practice have been brought into our countries and started

the history of sustainability in the Mongolian business cycle recently. Only large mining companies are asked to be responsible in Mongolia, but other non-mining companies are not studied by environmentalists, governments, and researchers as well. **Tseren, G. (2016)** highlighted that developing countries should focus on CSR and Sustainability more due to rapid economic growth and development, globalization, and the different socio-economic conditions than developed countries. **Batchimeg Bayaraa** pointed out that the determinants of the economy of Mongolia are the inflation rate, export growth rate, import growth rate, and domestic investment. Among these determinants, exports, and imports are contributed by business enterprises in Mongolia **(11)**. Therefore, our country needs to focus on not only thriving economic prosperity but also conversing the culture, society, and environment with a well-developed sustainability policy, which can be real only if the companies have a proper understanding and knowledge of it.

## **2. Literature review**

To put it simply, Sustainability is the concept of providing well-being for the current generation along with preserving the resource for future generations at the same time. It can be measured in three different dimensions; social, economic, and environmental, but some scientists argue that it is impractical to classify the sustainability concept into only three pillars or dimensions due to having only three dimensions is not a good measuring way, instead we should develop more pillars to be concrete sustainability base **Tseren, G. (2016)**. From a historical perspective, our ancestors were attentive to keeping the natural balance, but the concept of sustainability originated and was applied officially in the forestry field, which intended to balance the yield and harvesting amount. The sustainable development concept was created by the Brundtland Commission because of ten years of inefficient efforts to combat poverty increase living conditions and ensure social equity throughout the world. Initially, the whole world thought that industrialization was a way of solving problems, yet it was not the unique solution to solve all interrelated problems raised by the negative effect of industrialization when it comes to dealing with all issues related to the development and well-being of citizens along with protecting the environment. The Committee concluded “Sustainability is a holistic approach that considers ecological, social and economic dimensions, recognizing that all must be considered together to find lasting prosperity” and this concept should be adopted in daily practices of either government or private sectors **(4,21)**. According to the United Nations, sustainable development is defined as follows “Development is a multidimensional undertaking to achieve a higher quality of life for all people. Economic development, social development,

*and environmental protection are interdependent and mutually reinforcing components of sustainable development”*. (4,12) The same author also speaks of the sustainability concept with three pillars providing the opportunity to proceed with the corporate social responsibilities for firms. With the help of the sustainability concept, public policy can embody the clause for firms that the firms must take care of environmental and social issues besides its main function of earning profit. Implementing sustainable practices large and small will make a big difference in the long run (12,13). The sustainability policy greatly relies on the economic development and prosperity of the country and the countries that are classified as the third world are always neglected both at institutional, and governmental levels. (6, 19)

The point of view on how to define, measure, implement, and develop sustainability theory and practices has been investigated widely all over the world, but there is little empirical research on its nature in developing countries, mainly, in the particular case of Mongolia, which showed that Mongolia is an impartially neglected country when it comes to attracting attention from researchers. The given situation questioned me if the non-mining companies in Mongolia perceive sustainability as a part of ethical measures in their policy and implement any sustainability practice in their activities. We chose the listed non-mining companies that have a website and examined their attitude towards sustainability.

### **3. Methods**

The research design of this study can be categorized as descriptive and explanatory as we aim to investigate the patterns in the theory and the empirical findings to create a more detailed understanding and view of comprehension of sustainability policy and practice of business enterprises within the Mongolian business cycle. To answer the research question, we adopted the qualitative analysis method as the research method as it was the method that can test former themes of sustainability. Regarding data, non-mining firms' websites were used as the main sources of data, and we selected firms from the database of the Mongolian Commerce and Trade Center using the following two methods. First of all, we checked if the firm's website was working at the time of the data collection period. Following that, if the website of the given firm works properly, we reviewed if the firm has a page or content related to sustainability or the same topics on the website. In total, we examined 74 firms with pages or content about sustainability, all of them were registered as medium and large-sized enterprises in the registration system of the Mongolian Trade and Commerce Center and excluded 65 of them

based on the criteria we set at the beginning of the data collection. The criteria were if the firm has its own Sustainability policy which is followed by if the firm has a history of any practical experiences or projects on implementing its policy. The data collection process was executed between 15<sup>th</sup> March and 25<sup>th</sup> March 2022, and analysis using the collected data was conducted between 1<sup>st</sup> to 10<sup>th</sup> April. 7 of 15 firms have a Sustainability policy, while 8 of them have a CSR policy. In Table 1, the types of operations for the selected firms are listed. To investigate “what SMEs in Mongolia consider Sustainability in a broad range”, we principally concentrated on investigating the understanding and practice of sustainability policy for enterprises in Mongolia. To answer the research question, we employed the content-analyzing technique and created a list of themes and words that were highlighted frequently.

**Table 1.** *Types of operation of selected firms*

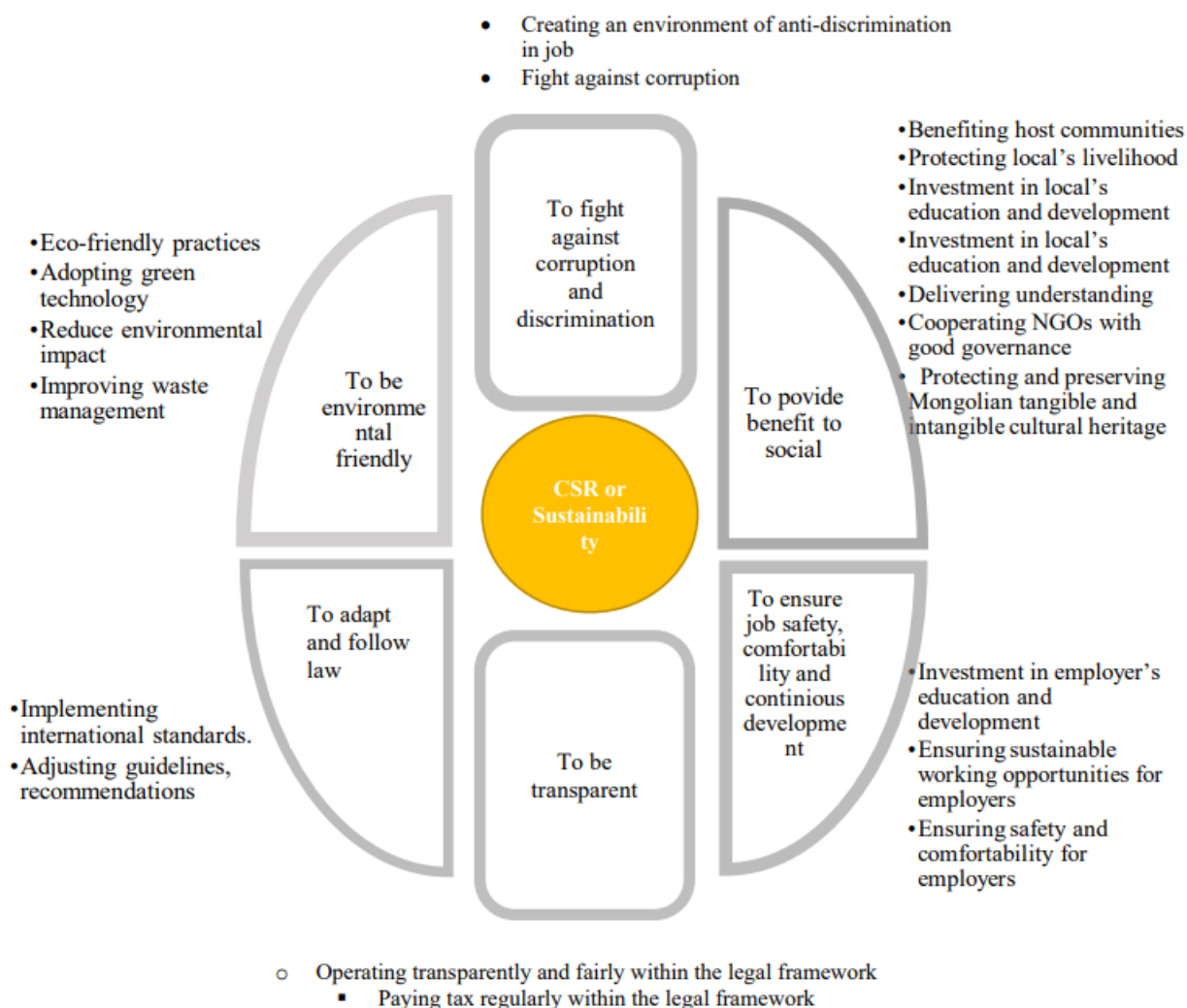
	<b>COMPANY NAME</b>	<b>COMPANY ACTIVITY</b>	<b>POLICY ADOPTED</b>	
<b>1</b>	Bishreлт group	Bank and service, and producing	Finance, trade, processing and	CSR
<b>2</b>	Vitafit group	Food producing, Construction, Trade		CSR
<b>3</b>	MCS LLC	Various		CSR
<b>4</b>	MONPOLIMET GROUP	Construction, Producing		CSR
<b>5</b>	Jiguur Grand	Various		CSR
<b>6</b>	Apu	Food food,		CSR
<b>7</b>	Telmen GROUP	Various		CSR
<b>8</b>	Bold GROUP	Various		CSR
<b>9</b>	Uguuj Chiher Boov	Food		Sustainability
<b>10</b>	Khanbogd Cashmere	Processing and Clothing		Sustainability
<b>11</b>	TESO GROUP	Food, Construction and Trade		Sustainability
<b>12</b>	PETROVIS LLC	Trade		Sustainability
<b>13</b>	Tour Mongolia	Travel		Sustainability
<b>14</b>	Golomt bank	Banking		Sustainability
<b>15</b>	MAX LLC	Food, Trade, Construction and Production		Sustainability

*Source:* Author's elaboration

#### **4. Results**

We examined the policy of fifteen selected firms and highlighted themes based on corporate social responsibility and stakeholder theories most announced through their page. Themes and subthemes are presented in *Figure 1*.

**Figure 1.** How do companies in Mongolia perceive Sustainability?



Source: Author's elaboration

### **Theme I. Fighting against corruption and discrimination**

Only a few firms described their policy toward sustainability including the concept of fighting against corruption and discrimination, which is caused by the lack of knowledge on sustainability and CSR in general.

### **Theme II. Providing benefit to social development**

Another point mentioned frequently by the firms with branches or factories in the countryside was to support the social development of citizens in the area. Firms here described their



sustainability activities as a pillar of being beneficial to social development that finances projects such as assisting people affected by unexpected sudden danger and natural disasters and scholarships for students and facilities to local schools and hospitals.

- **Investment in local education and development**

80% of all firms spoke on their website, they fund the projects that invest in local citizen education and development because of two main reasons. First, the firms wanted to prepare their own skilled workforce and apply a cost-efficient mode in terms of human resources. Second, the administration unit in the locals is interested in receiving funds for education and development projects, which eventually support the firm in upgrading its license and cooperation with local citizens.

- **Delivering understanding**

Some of the firms highlighted that delivering an understanding of sustainability to people through their daily activities, designated workshops, and other designated events is crucial.

- **Cooperating NGOs with good governance**

Next, some mentioned the projects or events jointly held with NGOs and firms are part of the implementation of sustainability for them. In most cases, the NGOs suppose their project concepts and request financial support from the big firms.

- **Protecting and preserving Mongolian tangible and intangible cultural heritage**

Several firms highlighted that they finance and are part of the projects preserving and acquainting the Mongolian tangible and intangible cultural heritage to a domestic and international audience.

### **Theme III. Preserving natural original characteristics**

All firms enclosed the concept of preserving natural original characteristics, adopting eco-friendly practices, adopting green technology, reducing environmental impact, and improving waste management in sustainability and CSR policy.

#### **Theme IV. Adapting standards, laws, and regulations**

For the firms in Mongolia, within the framework of sustainability, it is an essential contribution to ensure sustainability or CSR practices by adhering to the regulations, standards, and laws.

#### **Theme V. Being transparent**

More than three of four firms implied and attached the clauses on their website, in their sustainability policy documents, or in their annual report, the concept of operating transparently and fairly within the legal framework and adhering to tax law and regulation within the legal framework.

#### **Theme VI. Ensuring job safety, comfortability, and continuous development**

Half of the firms attached at least two to three sentences in their sustainability or their annual report on how they treat employer development and job training and ensure safe and comfortable working opportunities and conditions for employees.

### **5. Conclusion**

In conclusion, I hope that this study can bring a couple of benefits to the literature on Mongolian firms' policy toward Sustainability policy. Based on the results of the search engines, there are only a few studies have been carried out on the sustainable policy of firms in Mongolia. The aim of the study was to get acquainted with understanding of sustainability for all types of business enterprises in Mongolia, but only companies with the financial ability classified as large companies have room for sustainability on their website, which is why we selected the medium and large firms with sustainability policies. As a result of our study, in Mongolia, a firm with foreign investors or owners has its policy towards sustainability. Almost all firms mentioned "transparency, adhering to the law, environmental protection and supporting

continuous education & development of employees” in their Sustainability policy. Moreover, the anti-corruption and discrimination topic is highlighted only twice and half of them announced that preserving cultural inheritance is important and contributes to protecting it. Most of the measurements were classified into the social benefit category.

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# The impact of free SHS on quality education: a cross-sectional study in the SHS in the greater ACCRA region

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## ABSTRACT

Every nation's socioeconomic progress is greatly impacted by education. It improves one's quality of life, boosts one's self-confidence, and gives one the tools one needs to make smart decisions in life. This research study seeks to investigate the impact of free Senior High School (SHS) on quality education in the Greater Accra Region of Ghana. The researcher will conduct a cross-sectional survey of 405 teachers and administrators in the institutions.

The use of a simple random sampling method ensures that each participant has an equal chance to participate. Analyses of mixed-method study data were carried out. The socioeconomic and demographic aspects of the participants will be described using descriptive statistics such as frequencies and percentages. Multiple regression will be used to analyze the significant differences in the objectives of the study. The results from the study will provide data for researcher to provide an in-depth understanding of the impact of free senior high schools in Ghana.

**Keywords:** Sustainability, education, Ghana, FSHS

## 1. Introductions

In recent years, formal education has begun to receive new attention as it is seen as the foundation of development, poverty alleviation, and the country's human capital (Mohammed & Kuyini, 2020; Takyi et al., 2019) Yang & Guo, 2020.). The United Nations Educational, Scientific and Cultural Organization (UNESCO) launched the Education for All (EFA) initiative, which aims to reduce adult illiteracy and provide primary education to all children (Guilherme, 2016; Onyefulu et al., 2014). Work for all Powers was initiated by the United

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Nations. Inequality in access to secondary education is widespread in Sub-Saharan Africa and provides a foundation for young people to acquire the values, attitudes, skills and knowledge they need to be effective.

It is very important because it reduces poverty and increases wealth (Yang and Guo, 2020). UNESCO's 2015 report focuses on eliminating gender inequalities and increasing access to education for at-risk groups by ensuring they have access to education at all levels, including higher education. However, the education targets of the Education for All Goals and the Millennium Development Goals have not yet been achieved and are called “unfinished business” (Eck et al., 2016; UNESCO, 2015; World Bank, 2010)

## **2. Literature review:**

### **The concept of free senior high school education in Ghana**

When Ghana ratified the 1992 Constitution, it was intended to provide secondary and higher education to all citizens through all possible means, especially the teaching of free education (Constitution of the Republic of Ghana, 1992). Article 25(1b) of the 1992 Constitution of the Government of Ghana states that “education shall be free by all reasonable means and in particular through the promotion of free education.” What does the policy cover? According to Hameed (2017), it shows that “there are many days when students interrupt their education or drop out of school due to money” (Hameed, 2017). (FCUBE) to equalize the registration gap that has been widening for many years between rich and poor families in society (Essuman, 2018; Salifu et al., 2018; Takyi et al., 2019).

By law, the Free Compulsory Basic Education Programme (FCUBE) scheme can only provide free education to secondary schools and primary schools (primary schools have an enrolment rate of 85% and a graduation rate of 95%, but as of 2017 the enrolment rate is 95%). secondary school and high school is only 45% (Ministry of National Education, 2017b). Universal primary education cannot be achieved without access to quality higher education (Sutherland-Addy, 2008). According to Mohammed and Kuyini (2020), five (5) out of ten (10) children who start school for the first time do not attend senior high school (SHS). This is not due to lack of demand, but because low-income parents cannot afford senior high school education. In addition to the gender gap, data from the Ghana Statistical Service (GSS) shows that 20% of

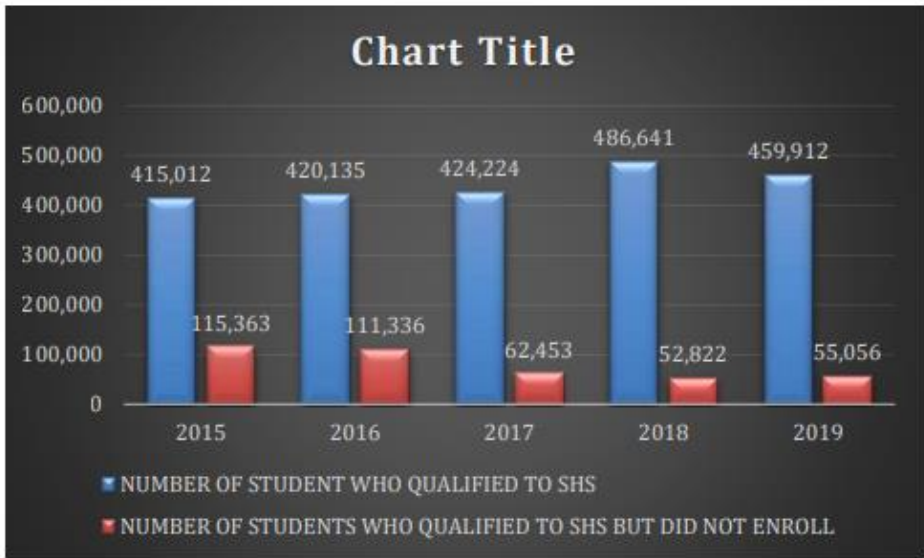


students were able to successfully transfer to senior high school in 2017-2018 and in addition to the majority of poor students who cannot attend senior high school (SHS)

**3. Objective of the study**

The purpose of this study is to investigate the impact of the free senior high school program on quality education in the Greater Accra Region of Ghana.

**Table 1:** *The number of students who qualified for SHS against the number of students who qualified to SHS but did not enrol*



Source: Free SHS Ghana (2020)

The initiative has enabled approximately 1.2 million children to attend high school free of charge since September 2017. According to the above data, in the two years before the government introduced the free SHS programme, 440,469 students had registered for the Secondary Education Certificate Examination (B.E.C.E.). Among them, 415,012 students or 94.2% of the total qualified for SHS; As shown in Table 1 above, only 299,649 students attended SHS that year, and 115,363 students, or 27.8%, did not attend SHS that year. 461,009 Secondary School Students (JHS) enrolled and attended B.E.C.E. Of these, 420,135 students or 91.13% are enrolled in various SHSs in Ghana; of these, only 308,799 students enrolled and 111,336 students, or 26.50%, chose not to participate in SHS, as shown in Table 1. of these, 424,224 or 90.63% have been admitted to various SHSs in Ghana, but only 361,771

of these students are enrolled while the remaining 62,453 or 14.70% are not enrolled in SHS as shown in Table 1. Following the announcement of the programme, 521,811 Secondary School (JHS) students were enrolled in BEC, of which 486,641 students (93.26% of the total) were deemed essential to attend SHS in various forms in Ghana. As of 2019, 433,819 students were enrolled in SHS, while 52,822 students (10.90%) were not enrolled; of which 512,083 Secondary School (JHS) students are enrolled and studying in B.E.C.E. Of these, 459,912 students (89.81%) entered Ghana. SHS), respectively in Table 1, 404,856 students are enrolled and the remaining 55,056 students (11.90%) are not enrolled in SHS. Previous efforts such as FCUBE will exacerbate previous problems (such as finance and infrastructure). International education and free education is still an unrealized privilege for many children in Ghana. Many supported the plan as a way to reduce poverty and increase literacy, but others considered it impractical and unrealistic. Some groups believe that this law promotes education (Gunu, 2019).

**Table 2: Trend of enrolment at secondary Education (2015-2019)**

YEAR	TOTAL REGISTERED BECE CANDIDATES	NUMBER OF STUDENTS WHO QUALIFIED TO SHS	NUMBER OF STUDENTS ENROLLED	NUMBER OF STUDENTS WHO QUALIFIED TO SHS BUT DID NOT ENROLL	% OF UNENROLLED QUALIFIED SHS STUDENTS
2015	440,469	415,012	299,649	115,363	27.80
2016	461,009	420,135	308,799	111,336	26.50
2017	468,060	424,224	361,771	62,453	14.70
2018	521,811	486,641	433,819	52,822	10.90
2019	512,083	459,912	404,856	55,056	11.90

*Source: Free SHS Ghana (2020)*

From 27 to 28 May 2009, the academic year of SHS was extended from three to four years (World Bank, 2017). At the SHS level, the school year is now three years. 66 The Ghana Education Service (GES) has recruited 357 teachers to work in these schools since 2017 (Bonney, 2019). As of 2017, 95% of the students started primary school 75% started high school, and 75% of them passed the exam. In 2017, the enrolment rate of primary school students was 95 percent and the enrolment rate of high school students was 75 per cent. Of the

75% of students who passed the exam to graduate, 60% passed and 80% of those who passed were accepted into high school (700 SHS nationwide compared to 9000 JHS) (Duflo et al., 2017).

#### **4. The concept of quality assurance in higher education**

We cannot ignore the issue of quality assurance in our efforts to improve higher education. According to Okebukola (2010) in Asiyai (2013), quality assurance is considered “an umbrella concept for activities aimed at improving the product quality, processes and outcome impacts of the higher education system.” Asiyai (2013) believes that one of the key elements of quality assurance is the establishment of minimum standards that lead to the establishment of quality management policies and procedures that are carefully written and followed. These minimum requirements include qualified teachers, good teaching in schools, high expectations for student performance, and the establishment of stricter academic management (Asiyai, 2013). The right to education, the continuing number of high school graduates entering university each year, and the quality of university education. To be clear, this will inform stakeholders of university teachers to ensure that university education is good in terms of Ghana's implementation of the white SHS policy.

#### **5. Cost of free senior high school in Ghana**

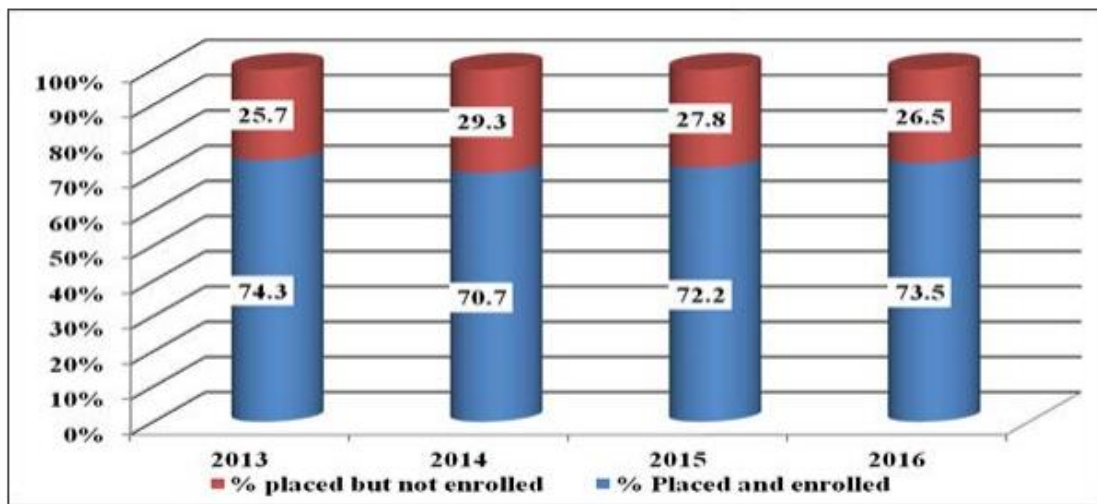
For example, the government's expenditure on education was GHc 9.08 billion in 2016 and GHc 10.5 billion in 2017 (Armah, 2021). In 2018 it was GHc 12.7 billion, in 2019 it was GHc 13.3 billion and in 2020 it was GHc 14.7 billion. Spending continues. The 2021 budget promises to spend more on education to promote secondary education (Armah, 2021) and provide equality and access to free secondary education to all Ghanaians living in Ghana. **GHC15.6 billion needs to be spent on education this fiscal year. (US\$95 million yearly-\$1.2 billion a year)**

The study by Babah, Frimpong, Mensah and Sakyi Darko (2020) revealed that there were many disparities in the enrolment and academic performance of students recognized in the BECE literature from 1998 to 2009. The research found that neighbourhood schools have difficulty attracting students, and some schools have too much money. Well-funded schools accept only the best applicants, making them more competitive than the least-funded schools

## 6. Benefits of the free senior high school programme (FSHSP)

In public high schools, this starts with fees for student days. Exams, sports, library, Student Representative Council (SRC), sports, culture, science and mathematics exams, media and communications technology (ICT) and additional tuition fees are all covered by the support of 320,488 days of state secondary school students. This includes 120,000 students progressing in the 2015-16 academic year. These actions led to an increase in enrolment from 393,995 in 2007-08 to 787,861 in 2015-16. Despite the increase in enrolment, most eligible and accepted candidates are still unable to enter secondary schools (see Figure 3).

**Figure 1:** *Enrolment trend in SHS from 2013 to 2016*



*Source:* MOE (2018)

## 7. Features Of the Free Senior High School Policy

Six (6) essential components of the Free Senior High School policy emerged from the thorough analysis of the literature (Abdul-Rahaman et al., 2018; Asher, 2018; Asumadu, 2019; Mensah, 2019; Mohammed & Kuyini, 2020; Salifu & Ayamba, 2018; Tamanja & Pajibo, 2019);

- Eligible beneficiaries of the policy are all Ghanaian students who are enrolled in public second-cycle institutions by the Computerized School Selection and Placement System (CSSPS) beginning from the 2017/2018 academic year.
- The Senior High School scholarship is for three (3) years.
- The Government of Ghana (GoG) will cater for all tuition fees of students in the Senior High School.

- Feeding costs for all admitted as boarding students at the Senior High School will be paid for by the Government of Ghana (GoG). Lunch would be provided for “day” students (those not admitted as boarding students) by the Government of Ghana.
- To achieve the goal of ensuring equity, 30% of places in elite schools are allocated to qualified applicants from the public Junior High School (JHS).
- The Government of Ghana will ensure the provision of infrastructure, buildings and furniture

## **8. Research questions**

- What are the effects of Free Senior High School on the academic performance and learning outcomes of students enrolled in secondary schools?
- How has Free Senior High School influenced the quality of teaching and learning in secondary schools, including teacher capacity, curriculum delivery, and classroom dynamics?
- How do stakeholders, including students, parents, teachers, school administrators, and policymakers, perceive the impact of Free Senior High School on quality education, and what are their experiences and perspectives regarding its implementation?

## **9. Methodology**

The methodology is the systems in which the study is used to achieve its objective. The population of the study was selected from the Senior High Schools in the Greater Accra Region of Ghana. A cross-sectional study was used for the research design. A cross-sectional study is observational studies that analyze data from a population at a single point in time. The study is a quantitative type and a simple random sampling technique was used due to the nature of the knowledge collection process, each respondent has an equal chance to participate in the study. This study utilized a self-structure questionnaire tailored to answer the study objective.

The sample size was calculated with the Cochran equation, resulting in a total of 405 respondents (teachers in the senior high schools in the Greater Accra Region of Ghana). Data analysis shall be done with descriptive statistics such as frequency and percentages to display the characteristics of the respondents. The multiple regression will be used to identify whether there's a significance between the independent and the dependent variable or not on the

objectives of the study. The American Psychological Association data collection guidelines were utilized, to protect the identity of each respondent.

**10. Results and discussions**

**Socio-demographic Characteristics of the Respondents**

Variable		Frequency	Percentage
Gender	Male	208	51.4
	Female	197	48.6
Age	21-30 years	78	19.3
	31-40 years	92	22.7
	41-50 years	116	28.6
	51-60 years	119	29.4
How long have you been working in the school	Less than 5 years	170	42.0
	6 to 10 years	116	28.6
	11 years and above	119	29.4

**Table 1:** The socio-demographic characteristics of the teachers indicate that most respondents were male, aged 51-60 years old who have worked in the senior high schools for less than 5 years.

**Dependent Variable 1 How has the Free SHS program impacted classroom dynamics and student-teacher ratios?**

- Increased student-teacher ratios
- Decreased student-teacher ratios
- No significant change

Model	R	R Square	F	B	T	P
Constant				1.046		
How long have you been working in this school	.855	.731	545.912	1.550	18.814	.000

**Table 2:** According to the findings, the R-value of 0.855 indicates a strong positive linear relationship. The R<sup>2</sup> of 0.731 means that approximately 73.1% of the variance in the dependent variable can be explained by the independent variable, which is a high value. The F value (545.912) suggests that the model fits the data well. The B value of 1.550 means that for every one-unit increase in the independent variable, the dependent variable increases by 1.550 units. The T value of 1.550 suggests that the independent variable is statistically significant. The P value of 0.000 means that the results are statistically significant. This means that there is an increase in student-teacher ratio due to the impact of the free SHS program in Ghana.

**Dependent Variable 2: The Free SHS programme is more likely to fail after some time.**

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Model	R	R Square	F	B	T	P
Constant				.405		
How long have you been working in this school	.869	.756	1248.590	.474	35.335	.000

**Table 3:** According to the findings, the R-value 0.869 means that the predictor variables are strongly correlated with the outcome variable. The R<sup>2</sup> (Coefficient of Determination) = 0.756 indicates that approximately 75.6% of the variability in the dependent variable can be explained by the independent variables showing a good fit for the study. The F-value 1248.590, suggests that the model is statistically significant and the independent variables explain a significant portion of the variance in the dependent variable. The B value 0.474 represents the amount of change in the dependent variable for a one-unit increase in the independent variable, the dependent variable is expected to increase by 0.474 units. The T-value (35.335) indicates that the independent variable is a significant predictor of the dependent variable. The P-value of

0.000 indicates that the null hypothesis can be rejected, suggesting that the independent variable has a statistically significant effect on the dependent variable.

This means there is a high chance the free SHS program will likely fail after some time.

**Dependent Variable 3: The Government has to be commended for introducing the programme.**

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>F</b>	<b>B</b>	<b>T</b>	<b>P</b>
Constant				1.645		
How long have you been working in this school	.511	.261	142.473	-.241	-11.936	.000

**Table 4:** According to the findings, the R-value 0.511 indicates a moderate positive correlation. The R<sup>2</sup> value of 0.261 means that approximately 26.1% of the variability in the dependent variable. The F value of 142.473 suggests that the model is statistically significant. The B value of -0.241 indicates that there is a negative relationship between the independent variable and the dependent variable. The T value of -11.936, which is quite large in absolute terms, indicates that the coefficient is significantly different from zero. The P value of 0.000 suggests that the results are highly statistically significant. This means that although the respondents agree that the government should be commended on the introduction of the free SHS program, there is still room for improvement.

**Dependent Variable 4: how would you rate the effectiveness of the Free SHS program in achieving its objectives?**

- Very effective
- Somewhat effective
- Not effective
- Not sure

<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>F</b>	<b>B</b>	<b>T</b>	<b>P</b>
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Constant				2.264		
How long have you been working in this school	.555	.308	179.708	.275	13.406	.000

**Table 5:** According to the findings, the R-value 0.555 indicates a moderate positive correlation. The R<sup>2</sup> value 0.308 means that approximately 30.8% of the variability in the dependent variable. The F value 179.708 is high, indicating that the model is statistically significant. The B value of 0.275 means that for every one-unit increase in the independent variable. The T value of 13.406 is very high, showing that the coefficient is statistically significant. The P value of 0.000 indicates that the results are highly statistically significant, meaning there is strong evidence against the null hypothesis. This means that the teachers think that the free SHS program is somewhat effective in achieving its objectives of providing quality education under the free SHS program.

**Dependent Variable 5: Have you noticed any changes in student enrollment since the implementation of the Free SHS program?**

- Yes
- No
- Not sure

Model	R	R Square	F	B	T	P
Constant				1.429		
How long have you been working in this school	.393	.155	73.741	.336	8.587	.000

**Table 6:** According to the findings, the R-value 0.393 suggests a moderate positive relationship. The R square 0.155 means that approximately 15.5% of the variance in the dependent variable. The F Value F 73.741 suggests that the model provides a better fit to the data. The B value 0.336 means that for each one-unit increase in the independent variable. The T value of 8.587 is high, indicating that the coefficient is significantly different from zero. The p-value of 0.000 shows that the results are statistically significant and the null hypothesis can be rejected. This means that the teachers are not sure whether there has been a change in the increase or decrease of student enrollment after the implementation of the free SHS program.

**Access vs. Quality debate:**

One of the central debates surrounding Free Senior High School is the balance between increasing access to education and maintaining or improving its quality. According to UNESCO, the implementation of Free Senior High School led to a significant increase in enrolment rates. Between 2017 and 2019, enrolment in Senior High School increased by over 36%.

**Infrastructure and resources:**

Free Senior High School has highlighted challenges related to inadequate infrastructure and resources in schools, which can impact the quality of education.

As of 2020, only 57% of schools in Ghana had access to electricity, and 32% had functional libraries, according to the Ghana Education Service. Additionally, there is an ongoing need to construct new classrooms to accommodate the increased enrolment.

**Teacher capacity and training:**

The capacity and training of teachers are critical factors influencing the quality of education. Discussions often revolve around whether teachers are adequately prepared to handle the diverse needs of students. In 2020, only 39% of teachers in Ghana had received in-service training in the past two years, according to the Ghana Statistical Service. This indicates a potential gap in teacher capacity-building efforts.

**Curriculum adaptation:**

Free Senior High School has prompted discussions about the relevance and adaptability of the curriculum to meet the changing needs of society. According to a study by the World Bank, the current curriculum in Ghana lacks emphasis on skills needed for the job market. Only 15% of students graduate with skills relevant to employers.

**Equity concerns:**

While Free Senior High School aims to promote equity in education by providing equal opportunities for all students, there are concerns about whether it effectively reaches marginalized populations. A report by the Africa Education Watch found that only 15% of schools in Ghana met the minimum standards for infrastructure and teaching quality, highlighting disparities in educational access and quality.

### **Monitoring and evaluation:**

Effective monitoring and evaluation mechanisms are crucial for assessing the impact of Free Senior High School on quality education. The Ghana Education Service conducts annual school inspections, but challenges remain in ensuring consistent monitoring of educational standards across all schools.

### **Further research directions**

- Conduct longitudinal studies to track the academic performance, graduation rates, and socio-economic outcomes of cohorts of students who benefited from Free Senior High School over an extended period. This could provide insights into the sustainability of the program's impact on educational attainment and socio-economic mobility.
- Investigate the trade-offs between expanding access to Senior High School education through Free Senior High School and maintaining or enhancing the quality of education. Explore how policymakers can balance the goal of increasing enrolment with ensuring that educational standards and learning outcomes are not compromised.
- Examine the extent to which Free Senior High School promotes inclusive education by addressing barriers to access for marginalized groups, including students with disabilities, girls, rural populations, and socio-economically disadvantaged students. Identify strategies to further enhance equity and inclusion in secondary education.

### **Summary**

While Free Senior High School has made significant strides in expanding access to education in Ghana, ensuring quality education for all remains a complex challenge. Addressing infrastructure deficits, promoting equity, enhancing teacher capacity, and adapting the curriculum are key areas that require attention to improve the overall quality of education under the program.

## 11. Recommendation

recommendations for improving the impact of Free Senior High Schools on quality education in Ghana, along with relevant statistics were available:

### 1. Investment in Infrastructure:

- Allocate funds for the construction and renovation of school infrastructure to accommodate the increased enrolment.
- According to UNESCO, as of 2019, Ghana needed to construct 14,600 new classrooms to meet the demand for Free Senior High School education.

### 2. Teacher Training and Capacity Building:

- Provide regular training and professional development opportunities for teachers to enhance their skills in handling diverse classrooms.
- In 2020, only 39% of teachers in Ghana had received in-service training in the past two years, according to the Ghana Statistical Service.

### 3. Curriculum Review and Enhancement:

- Update the curriculum to include practical skills training and promote critical thinking and problem-solving.
- A study by the World Bank found that the current curriculum in Ghana lacks emphasis on skills needed for the job market, with only 15% of students graduating with skills relevant to employers.

### 4. Quality Assurance Mechanisms:

- Establish rigorous monitoring and evaluation systems to ensure adherence to educational standards.
- The Ghana Education Service conducts annual school inspections, but a report by the Africa Education Watch found that only 15% of schools in Ghana met the minimum standards for infrastructure and teaching quality.

### 5. Access to Learning Resources:

- Increase investment in learning resources such as textbooks, libraries, and ICT facilities.

- As of 2020, only 32% of schools in Ghana had functional libraries, according to the Ghana Education Service.

#### 6. Community Engagement and Parental Involvement:

- Encourage parental involvement in school activities and decision-making processes.
- According to a UNICEF report, parental involvement in Ghanaian schools remains low, with only 23% of parents actively participating in parent-teacher associations.

#### 7. Promotion of Excellence and Innovation:

- Recognize and reward excellence in teaching and learning, and encourage innovative approaches to education.
- Ghana's National Education Assessment reports that only 39% of students in Junior High Schools are proficient in English Language, indicating a need for innovative teaching methods to improve literacy rates.

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# Breaking barriers: advancing gender equality in the video games industry

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## ABSTRACT

In today's climate of increasing calls for inclusivity and representation, the video games industry emerges as a pertinent arena for scrutinizing gender equality. This study aims to probe the industry's intricacies, uncover disparities, and propose actionable strategies for fostering inclusivity.

Key inquiries include the representation of genders across different roles in game development, barriers hindering diversity, and initiatives for promoting equality. Employing a mixed-methods approach, this research combines quantitative analysis with qualitative exploration through interviews and surveys.

By delving into industry demographics and drawing from sociological and gender studies frameworks, it seeks a comprehensive understanding of gender dynamics. Anticipated findings are expected to reveal significant disparities, particularly the underrepresentation of women and non-binary individuals in leadership positions. Furthermore, the study aims to highlight the link between diversity and creativity, emphasizing the importance of gender equality for innovation.

The practical implications of this research are manifold, offering insights to enhance recruitment practices, internal policies, and cultural initiatives within video game companies. By fostering inclusive environments, businesses can boost creativity, attract diverse talent, and enhance competitiveness. Moreover, addressing gender inequality in the industry has broader societal implications, influencing public perceptions and contributing to a more equitable gaming culture.

Ultimately, this research contributes to ongoing discussions on diversity and inclusion, providing valuable insights for practitioners, policymakers, and scholars invested in cultivating an inclusive and innovative gaming landscape.

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**Keywords:** Gender equality ; Inclusivity ; Video games industry ; Male gaze ; Stereotypes

## **1. Introduction**

The landscape of video games has evolved significantly, transcending its origins as mere entertainment to become a powerful cultural force shaping societal norms and perceptions. Central to this evolution is the portrayal of characters within these games, particularly female avatars, which holds sway over gender perceptions. Despite technological advancements and narrative depth, female characters often still fall prey to clichéd, hypersexualized stereotypes, perpetuating narrow gender roles and potentially impacting the self-image of female gamers and broader societal attitudes towards gender.

The core objectives of this research encompass a comprehensive examination of these issues. Firstly, it seeks to evaluate the prevalence of hypersexualization among female characters in major video game titles. This assessment aims to uncover the extent to which these representations align with or deviate from prevailing gender norms, shedding light on patterns of portrayal within the industry.

Secondly, the research endeavors to analyze the repercussions of these depictions on the reinforcement of gender stereotypes. By delving into the effects of such representations on player perceptions and societal attitudes, it aims to elucidate the role video games play in shaping cultural norms surrounding gender.

Lastly, the study aims to critically assess the broader social implications of these images. By exploring the ripple effects of hypersexualized portrayals of female characters, it seeks to highlight their influence on societal constructs of gender and contribute to a deeper understanding of the intersections between media, culture, and identity.

The significance of addressing these issues cannot be overstated. The pervasive sexualization of female characters in video games not only reflects but also perpetuates gender inequality within the industry and beyond. As such, this research endeavors to serve as a clarion call for action, urging stakeholders—from game developers to players and cultural critics—to prioritize

responsible representation in their creative endeavors. By bringing to light the consequences of hypersexualized portrayals, the study aims to foster greater awareness and accountability within the gaming industry, paving the way for more ethical practices and inclusive narratives. Furthermore, it seeks to contribute to ongoing discussions surrounding gender in media, offering valuable insights that can inform policy-making, advocacy efforts, and cultural discourse.

This examination of gender representations in video games stands as a critical endeavor with far-reaching implications for both the industry and society at large. By unpacking the prevalence, effects, and broader significance of hypersexualized portrayals of female characters, this research aims to catalyze positive change within the gaming landscape. Through its rigorous analysis and advocacy for responsible representation, it aspires to foster a more equitable and inclusive gaming culture, one that reflects and celebrates the diversity of human experience.

## **2. Literature Review**

The study of hypersexualization in video games lies at the crossroads of several theories. The main are those concerning media representation, feminist theory, and social learning theory.

Cultivation theory by Nabi & Riddle (2008) is a communications and sociological framework which posits that long-term exposure to media shapes how the consumers of media perceive the world as well as conduct themselves in life.

Feminist theory, with the concept of “male gaze” postulated by Laura Mulvey (1975), tried to explain how media content tries to conform to male-led visual and narrative expectations at the expense of the subjectivity and agency of females. The social learning theory, developed by Albert Bandura in the 1960s, suggests that behaviors in society can be learned by observation from the media.

A large amount of research has gone into how women are represented in video games. Research by Burgess et al. (2007) and Ivory (2006) have deduced that female characters are depicted in an even more sexualized manner compared to their male counterparts and are normally half-dressed, with plenty of exposure and associated sexually suggestive actions. This is supported

by a study from Lynch et al. (2016) in which they found out that this portrayal feeds a culture that encourages women to evaluate themselves first on appearance.

Dill and Thill (2007) further suggest that exposure to video games with sexualized female characters may influence beliefs about gender roles, from which women endorse more of the traditional, stereotypical views of women. The video game industry has historically been dominated by male representation, which has influenced both internal team dynamics and the products that are developed. Dill and Thill (2007) noted that male characters are significantly more likely to be depicted as aggressive (83%) compared to female characters (62%). Conversely, female characters are often subject to hypersexualization, which involves an exaggerated and stereotypical portrayal of their physical attributes and sexuality. This may include the use of provocative clothing, suggestive poses, or unrealistic bodily proportions. Additionally, these characters frequently appear as damsels in distress, needing rescue by male protagonists—perpetuating traditional, sexist narratives exemplified by characters like Princess Peach or Zelda.

Another study on this link of video game content to sexist attitudes, Fox and Bailenson (2009), further demonstrated that playing games with sexualized avatars can elicit more body-related thoughts, pointing at self-objectification among female players.

Szczepanska (2023) provides a comprehensive examination of the inclusion of women in the Swedish digital gaming industry. This study is distinguished by its nuanced exploration of the recruitment strategies and industry-specific discourses that shape gender dynamics. Szczepanska emphasizes the importance of certain recruitment practices and the prevailing discourse within Sweden's gaming industry, proposing that strategic policy modifications could enhance inclusivity.

Moreover, Behm-Morawitz and Mastro (2009) also stated that playing games with hypersexualized female characters may even lead to lower self-esteem and satisfaction with one's body, hence pointing toward important psychological effects through exposure to such representations.

### *Hypotheses Development*

Following this review of the literature, the following are the hypotheses to be tested in this study:

1. Hypersexualized video games with female characters make the players adhere more to the gender stereotypes in society.
2. Constant exposure to video games with female characters possessing hypersexual characteristics tends to lead to increased self-objectification and body image concerns among girls and women.
3. The depiction of female characters in video games influences societal attitudes towards gender roles, perpetuating a cycle of gender bias and discrimination.

This section of the literature review provides a solid foundation for understanding the theoretical and empirical context in which the current study is situated. It points to the necessary continued inquiry into how hypersexualized depictions within video games influence person perceptions and possibly more general social schemas.

## **3. Methodology**

### *Content analysis*

The study takes the approach to comprehensively investigate the effects of female characters' hypersexualization on video game gender stereotypes and social perceptions over the years. This is through adopting a mix-method design that operationalizes the advantage of viewing both quantitative and qualitative data from a holistic point of view to give powerful analysis on the complex dynamics involved. Above all, a chronological presentation of the evolution of the characters' designs over the years is mandatory. This will manage to identify any problematics or solutions that had been found over the years.

### *Data Collection*

The quantitative component involves the administration of an online questionnaire to a heterogeneous group of video game players. The questionnaire was articulated with questions seeking to measure participants' exposure to video games portraying hypersexualized female characters, perception of gender role portrayals, and attitudes concerning gender-based



stereotypes. This is quite preferable as it allows big datasets to be run. It facilitates the conduction of statistical analysis and allows a wide sample size for comprehensive scrutiny of pattern and trends.

For qualitative insights, semi-structured interviews have been conducted with a journalist and frequent players to gain insight into the lived experience. These experiences aimed to explore in detail the attitudes of female characters' portrayal and perceived impact on players and society. This qualitative approach, in essence, seeks to augment the statistical results and most importantly enrich the nuance in understanding issues not so easily quantified.

### *Data Analysis*

Expressed in statistics and ANOVA, this study is taken with the objective of probing the relationship of exposure to hypersexualized characters and gender stereotype attitudes. The main objective is to quantify the strength and significance of relationships so that a clear view can be created of how the portrayal of characters affects the perception of players.

Thematic analysis is an interpretation of data collected during interviews and content analysis. The method employed in such instances is an interpretive method whereby data collected are used to understand the recurring patterns and themes of the collected data. Qualitative analysis gives much more context and depth to statistical results than an attempt is made to give insights on what might be underlying reasons and implications of the observed trends and hence tends to give a much more elaborated view of the relationship of media representation with social perception. Furthermore, key studies serving as the basis, such as those highlighted in the recent academic discussion on the psychological impacts of hypersexualization, are those that underscore the theoretical depth that it involves.

Part of the purposive sampling - survey and interviews include active video game players who have had different gaming histories and belong to diverse demographic backgrounds. This will ensure that the study captures varied experiences and opinions through following up with the different participants, hence, drawing a more generalizable conclusion while providing a rich dataset from which to draw inferences.

### *Ethical Considerations*

An informed consent form, which briefed the participants about the purpose of the study, the voluntary nature of participation, and their right to withdraw from the study at any time without

penalty, and assurance of the confidentiality of their responses, was provided to all the participants. This research considers best-interest principles for all parties who are involved in its execution. The study sought to guard dignity and privacy for each participant. These are ethical considerations of the highest stringency, reflective of our own deep and uncompromising commitment to addressing this sensitive nature of gender representation in media.

## **4. Results**

### *1. The evolution of female characters over the decades*

The representation of female characters in video games has a complex history, marked by both progress and persistent challenges. Since the early days of the industry, female characters have often been relegated to secondary or stereotypical roles. In iconic games like "Pac-Man" and "Super Mario Bros," female characters were introduced as derivatives of male protagonists, embodying passive and objectified roles, such as the damsel in distress trope. Exceptions like Samus Aran in "Metroid" challenged these norms, presenting strong and capable female protagonists.

The 1990s witnessed both strides and stagnation in female character representation. Characters like Lara Croft from "Tomb Raider" broke molds as active protagonists but also faced criticisms for unrealistic physical attributes, drawing attention away from their skills and independence. Meanwhile, male characters like Mario and Sonic were celebrated for their bravery and abilities without relying on sexualized characteristics, highlighting a disparity in representation.

In the 21st century, there has been a notable increase in the diversity and complexity of female characters. Games like "Final Fantasy X" and "Mass Effect" introduced well-rounded female protagonists whose importance is defined by their roles and narratives rather than their physical appeal. However, challenges persist, as seen in controversies surrounding games like "Grand Theft Auto" and "Tomb Raider," which have been criticized for depicting women as objects of desire or violence.

Major controversies, such as those surrounding "Dead or Alive Xtreme Beach Volleyball" and "Resident Evil 5," have spurred changes in character design philosophy, pushing developers to consider practicality and character consistency in their designs. The release of the "Grand Theft Auto 6" trailer that features a female protagonist led to discussions and criticism from male audiences, who didn't want to play a female gangster for fear of a lack of identification.

Reactions to criticisms have led to significant changes in character design in some cases. Games like "Street Fighter V" and "Mass Effect 3" have adjusted female character designs to address concerns about excessive sexualization, promoting inclusivity and breaking traditional gender norms. Initiatives like Women In Game<sup>3</sup> aim to increase visibility and support for women in the industry, advocating for more realistic and diversified representation of female characters.

## 2. *Women as managers*

Despite a shift towards greater inclusivity, women continue to be underrepresented in the video game industry, particularly in technical and leadership roles. According to a report by the International Game Developers Association (2020), women comprise only about 24% of the game development workforce, with even lower representation in leadership positions. This gender disparity is notable given the more balanced gender distribution among gamers, with 53% male and 47% female in 2023, according to Statista (Appendix 1). This discrepancy underscores a significant misalignment between the demographic composition of game developers and the gaming public.

For an extended period, the neutrality of various video game genres such as fighting, racing, platform, and role-playing games was assumed, whereas games related to cooking or fashion were distinctly labeled as "girl games." This distinction in marketing reflects the gender stereotypes embedded within the minds of game designers.

An illustrative case of the lack of diversity in video game development is observed in the 2006 PlayStation 2 release, "Action Girlz Racing." Promoted as "a game by girls, for girls," this game ostensibly aimed to appeal to a female audience by mimicking the style of popular racing games like Mario Kart. Intriguingly, the game's cover credits featured female names such as Karla, Roberta, Marcia, and Stephanie. However, an examination of the authentic credits available online reveals that these were pseudonyms used by an all-male development team; Karl was listed as Karla, Robert as Roberta, Mark as Marcia, and Stewart as Stephanie, extending across the entire team.

**Figure 1** : *Action Girlz Racing credits on PlayStation 2*

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<sup>3</sup> Non-profitable organization founded in 2009 when women numbered only 6% of the Games Industry workforce.

Developed by Data Design Interactive	
Dedicated to	The hard working team that pulled together and made this happen ... thanks
Head of Programming	Karl White (credited as Karla White)
Programmers	Julian Alden-Salter (credited as Julia Alden-Salter), Adrian Fox (credited as Adriana Foxy), Ian Newborn (credited as Iris Newborn)
Head of Art	Robert Dorney (credited as Roberta D'Orney)
Head of Animation	Teoman Irmak (credited as Teowoman Hermak)
Art Team	Simeon Hankins (credited as Simone Hankins), Noel Keegan (credited as Betty Keegan), Ed Pattman (credited as Edwina Pattman), Michael Rooker (credited as Michelle Rooker), Henk Venter (credited as Hen Venter)
QA Testing	Mark Gemmell (credited as Marcia Gemmell), Ronald Haupt (credited as Rhonda Haupt), Matt Lee (credited as Matilda Lee), Cassandra Neal
Audio Production	Paul Weir, Earcom Ltd.
This game uses GODS Technology	© 2004 Green Solutions Ltd.
RenderWare	RenderWare is a registered trademark of Canon Inc., Portions of this software are copyright 1998-2004 Criterion Software Ltd. and its licensors.
Havok	Copyright 1999-2003 Havok Inc. [and its licensors], All rights reserved. See www.havok.com for details
Special Thanks	Christine, Mom and Dad, Other Mom and Dad, Mark, Amanda, Mark James, Rob Nicholls, Hi Jean
Lead Design	Stewart Green (credited as Stephanie Green)

Source: [MobyGames](#)

This example shows the influence of the "male gaze" in the gaming industry, further compounded by the game's poor gameplay and its reliance on stereotypical interests attributed to women, such as pink cars, lipstick, and nail polish.

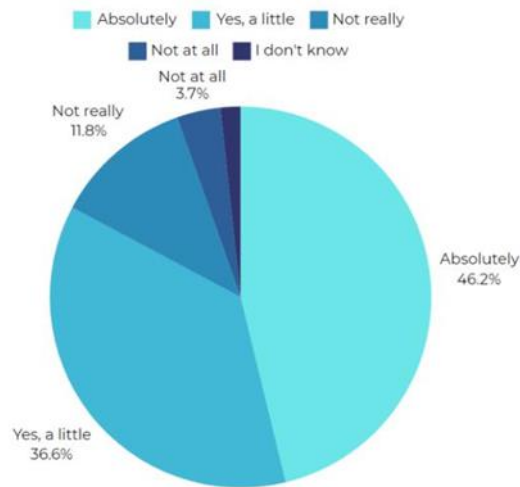
### 3. *Quantitative insights*

The study included 1,200 respondents; males constituted 700 (58.3%), females 480 (40%), and others (non-binary, transgender, etc.) (1.7%). The average age of the respondents was 24 years, with a standard deviation of 4.5 years. On the frequency of playing the game, 30% of the respondents said every day, 45% said several times in a week, 20% said in one week, and 5% said even less than. This makes these demographics represent a broad cross-section of the gaming community in France and give a wholesome insight into present-day gaming culture and how it cuts across gender representation.

Participants rated, from 1 (never) to 5 (very often), their exposure tendency in video games with hypersexualized female characters. The tendency of exposure averaged 3.4, which, in general, implied a moderate to high level of exposure across the sample. The breakdown of the responses indicated that 55% indicated high exposure (ratings of 4 or 5), 30% moderate exposure (rating of 3), and 15% indicated low exposure (ratings of 1 or 2).

Also, participants have also been asked if they think that this (hypersexualised) representation of female characters could have an impact on gender stereotypes; 46% answered "Absolutely". 37% of them answered "Yes, a little". The other 17% said they don't know or disagree.

**Figure 2 :** *Do you think the representation of female characters in video games reinforces gender stereotypes?*



*Source:* Our own work

This report points toward a significant portion of the gaming community experiencing hypersexualized representations regularly and being aware of this problematic, strongly indicating the relevance of the problem within modern video games.

#### *Impact on gender stereotype adherence*

Further analysis of the data from the survey presents that those participants who had high exposure to hypersexualized characters were high in the ease with which they saw themselves in the endorsement of traditional gender roles. There is a strong positive relationship between exposure to hypersexualized characters and endorsement level on all stereotype scales,  $r = 0.62$ . This powerful correlation suggests a statistically founded agreement between hypersexualised exposure to characters in video games and the reinforcement of traditional gender stereotypes, accenting a possible influence of media representation on social attitudes.

#### *4. Statistical tests*

ANOVA<sup>4</sup> was conducted to compare the levels of stereotype endorsement means across levels of exposure. Results indicated significant differences,  $F(2,1197) = 75.64$ ,  $p < 0.001$ ; post-hoc

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<sup>4</sup> Statistical method in which the variation in a set of observations is divided into distinct components.

testing indicated that high-exposure groups differed in great part from the moderate group with significantly higher stereotype endorsement ( $p < 0.01$ ) and most markedly differed. These findings help clarify the fact that greater exposure to hypersexualized video game characters is significantly related to endorsement of the traditional gender role, signifying toward the potential of media exposure in influencing attitudes.

In this model, the effect of exposure to hypersexualized characters on the acceptance of gender stereotypes was regressed through age, gender, and gaming frequency. This model achieved statistical significance ( $F(4, 1195) = 102.3, p < .001$ ), accounting for 35% of the variance in stereotype endorsement. Hypersexualized character exposure was the most viable predictor ( $\beta = 0.45, p < 0.001$ ), showing a strong, robust effect on the endorsement of gender stereotypes. Gender ( $\beta = -0.21, p < 0.001$ ) has negatively affected the endorsement of stereotypes, pointing to the fact that females or non-binary were less likely to endorse the traditional roles of.

Frequency of the game was also a reliable predictor of the game but to a smaller degree ( $\beta = 0.18, p < .05$ ), suggesting a fine-grained role for the frequency of engagement with the game. All of this is very strong statistical evidence that "character portrayals in video games can prime accessibility of certain beliefs or gender-related schemata, just as character portrayals in other media can." Results like these show the higher need for awareness, possibly even resulting in taking regulatory measures for the impact of content on digital media.

### *5. Qualitative insights*

Rich, in-depth data from the qualitative component of this study provided results that complemented findings brought to light in the quantitative section and provided nuanced perspectives of the influence of hypersexualized female video game characters on players' gender role perceptions and stereotypes.

#### *Interview with a journalist*

During the interview, the journalist<sup>5</sup> unpacked the impact of hypersexualized female characters in video games. Drawing on some evidences, the journalist talked about studies correlating

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<sup>5</sup> The journalist didn't want his name to appear.

exposure to such portrayals with negative body image among female players. This underscored the insidious nature of these representations and their potential to shape perceptions of beauty and self-worth among women and girls. Real-life examples like "Dead or Alive Xtreme Beach Volleyball" and "Grand Theft Auto" helped illustrate how these characters perpetuated harmful stereotypes from his point of view. By grounding the discussion in concrete evidence and relatable instances, the journalist effectively brought to light the pervasive influence of hypersexualized female characters in gaming culture.

This interview underscored the broader societal ramifications of these portrayals. Beyond shaping individual perceptions, hypersexualized female characters contributed to a culture that normalized the objectification of women, fueling gender inequality, sexual harassment, and violence. The journalist emphasized the toxic environment within the gaming community, where sexism and misogyny marginalized female players and hindered their full participation. However, amidst these challenges, the journalist offered a ray of hope by suggesting actionable steps for change. By advocating for more diverse and respectful representations of women in games, involving women in the development process, and implementing tools to combat harassment, the journalist highlighted the potential for progress within the gaming industry.

#### *Focus group with players*

The focus group convened six participants, evenly split between men and women, to discuss the portrayal of hypersexualized female characters in video games. The objective was to elicit diverse viewpoints on the impact of these representations on individuals and society.

The discussion revealed a range of opinions among participants, with one male member advocating for the artistic autonomy of game developers in character design, positing that hypersexualization could be attributed to artistic direction and might not inherently harm anyone. Conversely, other participants expressed concerns about the perpetuation of stereotypes. One woman even said that sometimes these stereotyped characters are in "family" games, and that she wouldn't want little girls to see it.

Participants engaged in nuanced debates regarding the balance between creative expression and responsible representation in video games. While acknowledging the importance of artistic freedom, there was consensus on the need for greater diversity and inclusion in character design to reflect the breadth of human experiences. Additionally, participants emphasized the influence of media portrayals on shaping societal behaviors.

## 5. Discussion

The results of this research clearly pointed to exposure to women portrayed as hypersexualized in video games as a predictor of attitudes in which the traditional gender role was strong in players' minds. There would have been a stronger relationship that would have appeared even after accounting for demographic factors such as age, sex, and frequency of gaming, and this would have reaffirmed the powerful influence that media depictions have over social attitudes and self-identity.

These results point very strongly towards the conclusion that exposure to video game characters presented in the bodies of women with hypersexualized females is high and strong enough to predict an increase in the endorsement of traditional gender-role stereotypes. This would mean that such representations do not serve only to perpetuate old-fashioned gender norms but, in reality, they become powerful shapers of the perception and behavior of the players outside the playing environment.

Such a high and direct correlation observed, as well as regression-based results, clearly portrays greater exposure to the use of hypersexualized characters, increasing the propensity to accept traditional gender roles. This effect is considerable across different demos and can potentially underline the pervasive impact of media portrayals on societal perceptions of gender.

These findings resonate with some earlier studies, such as those by Burgess et al. (2007) and Ivory (2006), who actually found exactly similar patterns of gender portrayal in the media and effects on audience perception. This study, however, builds on the prior body of research and quantitatively demonstrates the impacts of this exposure on a diverse sample of people, deepening our understanding of how such depictions are, in fact, ingrained into gaming culture. Further findings are in concordance with the hypothesis of Dill and Thill (2007) that media influence the attitudes toward gender in society. Hence, this has a stronger impact on the necessity to develop media literacy and active involvement with media already from the early years.

The findings from this research will have huge impacts and far-reaching implications that will influence game developers, educators, and policymakers.

*Game developers* would be encouraged to make a more varied, lifelike representation of female game characters and avoid hypersexualizing such characters, which may tend to further stereotype. Considering an organization, game developers should assist in building more



inclusive gaming cultures through a range of characters in character design. Plus, they should let women make more games, to avoid the famous male gaze.

*Educators* will find this study very helpful when coming up with a bigger media literacy program in teaching the youth how to engage critically with video game content. This is something that would allow youth to recognize and subsequently question gender stereotypes and, in the process, become better critics of the media.

Policy across the nation would take an initiative to set rules or guidelines for the inclusion of a diverse representation of video game characters, just as other regulated environments within the media industries. *Policymakers* should ensure that such policies enable video games to make a positive contribution to the cultural dialogue on gender and diversity.

#### *Limitations and strengths*

The biggest concern remains with the self-reported nature of the survey data and its tendency of respondents to provide socially desirable answers. The cultural context, with the unspecified but assumed diverse sample, would, therefore, further impact the generalization of the findings to another region or other cultures. Therefore, this constraint applies cautiously in the interpretation of data since the present findings do not reflect all variances of experience under different cultural backgrounds.

The large sample size and the mixed-methods approach used have been adopted to enhance the reliability and depth of this study. The use of both quantitative and qualitative data helps provide a comprehensive perspective on the issue at hand, making the conclusions stronger and actionable. The inclusion of those varied demographic factors also lends itself to an understanding of the broad impact of video game content across different segments of society, giving insights valuable as to how gender stereotypes are being carried out by the media.

#### *About the future...*

Future research should adopt longitudinal designs to give a sense of the long-term influences that the exposure to hypersexualized characters produces on gender stereotypes. Indeed, research of this type could go on to examine how the sustained presence of certain media portrayals might affect the attitudes of society over the years. Studies will have to be conducted with young players and follow their evolution as persons growing up surrounded by stereotyped bodies.

## 6. Conclusion

This study embarked on an intricate journey through the virtual realms of video gaming, where characters are not merely pixels on a screen but bearers of cultural messages that can significantly shape societal perceptions of gender. Our findings elucidate a stark portrayal of gender stereotypes, notably through the hypersexualization of female characters in video games, and their profound implications on players' perceptions and societal attitudes towards gender roles.

The quantitative data from this research presents undeniable evidence that exposure to hypersexualized female characters correlates strongly with the reinforcement of traditional gender stereotypes. This relationship holds even when accounting for various demographic factors, highlighting the pervasive influence of such media portrayals. The significant positive correlation between exposure to hypersexualized characters and endorsement of traditional gender roles suggests that these depictions are not merely passive reflections of existing gender norms but are active in shaping and reinforcing these norms among the gaming community.

The qualitative analysis further complements these findings, providing nuanced insights into the lived experiences of gamers. Interview and focus group discussions reveal a critical perspective on the normalization of objectification and sexualization in gaming culture, which not only distorts perceptions of gender roles but also impacts gamers' self-esteem and body image, particularly among female players. These discussions have uncovered a complex interplay between media representations and the reinforcement of harmful stereotypes, which contribute to a gaming environment that often marginalizes or disadvantages female players and other gender minorities.

The implications of these findings are manifold and extend beyond the realm of video gaming. For developers, there is a pressing need to reconsider the portrayal of female characters, moving away from hypersexualized depictions towards more realistic and empowering representations. This shift could not only alter the landscape of gaming content but also serve as a catalyst for broader cultural changes in how gender is perceived and represented in media.

Educators and policymakers also have a crucial role to play in this dynamic. Enhanced media literacy programs that encourage critical engagement with video game content can empower younger generations to recognize and challenge gender stereotypes. Policy interventions that mandate diversity and inclusivity in media representations can further ensure that the gaming industry aligns more closely with societal values of equality and respect for all genders.

Despite these compelling findings, the study acknowledges certain limitations, particularly related to the self-reported nature of the data and the cultural specificity of the sample. Future research should, therefore, expand the demographic and cultural breadth of participants to ensure broader generalizability. Additionally, longitudinal studies could offer deeper insights into the long-term effects of exposure to hypersexualized media content on gender perceptions.

As we look to the future, the call for an inclusive, diverse, and respectful gaming industry grows louder. This study not only contributes to the ongoing discourse on gender representation in media but also lays down a challenge for all stakeholders involved—game developers, players, cultural critics, educators, and policymakers—to forge a path towards a more equitable media landscape. By embracing diversity and actively rejecting outdated stereotypes, the video game industry can evolve to become a powerful force for positive cultural change, reflecting and celebrating the rich diversity of human experience.

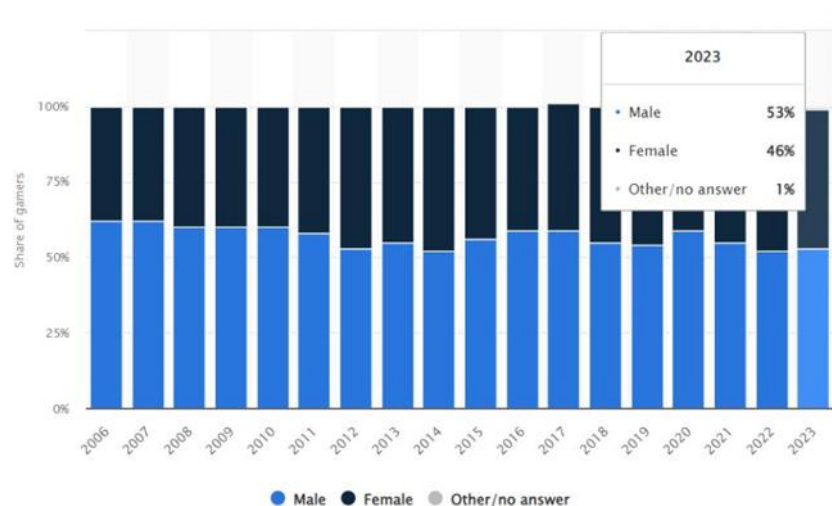
While the findings of this research are a clarion call for immediate action, they also offer a beacon of hope. By understanding the influence of video game content on gender stereotypes, we can begin to dismantle the archaic norms that have long governed media representations. This is not merely a challenge but an opportunity—a chance for the video game industry to lead by example and for all of us to participate in shaping a more inclusive society

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## Appendix

**Appendix 1** : U.S. video gaming audiences 2006-2023, by gender. Published by J. Clement, Nov 6, 2023, Statista



# Payments for Environmental Services: experiences from the globe

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## ABSTRACT

This paper tries to analyze the concept of Payments for Environmental Services (PES), to make a review on which countries have successful experiences and if there is any unsuccessful one. At the same time, analyses the lessons that can be learned and existent opportunities for other countries. To this extent, the research proceeds to documentary analysis, where there will be literature review and collection of statistics to support the theory.

Payments for Environmental Services are an emerging topic that has a potential to be extensively studied and developed, there are opportunities for more businesses to join these kinds of programs and contribute. The programs of PES have mostly been focused as a program of governments for promoting sustainability and generating profit and employment in certain rural territories, but there is a great chance of them to be adapted as part of the CSR strategies of different companies, even there are chances for SMEs to adapt similar initiatives and in general to involve the private sector on these programs.

It is known that PES schemes can impact positively not only the ecosystems and the environment overall, but they can also have a positive impact on communities that are seeking for opportunities of generating income by caring about the environment. This paper aims to be a guide for persons who are interested on getting involved with PES, whether it is for establishing as PES recipients or donors, also for academic people who are interested on environmental economics.

## 1. Introduction

In the current world and its climate conditions, it is becoming more and more important to search for sustainable options for production, ways of producing harmonized with the environment and where all the stakeholders can contribute in a certain way, to preserve what is

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more valuable for us. Certainly gold, oil and minerals are valuable, but also is the water, the oxygen, and the trees, without them, the world as we know it would not exist.

There is an interesting approach when it comes to compensating on the environment for the damage that production causes, it is the Payments for Environmental Services (PES) which on a simple explanation, they are “payments to farmers or landowners who have agreed to take certain actions to manage their land or watersheds to provide an ecological service” (IIED, 2023). The PES as it is possible to observe, are a way to generate economic activity within the conservation, because that is the main idea, that the farmers receive payments for taking care of the environment, so it has a goal for nature preservation.

The logic behind the PES says that the provisioners of environmental services should be “compensated directly while those who receive them must pay” (OAS, 2005, p.1). This represents a change on the previous paradigms because basically, through all of our existence as human beings, there has been people who protects the environment, and the nature generates some positive externalities from which we all benefit, we benefit from the scenery, air purifying, capture carbon and so on, but no one paid before for these services, hence the PES represent a trend for recognizing the hard work of taking care of the environment.

The theory that sustains this is based on the environmental economics, which is defined by the United States Environmental Protection Agency as the “application of the principles of economics to the study of how environmental and natural resources are developed and managed” (EPA, 2024). On this case, the discussion is basically focused by the neoclassical approach of economics, that pretends to assign a value to natural resources and at the same try to solve environmental issues, so it shows how the environmental policy is closely related to the economic policy.

On the other hand, there is another discipline that should not be confused with environmental economics, and it is the ecological economics, as defined by one of its main exponents, the ecological economics “addresses the relationships between ecosystems and economic systems in the broadest sense. These relationships are the focus of many of our most pressing current problems (i.e. sustainability. acid rain. global warming, species extinction. wealth distribution) but they are not well covered by any existing discipline” (Costanza, 1989, p.1). This makes clear that here there are two different currents presented that are not to be confused, both have made very important contributions, and both provide great tools for addressing environmental issues that will be experienced in the future, but certainly the topic of this document is more closely related to environmental economics.

It is important to clarify, that sometimes the literature addresses the PES for referring to the Payments for Ecosystem Services, which is a related term, but more recently developed, metaphorically, we could say that payments for ecosystem services is an evolution of the payments for environmental services approach, it is defined as a “variety of arrangements through which the beneficiaries of environmental services, from watershed protection and forest conservation to carbon sequestration and landscape beauty, reward those whose lands provide these services with subsidies or market payments” (WWF, 2024).

## **2. Payments for environmental services: Experiences from the globe.**

For this section, the purpose is to analyze different case studies on PES from different countries in the globe, the experiences will be presented in a way that we aim to present one case study by continent, trying to present some general information about the country where this case study happened, main features that make this case study very particular, and what lessons we can learn from it.

The section will start with the case of Costa Rica, since this country is acknowledged as the pioneer on establishing the PES, and its experience has been a role model for other countries of the world that have established similar systems.

### **1. Costa Rica: Payments for Environmental Services of forests**

Costa Rica is a Central American country, small (51 100 km<sup>2</sup>) but rich in natural resources, because of its location, the country has a tropical weather and has access to the Pacific Ocean and the Caribbean Sea, allowing it to host 5% of world biodiversity. The country shares borders with Panama and Nicaragua, among the environmental achievements of the country, is the fact that the country reached 99% of its energy production coming entirely from renewable energy sources, here is a summary of some indicators of Costa Rica:

**Table 1.** *Main introductory indicators on Costa Rica.*

<b>Indicator</b>	<b>Latest Value</b>
Population	5 M
Carbon dioxide emissions per capita (metric tons)	1,4
Nationally protected terrestrial and marine areas (% of territorial area)	28,8
Forest area (km <sup>2</sup> thousands)	31
ND-GAIN Index <sup>2</sup>	55

*Source:* Own preparation with data from World Bank.

Costa Rica has experienced a long journey on development which is reflected on its indicators, as stated before, it has an advantage on the wide variety of natural resources that the country has, so it made possible that the first program of PES was established in the country. This happened during the decade of 1990, certainly it was a period of transition for Costa Rica and the central American region in so many aspects, their preparation towards the new millennium was marked by the aims of having access to more development opportunities but at the same time, many obstacles for getting there. This time was marked by two main issues, persistence, and reproduction of the poverty, and at the same time high scale exploitation of natural resources, influenced by the idea that natural resources were unlimited, there was an intensive use of them, and this caused an important disappearance of the forest coverage.

On this context, the lack of incentives to protect the forest was noticeable, so there was an initiative to promote the conservation of forests through the international cooperation, considering that the country itself did not have enough resources to do it, this represented a change on the environmental policy of Costa Rica, considering that this measure was supported by a lot of international regulations like the Kyoto Protocol, Costa Rica decides to launch its PES program managed by the government.

This PES program is supported by the existing National Forestry Law and specifically for managing the PES, the government creates an institution named FONAFIFO, which in Spanish stand for the National Forest Financing Fund, on the Article 46 of the law it specifies that this institution will:

*“Finance, for the benefit of small and medium-sized producers, through credits or other mechanisms to promote forest management, whether intervened or not, the processes of afforestation, reforestation, forest nurseries, agroforestry systems, recovery of denuded*

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<sup>2</sup> ND-GAIN is the Notre Dame Global Adaptation index which “summarizes a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience” (ND, 2023). The lower the score, the more vulnerable a country is to climate change.



*areas and technological changes in exploitation and industrialization of forest resources. It will also raise financing for the payment of environmental services provided by forests, forest plantations and other activities necessary to strengthen the development of the natural resources sector, which will be established in the regulations of this law". (Forestry Law, 1996)*

Since its creation, FONAFIFO has served as a role model for other countries who are implementing PES schemes, as it comes to the services that the institution is recognizing, they mention the following ones:

- Mitigation of greenhouse gas emissions (fixation, reduction, sequestration, storage, and absorption).
- Protection of biodiversity for its conservation and sustainable use, scientific and pharmaceutical, research and genetic improvement, as well as for the protection of ecosystems and forms of life.
- Protection of water for urban, rural, or hydroelectric use.
- Natural scenic beauty for tourism and scientific purposes. (FONAFIFO, 2024).

To present a current panorama of the PES scheme, some statistics for the last decade can be mentioned.

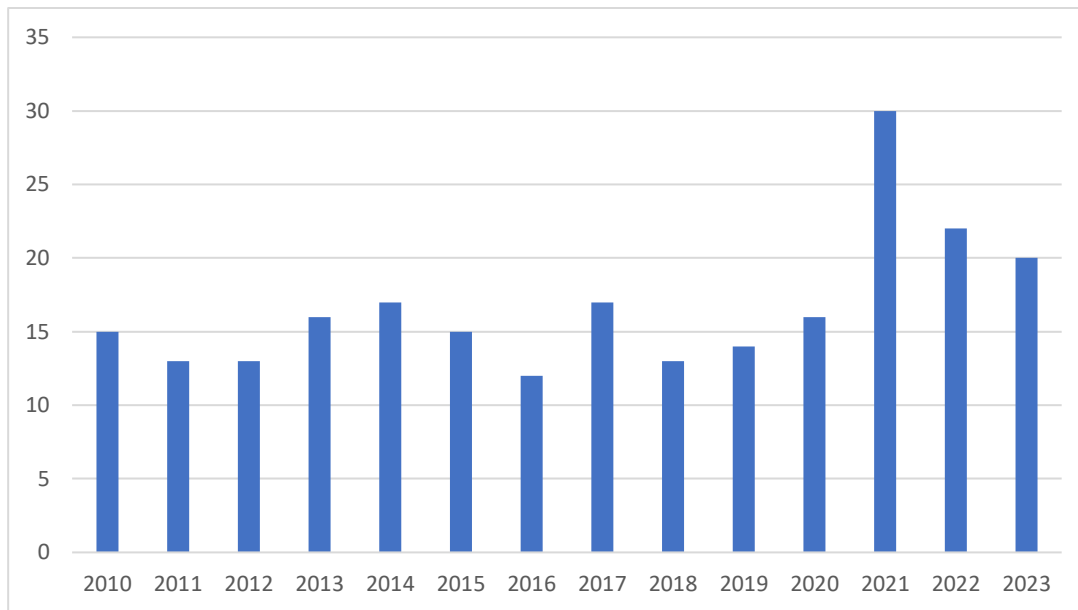
**Table 2.** *Statistics on PES schemes in Costa Rica for the period 2010-2023.*

<b>Indicator</b>	<b>Value</b>
New contracts	12.118
Total hectares on PES	748.338
Contracts on wild protected areas	1.626
Contracts on biological corridors	4.641

*Source:* Own preparation with data from FONAFIFO.

When it comes to the results, something very interesting is not only the fact that the PES scheme contributed to recover the forest coverage and promote the conservation of the environment, but it also enhanced different social aspects that promoted the development of the population, as it is possible to appreciate on their statistics.

**Figure 1.** *Yearly percentage of women managing PES contracts.*



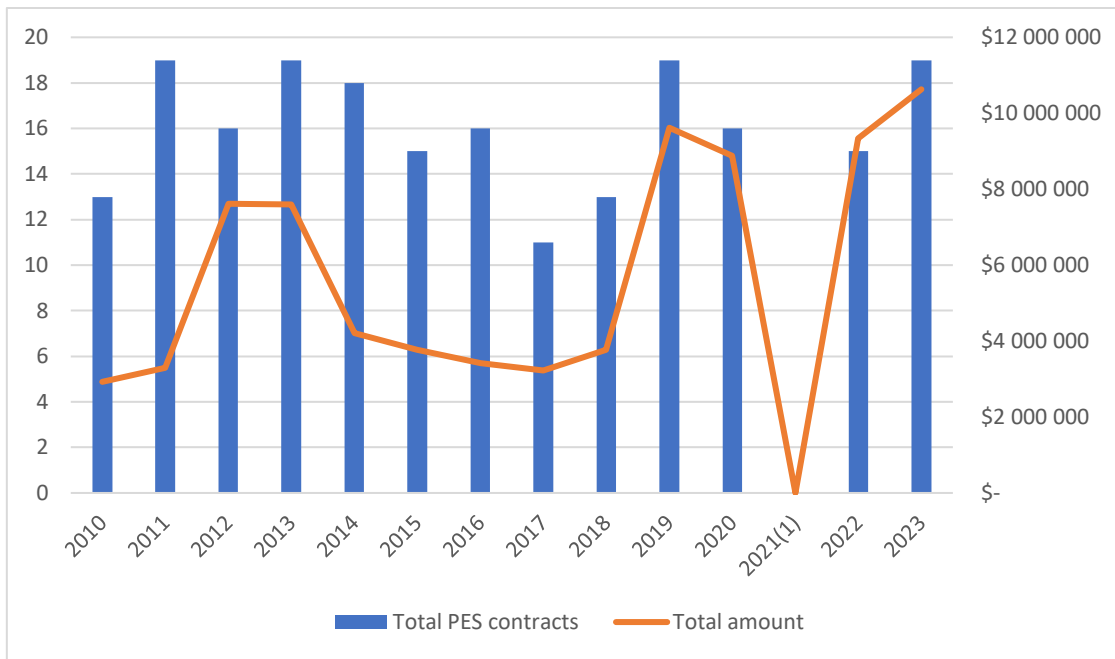
*Source:* Own preparation with data from FONAFIFO.

Through the period of study, it is possible to observe that around 15% of the contracts of PES are managed by women, this represents a remarkable fact, considering that historically in Costa Rica, many agricultural tasks have been executed by the man, and now there is an emerging market of women that are working in the conservation. Not to mention that in general, women usually face more obstacles for finding a place for them in the labor market, so the PES represent a very important opportunity for them to generate their income out of sustainable projects by providing environmental services.

Another interesting fact concerning the PES scheme in Costa Rica is its impact on indigenous communities, when it comes to the situation of indigenous territories in Costa Rica this is a very particular situation because their levels of development have been affected by several aspects, during many years they were lacking essential services, so they had to move long distances for having access to education, health, or internet connection.

Indigenous communities have deep-rooted traditions that differ from the rest of the country and sometimes there are even different legislations or regulations applicable for them, however, in the territories where they live, the economic activities are very limited and new job opportunities for them are practically inexistent, but in the following graph, it is possible to appreciate the statistics related to the PES on indigenous territories.

**Figure 2.** *Total contracts of PES on indigenous territories and the hired amount of the contract.*



Source: Own preparation with data from FONAFIFO.

Given the previous conditions mentioned, it turns out great to observe the information that almost 20 contracts are generated every year on indigenous territories, meaning that this could represent incomes for millions of dollars, reaching a peak of over \$10 millions in 2023. It is important to mention that this not only represents an opportunity for preserving the environment and its services, but it also represents an opportunity of developments for indigenous families that are able to find ways of generating income and at the same time, staying at their territories and develop an economic activity that matches their principles of taking care of the nature and preserving their protected areas.

## 2. Kenya: PES scheme in the lake Naivasha.

The second country of study is Kenya, located in East Africa, Kenya is a big country with access to the Indian Ocean, Kenya has a considerable amount of land dedicated to wildlife, however, they are considerably vulnerable to climate change, and an aspect that is hazardous for them specially when it comes to the draughts. In the following table, the general introductory statistics of Kenya are presented.

**Table 3.** Main introductory indicators in Kenya.

Indicator	Latest Value
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Population	52,6 M
Carbon dioxide emissions per capita (metric tons)	0,4
Nationally protected terrestrial and marine areas (% of territorial area)	10,3
Forest area (km <sup>2</sup> thousands)	36
ND-GAIN Index	38

*Source:* Own preparation with data from World Bank.

In Kenya there are various PES projects identified, but for the purpose of this paper, the PES scheme in the Lake Naivasha was chosen because of some special features that make it interesting. First, we can mention the fact that this project is focused on payments for the watershed services and the restoration on the vegetation to reduce the deposit of sediments.

A key aspect is that besides the assessment of the environmental services, the stakeholders were clear that this lake has an economic importance when it comes to Kenyan GDP, because “floriculture investment contributes to over 35% of all flower sales in the European Union (EAC-EU 2015, p. 12), and 280MW of geothermal power generation is connected to the national grid” (ICRAF, 2018) and this certainly, facilitates the valuation and comparison.

Another important factor that meant a differentiating element in this project is the partnerships they developed with the stakeholders, on this case, there was of course involvement of the governmental institutions and civil society organizations, but key partners were also international organizations like WWF (World Wildlife Fund) and CARE (Cooperative for Assistance and Relief Everywhere) both on their Kenya chapters. These organizations were “providing funding and coordination as intermediary institutions to develop Payment for Ecosystem Services – PES (the ecosystem service in this case being water) – as a market-based scheme for delivery of sustainable natural resource management and improved livelihoods.” (Chiramba et al, 2011, p.2). With this initiative, there were many changes implemented in the communities and its inhabitants, among these, we can mention:

- “Rehabilitation and maintenance of riparian zones.
- Establishment of grass strips/terraces to reduce runoff and erosion on steep slopes.
- Reduced use of fertilizers and pesticides.
- Agroforestry/tree planting.
- Training for livelihoods enhancement” (Chiramba et all, 2011, p.4).

In summary, we can mention that the project developed in Kenya brought very satisfactory results for the communities, not only they found more sustainable ways of using their resources and preserving them, but also this project brought many lessons for them and improved their livelihood.

3. Indonesia: Experiences from PES schemes.

The third case of study is Indonesia, for this case the journey of the research is moving towards the southeast Asia, known for being the world's largest archipelagic state, which makes it quite interesting for this study also because of the large access of natural resources, the country is having access to Indian and Pacific Oceans. Some introductory data can be observed in the following table:

**Table 4.** *Main introductory indicators on Indonesia.*

<b>Indicator</b>	<b>Latest Value</b>
Population	270,6 M
Carbon dioxide emissions per capita (metric tons)	2,1
Nationally protected terrestrial and marine areas (% of territorial area)	5,3
Forest area (km <sup>2</sup> thousands)	915
ND-GAIN Index	50

*Source:* Own preparation with data from World Bank.

As the table details, Indonesia has a huge population and it is important to consider the effects that this has on the environment, also there is a considerable vulnerability to climate change, not really surprising keeping in mind their geographical conditions, which also gives them important advantages when it comes to biodiversity, in fact, Indonesia holds the second place in the world when it comes to total endemic species, together with their tropical climate makes them to have a wide range of resources that are able to provide all kinds of ecosystem services, starting from the scenic beauty of their beaches up to carbon capture.

Indonesia fulfills very interesting conditions for establishing PES schemes, because it has the world’s third largest tropical forest, but also has one of the fastest deforestation rates, “third largest emitter of greenhouse gasses” (Sloan et al, 2012). Due to the previously mentioned details, they had previous experiences with REDD+ activities in the country, so this represents a positive aspect because it sets a baseline for establishing PES schemes.

The evidence suggests that there have been PES projects in Indonesia since the early decade of 2000s, but not always the best evidence considering that some of them just stayed in pilot projects. A study carried out by Suich et al (2017) gathered information on existing PES projects or programs, they were able to identify 87 projects in total, this is an impressive number considering the challenges that are still ahead.

From this extensive list of projects, they purged the list according to some criteria that made these projects suitable for comparison and for the evaluation of their effectiveness to reflect on them and formulate some lessons learned out of their execution, the list was shortened to 9 existing projects.

Within the list of projects selected for the study they were divided in 2 main groups according to the focus of the scheme whether is water or carbon, some interesting facts to mention is that the buyers tend to differ when it comes to their constitution, some of them are state-owned enterprises, others are donors, companies from the private sectors and for one of them the buyer was a water association and its members. All of them worked with intermediaries (mainly NGOs) and when it comes to the activities carried out, they identified tree planting, agroforestry, reforestation, avoiding planned deforestation, forest rehabilitation among others.

When assessing the projects, the authors (2017) of the research found some common challenges, the first one was to make the stakeholders understand the value and the importance of the ecosystem services, this is a similar case to what happened in other countries, people just assume that the ecosystem services are free because they are provided by the environment so they do not see the logic on paying for them.

Another constraint for them was to work with the governments, especially “demonstrated by the persistence of overlapping and conflicting regulations and the apparently ineffective regulatory development processes” (Suich et al, 2017, p.493), they even mention the Costa Rican scheme and highlight how the fact that its supported by a law helps to have clarity, avoid uncertainty and have the arm of the government helping with the collection from taxes.

#### 4. France: The PES scheme on Vittel waters.

Finally, the last case study that is analyzed comes from France, is the case of Vittel waters, France is a developed country with a large territorial extension, diverse landscapes and a big population that develop a lot of economic activities within their territory, the following table provides the introductory data.

**Table 5.** *Main introductory indicators for France.*

Indicator	Latest Value
Population	67 M
Carbon dioxide emissions per capita (metric tons)	4,0
Nationally protected terrestrial and marine areas (% of territorial area)	36,6
Forest area (km <sup>2</sup> thousands)	173
ND-GAIN Index	67,5

*Source:* Own preparation with data from World Bank.

France is a wealthy country not only when it comes to natural resources, but also with its economic factors, the interesting part of this scheme that will be presented is precisely that is not widely used at a country level, in fact, it started by a private company in a small scale that served as a model for further expansion of PES schemes.

Vittel is a French brand of bottled water, who is owned by Nestlé, since 1993 they have developed a PES scheme on their 5100 hectares catchment at the foot of the Vosges Mountains to keep the high quality of aquifer water, they pay to “all 27 farmers in the ‘Grande Source’ watershed to adopt best practices in dairy farming. It is implemented through Agrivair, a buyer-created agricultural extension agency, which has a solid local base and is trusted by farmers” (Prokofieva et al, 2012, p.6).

The challenge that they wanted to address was to reduce the nitrate contamination in the aquifer caused by the agricultural activities of the farmers, in order to manage the PES scheme, Nestlé created an institution who will act as an intermediary named “Agrivair”, they will carry out the negotiation and the execution of the programme.

At first farmers were opposed to it, a series of conditions and compensations were presented to them and this implied that they had to transform a conflictive situation into something positive, to ensure the compliance, there was a monitoring and evaluation role where Agrivair “monitors the farming practices, the livestock stocking rate, the good use of new building facilities (...) and reviews all farm accounts, a specific right explicitly stated in the PES contract” (FAO, 2013, p.3).

The program combined a complex structure where they combined conditional cash payments with technical assistance and a recognition of variable costs paid through reimbursement, and this in fact is a key aspect that every PES scheme should consider, the constant monitoring and evaluation of the services and its correspondent payment once the intermediary assures that they are complying with the promised services. The scheme was so successful that eventually the total number of hectares covered doubled compared to the year when they initiated (so it

expanded to 10.000 hectares). To finalize, experts have summarized 6 lessons learned from this scheme that seem very valuable:

1. Target threat / leverage zones.
2. Target high-service zones.
3. Pay customized rates.
4. Strengthen conditionally.
5. Ensure institutional coordination of policies.
6. Limit transaction costs” (Prokofieva et al, 2012, p.6).

These lessons pretty much summarize the overall lessons learnt from the different case studies in the paper, but further discussion of them will be addressed in the following section.

### **3. Conclusions**

The payments for ecosystem services have always been a controversial topic, they carry a huge debate on whether the stakeholders are simply paying to justify the pollution or other negative externalities, this has always been a typical argument against the tools provided by the environmental economics thoughts. On a personal thought, environmental economics and ecological economics should not be seen as rivals, on the contrary they must be allies that work together to ensure sustainability and development.

The negative externalities on the environment probably will exist forever, it is very difficult to think of a production in the current globalization conditions that do not harm the environment in a certain way, but at least there are some tools to compensate for the damage caused. However, it is obvious that these tools are not enough, they should be combined with more sustainable strategies of production, re-utilization and enlarging the product life cycle and other strategies provided by the circular economics.

When it comes to the PES schemes, the lessons learnt during this research showed that the activities on PES can bring positive results, not only for the environment but also for the communities that work with them, however, for meeting this success, some requisites are essential, that will be summarized:

1. Coordination with governments and the institutional environment; preferably they should be supported by the law.



2. The schemes are usually not perfect, not only because of their effects, but also during their execution, there is a chance for many mistakes, the lack of documentation and information on the execution of this projects should not be acceptable, since we are “doing business” with these projects, there should also be continuous improvement as if we were dealing with any other project or company.
3. Monitoring and evaluation are essential, as any other project where there is money involved, there will be many interested parts, some of them might not come with the best intentions, so the intermediaries should grant compliance with the objectives of the project and ensure that all of them are met and none is left behind.
4. Stakeholders and its involvement are essential, it is important to choose the right ones, organizations that have experience, that have political skills and that are interested on the correct execution of the scheme.

This aims to be an initial statement on the lessons learned from the different PES schemes in different continental locations through the world, but as stated before, it is a process of constant learning that can keep growing through the years.

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# The link between sustainability performance and value creation

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## ABSTRACT

The increasing focus on corporate sustainability has generated a strong interest in understanding how environmental, social, and governance (ESG) factors affect business value. Companies are investing in sustainability with an eye on future returns. However, measuring the financial impacts of sustainability is challenging due to uncertainties in future conditions and regulations. A study using a real options approach, which looks at the connection between sustainability performance and the creation of long-term value, offers a more comprehensive evaluation of strategic initiatives. An analysis of 27 rigorous and peer-reviewed research studies revealed a significant finding: 81% of them showed a positive correlation between sustainability performance and the generation of long-term value. This compelling finding should inspire confidence in the potential for sustainability to drive long-term value creation, although the impact of this relationship may vary depending on factors such as geography, industry, or performance components.

**Keywords:** Sustainability, ESG, corporate social responsibility, long-term value creation, real options valuation, PRISMA

## 1. Introduction

Every business aims to create value with each transaction- for its customers in terms of satisfaction and for itself and its shareholders in terms of profit. Organisations that generate more value per sale are more likely to achieve greater profitability than organisations that generate lower value per sale (Stobierski 2020). Companies that consider environmental and societal impacts build more resilient operations with higher future earnings and lower volatility. For this reason, many companies are investing in sustainability, and many investors are

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incorporating sustainability performance data into their capital allocation decisions (Khan et al. 2015). As per Henisz et al. (2019), ESG can add value for companies in five basic ways: top-line growth, cost reduction, addressing regulatory concerns, improving staff productivity, and optimising asset investments. All business executives across sectors need to take into account these five value-creation levers stemming from ESG, as they can inform decision-making and contribute to long-term success. This is why investing in a strong ESG proposal can help grow its top line with an eye on penetrating new markets, extending its presence in existing ones, and facilitating easier access to resources by fostering closer relationships between firms and local communities/governments. Companies with well-established reputations in ESG are more likely to get opportunities such as infrastructure projects. Besides, efficient implementation of ESG practices can help reduce the current increase of operating expenses associated with factors like resource costs. A better image of ESG might enable organizations to achieve greater strategic flexibility by cutting regulatory scrutiny and winning government support. In addition, ESG practices may aid in the attraction and retention of high-calibre employees, boost employee motivation and a sense of purpose, and ultimately elevate overall productivity. Additionally, by strategically allocating resources to sustainable possibilities and avoiding stranded assets, ESG practices may optimise investment and capital expenditures, ultimately enhancing investment returns. It can also help companies avoid future regulatory changes and constraints (Henisz et al. 2019).

The real options approach plays a significant role in connecting strategic and financial analyses of corporate decisions that include ESG practices. It helps better understand the underlying mechanisms that create value (Trigeorgis & Reuer 2017). Generating value from ESG practices requires evaluating current and future consequences (Hart & Milstein 2003). However, valuing the future value of ESG investments is challenging due to the imbalance between the certainty of short-term costs and the uncertainty surrounding future returns in both scale and timing (Inard, L. 2023). Implementing ESG policies can improve a company's capacity to innovate, pursue new endeavors, create value, and enhance financial performance (Ahmad et al., 2023). Additionally, achieving long-term value necessitates balancing ESG performance, growth opportunities, and other strategies (Fuente et al. 2021).

The research aims to understand how sustainability performance and value creation, using a real options approach, are interrelated and mutually affect each other. Sustainability is increasingly recognised as crucial in business, so it is essential to investigate the long-term financial benefit of practicing sustainable practices. Furthermore, this study will utilise the real options approach to examine the strategic value of sustainability investments and how they can

improve a firm's competitive advantage. According to Brozovic et al. (2020), companies with strong sustainability performance outperform peers in financial, stock market, and accounting performance, suggesting that sustainability is crucial for long-term value creation. The evidence suggests that adopting a sustainability-oriented approach contributes to long-term financial sustainability. However, the relationships between sustainability and financial performance are complex and require in-depth analysis. By applying a real options approach to evaluate the relationship between sustainability performance and value creation, this study aims to address the following questions:

Q1: Is there a correlation between the sustainability performance of a business and its ability to create value within the framework of real options valuation?

Q2: Does the connection between sustainability performance and value creation differ based on industries or regions?

This study uses a systematic literature review methodology to develop its argument. A systematic literature review (SLR) helps to identify relevant scientific research on a particular issue, evaluate its quality individually and collectively, and summarise its findings. According to Dinter et al. (2021), SLR is a research method that involves a comprehensive search for relevant primary papers, followed by data extraction, analysis, and synthesis. The goal of SLR is to gain a more in-depth and comprehensive understanding of a particular domain by examining and synthesising the findings of multiple studies. This study compares the theories used by researchers in their investigations to achieve these objectives.

## **2. Theoretical Background**

### *Definition of value creation in real options analysis*

According to Boyer et al. (2003), real options valuation is a strategic decision-making tool that enables companies to take advantage of opportunities and mitigate risks in an unpredictable business environment. They are derived from financial options but applied to actual business situations. Real options valuation allows organisations to make future decisions based on market conditions and other factors. This provides flexibility in decision-making, allowing businesses to adapt to changing conditions and optimise the value of their investments (Yeo & Qiu, 2003). Real options analysis refers to the strategic flexibility that enables businesses to adjust to market changes and make decisions based on the potential value of future opportunities. However, managers hesitate to adopt real options valuation due to concerns about imprecise assumptions and the potential overvaluation of risky projects (Alexander et al., 2004).

The real options approach enables value creation by providing flexibility and the opportunity for enhanced returns on investment. Real options analysis enables management to adjust to evolving circumstances and make decisions based on anticipated future situations. Therefore, a project with a negative net present value (NPV) can be transformed into one with a positive NPV. The ability to adapt to market fluctuations and uncertainty can generate value by seizing opportunities that conventional discounted cash flow analysis may fail to recognise (Yeo & Qiu 2003). Real options valuation is used to value flexibility in managerial decision-making under uncertainty (Brach 2003). Options are advantageous in situations of uncertainty, as they enable management to maximise the value gained from an investment. Thus, possessing a precise project valuation is essential for the viability of firms. The use of various valuation methodologies can lead to differing values for options, underscoring the need to choose the appropriate method (Radjenovic, 2008). Seidl et al. (2021) state that real options valuation distinguishes itself from typical financial options by including the possibility of altering decisions in the future. Hence, real options valuation can generate favourable value by enabling adaptability and decision-making flexibility in response to newly acquired knowledge. This adaptability can result in more advantageous results and enhanced value generation.

#### *Sustainability performance*

Business sustainability involves integrating social equity, economic effectiveness, and environmental performance goals into a company's operational procedures. Assessing sustainability performance allows companies to thoroughly measure their impact in all three aspects of sustainability and identify areas for improvement in their operational and managerial approaches (Labuschagne et al. 2003).

Sustainability performance indicators evaluate and measure an organisation's endeavours and results in attaining sustainable practices (Caiado et al., 2018). Organisations can use ESG scores to assess their sustainability performance (Rajesh & Rajendran, 2019). ESG scores assess a company's sustainability performance by evaluating its environmental effect, social responsibility, and governance procedures. Chandrakant and Rajesh (2023) use quantitative methods to assess the effectiveness of companies in handling risks and opportunities associated with sustainability.

#### *Sustainability Performance and Long-Term Value Creation*

Ochi (2018) explored methods of willingly encouraging corporations to reveal information about ESG factors. Additionally, he examined the concept of the "real option value" in managing externalities. According to him, integrating ESG strategies and real option value can

enhance organisations' ability to address external factors and generate corporate value effectively. He proposes that incorporating ESG measures to address the impact on stakeholders might result in the creation of real option value, which can generate corporate value by capitalising on commercial opportunities or enhancing a company's legitimacy. Non-financial variables, such as reputation, stakeholder engagement, and employee satisfaction, also have an indirect impact on long-term value. Furthermore, organisations that possess a greater understanding of ESG factors appear to guarantee sustained value for shareholders over the long term by enhancing their financial performance and managerial excellence and reducing risk (Zumente & Bistrova 2021).

ESG aspects are essential for creating value as they help firms align with sustainable practices, improve connections with stakeholders, mitigate risks, and promote innovation and efficiency (Inard, L. 2023). Signori et al. (2021) discovered that organisations with higher ESG ratings allocated greater value to their shareholders and reserved a more significant portion of their income for the company's long-term sustainability. However, this was achieved at the cost of reducing benefits for employees and financial providers (excluding shareholders).

ESG factors can have a substantial impact on the value of growth options. This impact can be either positive or negative, depending on the level of ESG performance. Modest ESG measures can enhance value by fostering trust and attracting stakeholder investments. Nevertheless, if the ESG initiatives are overly abundant, they may diminish the value by excessively mitigating the risk. Hence, it is crucial to uphold a suitable equilibrium between ESG endeavours and risk reduction in order to guarantee enduring expansion (Fuente et al. 2021). Furthermore, organisations that proficiently handle a range of sustainability metrics are more capable of creating enduring value for all stakeholders (Funk 2003).

Rodrigo-González et al. (2021) propose a methodology that combines the circular economy idea (It is considered one of the factors of sustainability) with financial valuation using a real options approach. This enables the measurement of the value generated by asset circularity inside a company in the presence of uncertainty. The circular economy generates value by extending the longevity of assets through the four processes of Reuse, Refurbish, Remanufacture, and Recycle. Prolonging the duration of an asset's existence enhances its value by maintaining or improving its use and economic significance over a period of time. In addition, the circular economy enables the use of subjective judgement and brings adaptability into the process of determining value, leading to a more precise evaluation of the economic and financial worth of circularity. In addition, the circular economy can provide substantial value through the promotion of sustainable production and consumption, improvement of resource

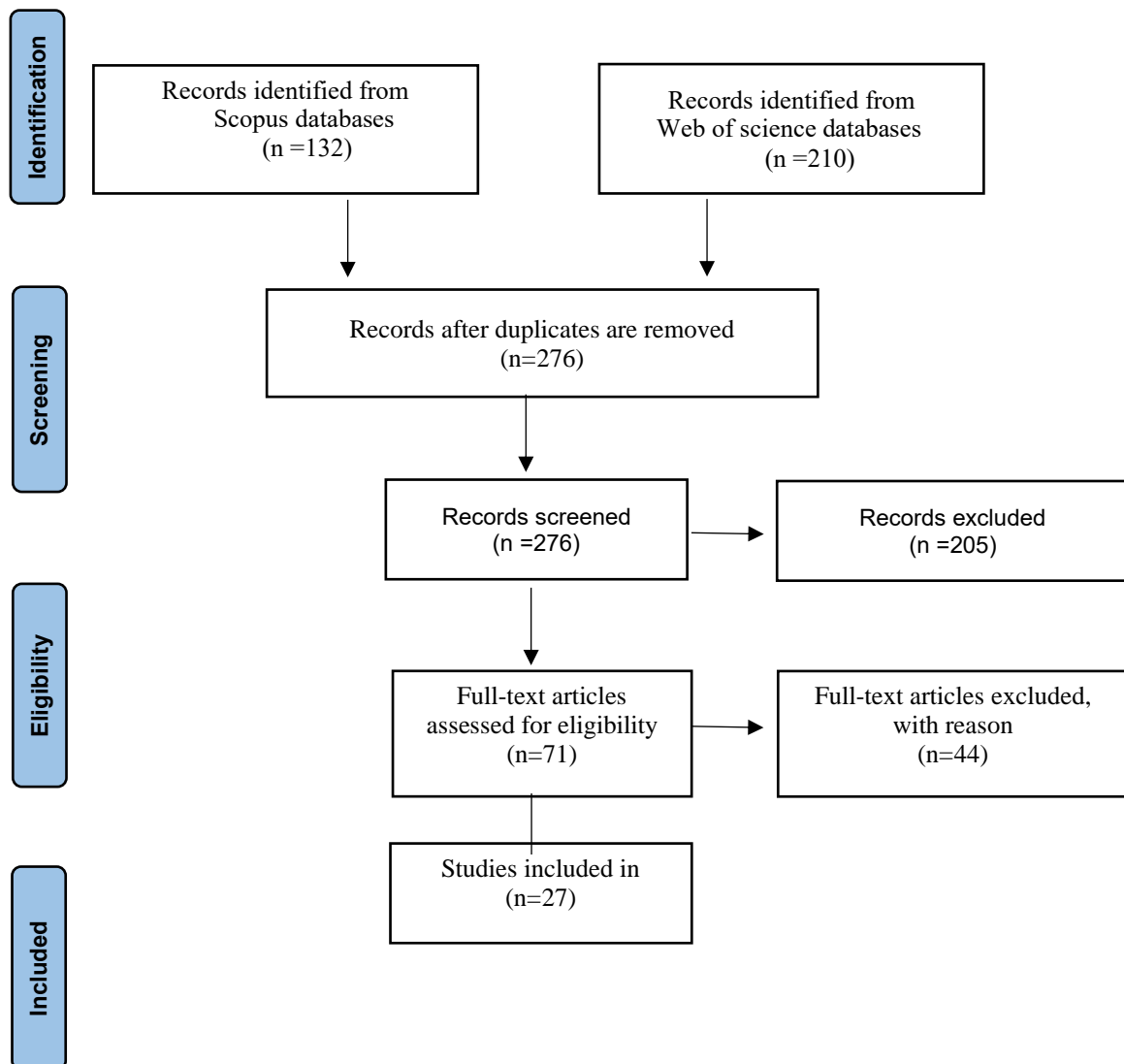


efficiency, reduction of emissions and environmental impacts, and contribution to economic, environmental, and social efficiency (Axhami et al., 2023).

### **3. Methodology**

The search approach was enhanced by incorporating "ESG" and "CSR" as alternatives to "sustainability" in order to encompass the various concepts related to sustainability performance. The disclosure of a company's ESG information has a direct impact on its sustainability performance, since a higher level of ESG information leads to improved economic sustainability (Alsayegh et al., 2020). In addition, we expanded the scope of our search for opportunities to create value by incorporating additional terms such as risk and flexibility. Integrating adaptability into decision-making procedures can assist organisations in seizing opportunities and effectively managing risks, hence generating value within the framework of real options valuation (Boyer et al. 2001).

Figure 1: PRISMA flow



The algorithm for searching articles is determined by the concepts and research questions provided. In this case, the search included the terms (sustain\* OR ESG\* OR CSR\*) AND (“value creation”) AND (“real options” OR risk OR flexibility). The review process involved collecting and analysing research articles from two databases: Scopus and Web of Science. At first, the search yielded 356 documents in Scopus and 652 in Web of Science. Nevertheless, filters were implemented to enhance precision and pertinence by considering the subject area, article and review type, and the English language. After implementing these filters, 132 documents in Scopus and 210 publications in Web of Science that met the amended criteria were retained.

To improve the clarity, understanding, excellence, and significance of the reports, we did a systematic literature review following the guidelines set out in "Preferred Reporting Items for

Systematic Reviews and Meta-Analyses (PRISMA)" (Figure 1). Furthermore, a computer program was utilised to analyse the title, abstract, and keywords to discover relevant information. We then analysed 276 abstracts, assessing their appropriateness for whole-text reading using the criteria of titles and abstracts. The study selected articles using terms related to sustainability performance, such as ESG and CSR.

To improve the clarity of our analysis, we removed articles irrelevant to the specific keywords and did not sufficiently address the correlation between sustainability performance and the generation of value. Therefore, we selected 71 articles for comprehensive textual examination in the subsequent phase. The study algorithm generated proverbs from 1994 to 2023. However, it was observed that papers released before 2005 exhibit a notable lack of relation to the present subject matter. A comprehensive analysis was conducted on 71 articles, and the most relevant papers were selected. After many rounds of review, the whole material was carefully examined, and 27 publications that were considered thematically significant were identified and examined.

Our primary aim is to analyse the correlation between sustainability performance and long-term value generation from a real options valuation perspective during selection. Articles that fail to depict this correlation, such as those that exclusively advocate for sustainability or only emphasis value creation, are eliminated. In addition, challenges arose when choosing articles that specifically linked value creation to real options valuation. Value creation is not just limited to real options analysis but also encompasses accounting, operational management, and several other areas. Hence, careful deliberation was undertaken to guarantee that the chosen articles centered on creating value through a real options valuation viewpoint. In addition, some researchers do not directly employ a real options valuation framework. However, the article's findings suggest that a real options valuation perspective could offer further insights, particularly about the flexibility, uncertainty, and timing effects of ESG strategies on corporate investment and long-term value.

## **4. Findings and Discussion**

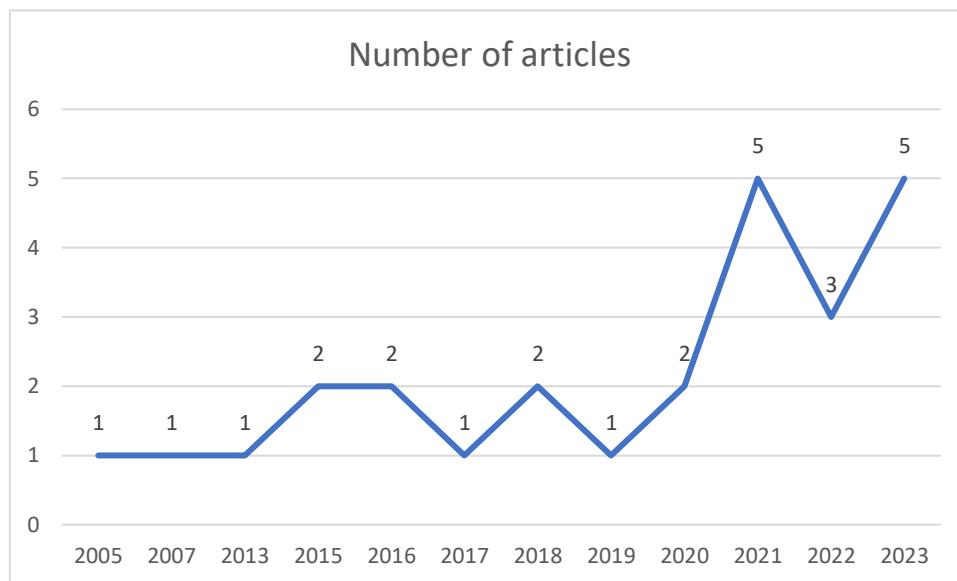
### *1. Bibliometric Analysis*

This section provides a bibliometric literature analysis regarding the relationship between sustainability performance and value generation. It offers a comprehensive overview of the current research on this correlation by undertaking a systematic evaluation of the literature (Chen et al. 2014). It includes an overview of the yearly publication trends, the publishers that stand out in the reviewed articles, citation analysis of the reviewed articles, and the leading countries.

### 1.1. An overview of the yearly publication trends

This section examines the number of publications addressing sustainable value creation over the years. The analysis shows the yearly trends in publication rates, with Figure 2 displaying the number of reviewed articles released each year. As shown in the figure, no relevant articles were identified before 2005. The first relevant article emerged in 2005, with a consistent publication rate and minimal fluctuations until 2020. However, from 2020 onwards, there was a significant increase in publications, culminating in a significant spike in 2023.

**Figure 2.** *The yearly publication trends.*



*Source:* Authors work

There are many vital reasons why sustainability has gained heightened attention in recent years. Organisations increasingly prioritise sustainability due to global concerns, investor expectations, talent preferences, financial benefits, etc. Winston (2022) has analysed the top 10 main stories that significantly impacted the increasing sustainability performance in recent years. These are multiple environmental crises, the first war in Europe in 80 years, and various challenges related to elections, sustainability trajectory, ESG investing, transparency, etc. In addition, the recent focus on sustainability is largely due to legal requirements. For example, ESG performance and reporting are now mandatory in many countries. With different regulatory frameworks and social requirements in many countries, comprehensive and standardised ESG reporting procedures are essential for transparent and cost-effective stakeholder communication (Dathe et al. 2024)

### 1.2. Key publishers of the reviewed articles

Sustainability has emerged as a prevalent subject of discussion inside organisations. The objective of this analysis is to determine the main research repository that focuses on the long-term impact of sustainability performance on value generation. Identifying notable publishers can offer valuable insights into the possible impact that future scholars may have on the growing field of research. The 27 publications that were examined were published in a total of 23 distinct journals. Among these, 13% were published in the Journal of Cleaner Production, 8% in the Journal of Sustainable Finance & Investment, and 8% in Sustainability. The remaining journals accounted for 71% of the articles (Table 1).

### *1.3. Keyword analysis for reviewed articles in VOSviewer*

VOSviewer is a software application used to visually represent and analyse bibliometric data, such as networks of co-authors, citations, and keyword co-occurrence. This software tool, available at no cost, can generate and present bibliometric correlations among several variables (Kirby 2023).

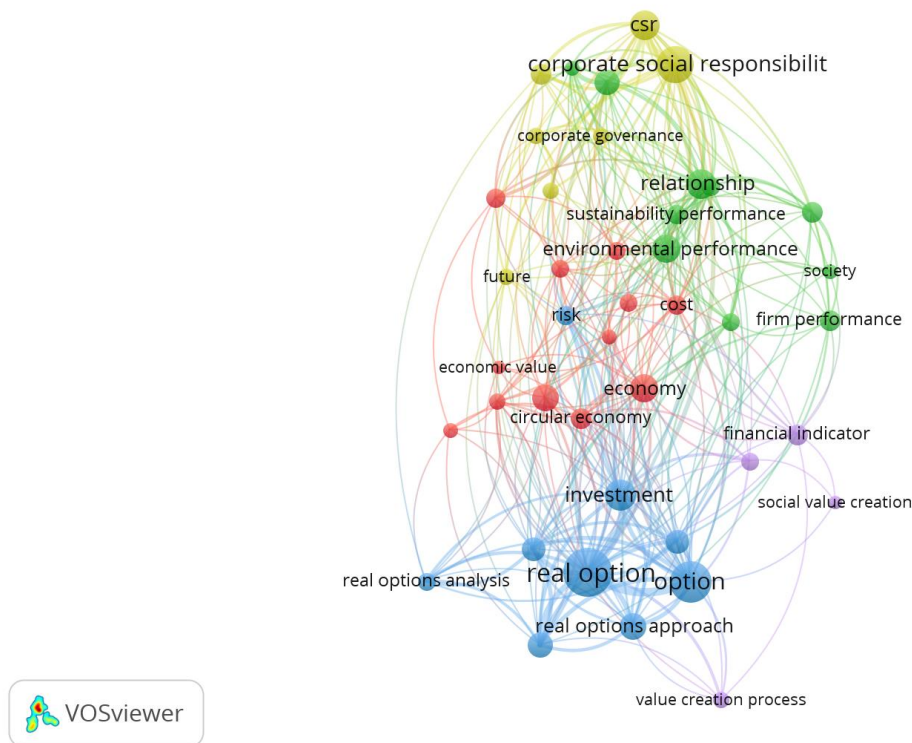
**Table 1.** *The publishers that stand out in the reviewed articles*

No	Journal names	Number of articles	H Index (SJR)
1	Journal of Cleaner Production	3	309 (Q1)
2	Journal of Sustainable Finance & Investment	2	35(Q1)
3	Sustainability	2	169(Q2)
4	Accounting Auditing & Accountability Journal	1	121(Q1)
5	Architectural Engineering and Design Management	1	40(Q2)
6	European Review	1	33(Q3)
7	Economic Analysis and Policy	1	59(Q1)
8	Economics Letters	1	125(Q2)
9	Geneva Papers on Risk and Insurance Issues and Practice	1	42(Q2)
10	International Journal of Accounting and Information Management	1	35(Q1)
11	International Journal of Applied Economics, Finance and Accounting	1	5 (Q3)
12	International Journal of Business and Society	1	25(Q3)
13	International Journal of Financial Research	1	14(Q4)
14	Journal of Accounting Literature	1	24(Q1)
15	Journal of Business Research	1	265(Q1)
16	Journal of Creating Value	1	15(Q3)
17	Journal of Social and Economic Development	1	20(Q4)
18	International Journal of Product Lifecycle Management	1	24(Q3)
19	Meditari Accountancy Research	1	39(Q1)
20	Polish Journal of Management Studies	1	34(Q3)
21	South African Journal of Economic and Management Sciences	1	26(Q2)
22	European Research Studies Journal	1	38(Q2)
23	Asia-Pacific Journal of Financial Studies	1	22(Q2)

*Source:* Authors work

Furthermore, this software has the capability to assess extensive amounts of data and provide outstanding network data mapping (Bukar et al. 2023). By utilising VOSviewer to analyse the co-occurrence network of terms, one can gain useful insights into the correlation between sustainability and value generation. The academic discourse highlights the connection between sustainability performance and value generation. This is evident through the presence of keywords such as value creation, real options valuation, sustainability, and CSR, as depicted in Figure 3. The results demonstrate a more robust association between sustainability performance and the development of value in organisational contexts.

**Figure 3.** *Keyword analysis in the VOSviewer*



*Source:* Authors work

## 2. Key findings

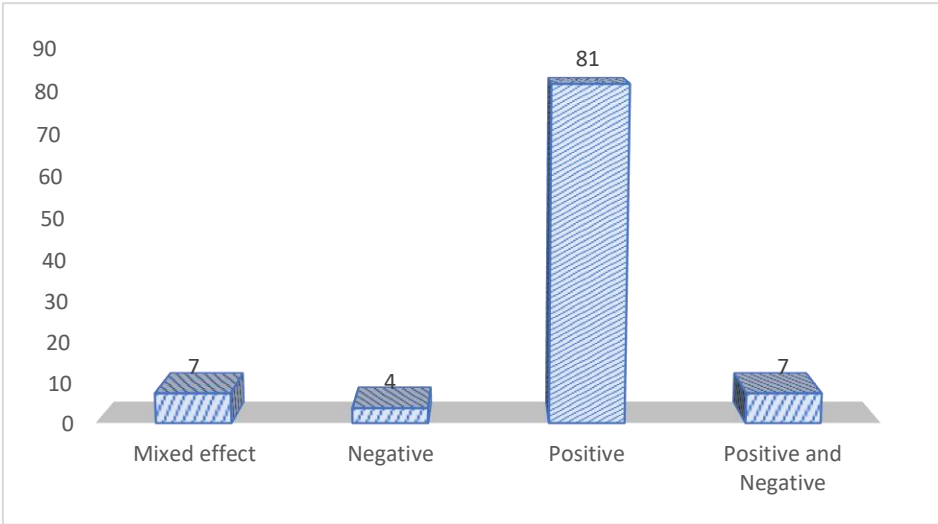
### 2.1 The link between sustainability performance and value creation

In the current corporate environment, there is a swift and constant evolution, prompting organisations to prioritise the integration of ESG/CSR efforts into their operations. Implementing thorough and authentic corporate social responsibility (CSR) practices over a long period of time can allow companies to utilise intangible assets like trust, reputation, and goodwill to create value, as stated by Marsiglia and Falautano (2005). The results suggested a positive link between sustainability performance and value generation within the framework of real options analysis. Here, value is created by combining durability, adaptability, convenience, and environmental harm reduction (Vakili-Ardebili & Boussabaine 2007).

The papers examined various results of consequences regarding the association between sustainability performance and value creation in the context of real options valuation. The study analysed 27 scientific papers and found that 81% had a positive correlation, while just 4.0% had adverse effects. Around 7% of the studies presented results that encompassed both good

and negative consequences, while 7% of the publications displayed a mixture of positive, negative, and neutral interactions (Figure 2).

**Figure 2:** *The link between sustainability performance and value creation*



*Source:* Authors work

Sustainability enhances value generation by mitigating risk and fostering long-term economic prospects (Gomez-Bezares et al. 2017; Ochi 2018; Herbert et al. 2020). There is a direct correlation between sustainability performance and market valuation. Furthermore, this correlation is more pronounced in nations with excellent investor safeguarding and financial transparency (Yu & Zhao 2015). Companies that demonstrate exceptional sustainability performance can primarily distinguish their products in the market, attracting new clients and gaining a competitive edge over their rivals (Manda et al. 2017).

Innovation is critical to long-term value creation from a sustainability perspective. Research and development (R&D) enable organisations to create and implement more environmentally friendly goods and business models. This helps them address increasing demands, gives them a competitive edge, and allows them to tap into new market prospects (Saling 2015).

Better ESG disclosure facilitates information processing and reduces risk, enhancing the value of structured warrants as real options valuation on the stock (Yen Yip 2019). In addition, investing in funds or companies that concentrate on SDGs can be seen as a way to provide potential opportunities for future growth. Achieving the SDGs is a gradual process, and allocating resources to sustainable initiatives now unlocks potential prospects for creating value in the future as progress is made towards the goals (Harasheh et al., 2023).

Several research results demonstrated disparate negative, positive, and adverse outcomes and



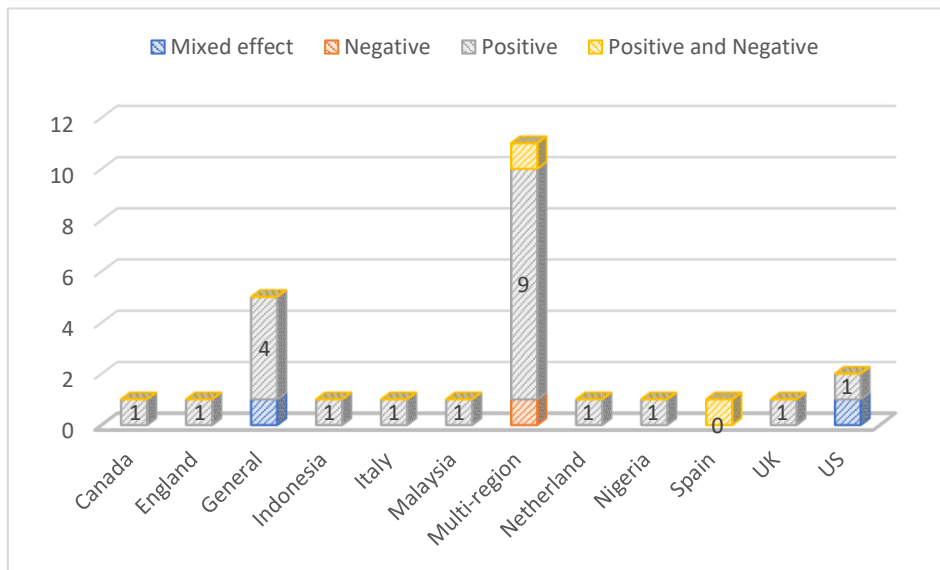
mixed effects. The research results of Rojo-Suárez and Alonso-Conde (2022) indicate that although ESG policies have minimal effects in the short term, over time, better ESG performance leads to reduced value creation. This is primarily due to substitution effects that result in higher long-term discount rates, affecting market value. Piechocka-Kaluźna et al. (2021) focused on ascertaining the correlation between ESG score, its individual components, and the expenses associated with equity, debt, and their weighted average. The findings indicate a significant and negative correlation between ESG (E, S and G) scores and WACC, specifically the WACC of Equity. On the other hand, there is an insignificant negative correlation between ESG and its components and the WACC Cost of Debt. According to Weston & Nnadi (2023), numerous non-financial advantages exist, although there are no direct financial benefits to practising sustainability. These include an enhanced reputation, a sense of satisfaction from being environmentally conscious, improved access to debt and equity financing, potentially better credit ratings, and an overall contribution to a healthier environment.

Change et al. (2022) have examined the link between ESG/CSR, firm value, and investment returns. The researchers employed a discounted cash flow valuation methodology to determine the factors that might increase the company's value through these methods. Empirical research substantiates that implementing ESG/CSR practices may enhance company value through the stimulation of staff motivation, the reinforcement of customer-supplier connections, the promotion of long-term growth, the augmentation of dividends, and the mitigation of financing costs. In contrast, socially responsible firms do not deliver higher excess stock returns in the long run.

## *2.2 Regional evaluation of the links between sustainability and value creation*

The research results on the example of countries such as Canada, England, Indonesia, Italy, Malaysia, Holland, Nigeria, the UK, and the USA revealed a clear and positive relationship between the sustainability indicators of enterprises in these countries and their value creation potential. Furthermore, Spain had a combination of positive and negative outcomes concerning the correlation between factors (Figure 5).

**Figure 5:** *Regional evaluation of the links between sustainability and value creation*



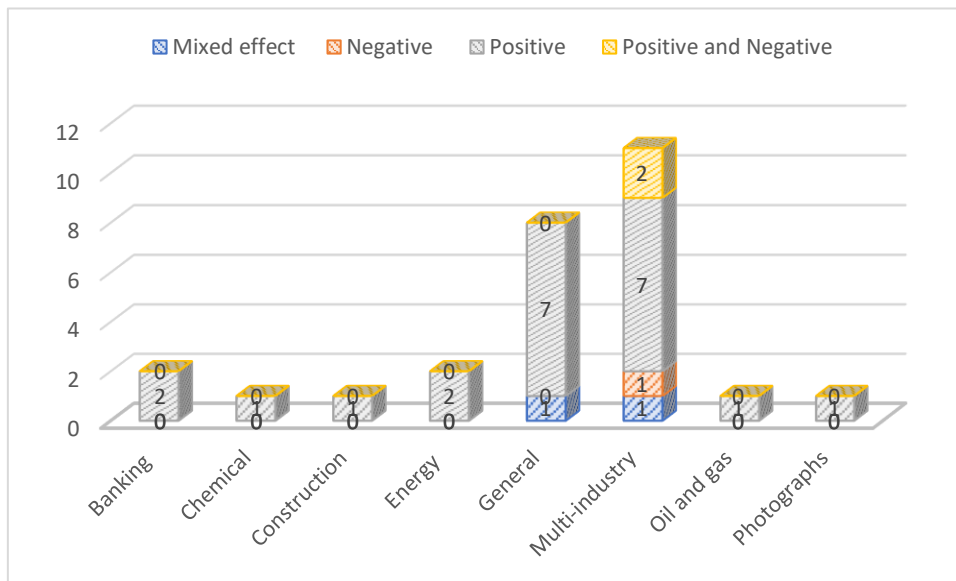
*Source:* Authors work

It's vital to differentiate between multi-regional and general results. These terms refer to the extent and representation of data utilised in a study, which can significantly affect the validity and usefulness of the findings. While both approaches have their advantages, comprehending their distinctions is essential for precisely interpreting research outcomes. Multi-regional research involves using data utilised from multiple countries or regions. Unlike multi-regional research, general research does not concentrate on countries or industries. It intends to offer a comprehensive insight into a particular subject by combining existing literature or utilising methodologies that don't demand country-specific data.

### *2.3 Industrial evaluation of the links between sustainability and value creation*

Moreover, the results suggest a positive association between sustainability performance and value generation across various organisations in diverse industries, notably banking, energy, and multi-industry domains. However, positive and negative effects were observed in some of the studies at the multi-regional level (Figure 6). In their study, Nsibande and Sebastian (2023) examined how incorporating ESG ratings as a variable affects the prediction accuracy of the Fama-French five-factor model (FF5F) in forecasting stock returns on the Johannesburg Stock Exchange (JSE) at the industry level. The results suggest that the FF5F model's prediction ability is somewhat improved when including an ESG score component. Nevertheless, the influence of ESG criteria on investment decisions made on the JSE is insignificant.

**Figure 4:** *Industrial evaluation of the links between sustainability and value creation*

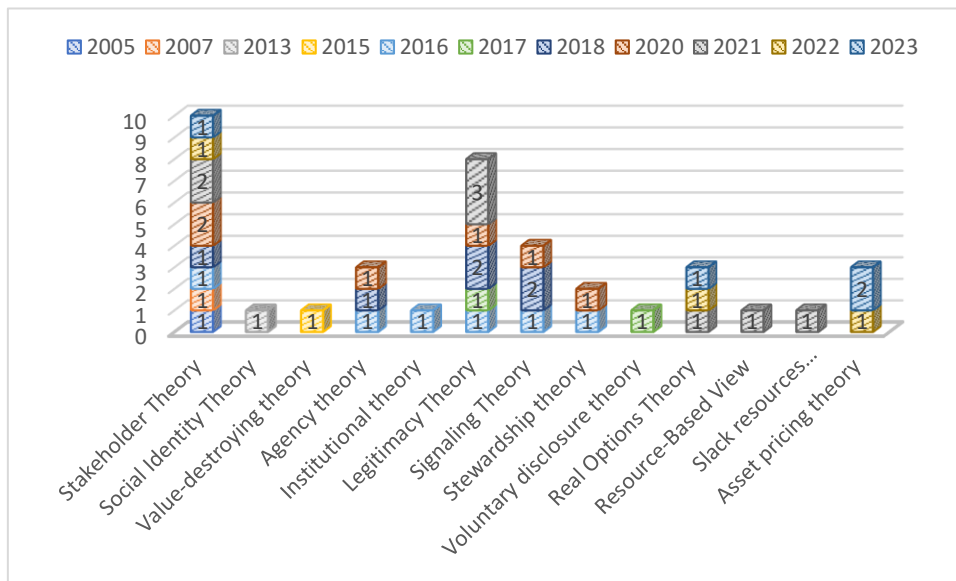


*Source:* Authors work

#### *2.4 Theoretical review*

The correlation between sustainability performance and value creation may be elucidated by the theories of stakeholders (cited ten times), legitimacy (cited eight times), signalling (cited four times), agency, real options, and asset pricing (each cited three times). Stakeholder theory asserts that companies should create prosperity for all individuals or groups (stakeholders) involved in the firm's goals and operations (Benvenuto et al. 2023).

**Figure 5: Theoretical review**



*Source: Authors work*

While stakeholders or investors may have a limited comprehension of the immediate environmental effects of financial operations, they believe that businesses adopting environmentally responsible practices will enhance their competitive advantage in both the short and long term (Gutiérrez-Ponce & Wibowo 2023). Implementing the stakeholder theory and corporate social responsibility (CSR) improves interactions with stakeholders, including consumers, employees, communities, and other relevant parties. As a result, this can positively impact important measures of success like customer satisfaction, likelihood to make a purchase, perception of the brand, and more, ultimately resulting in better financial performance over time (Adamska & Dabrowski 2021).

Significant degrees of uncertainty in technical, policy, and market aspects are obstacles to implementing carbon capture and utilisation (CCU). By utilising the principles of basic options theory (ROT), the valuation of environmental investments may effectively tackle this problem by acknowledging the origins of uncertainty and the presence of flexible choices. ROT aims to include and prioritise adaptability in investment choices to respond effectively to evolving circumstances. This statement precisely represents the risks and possibilities associated with CCU projects (Assche & Compernelle 2022).

Legitimacy theory significantly explains how organisations use sustainability reporting to bridge legitimacy gaps and create value. The article emphasises that the systematic use of photographs in sustainability reporting is construed as an attempt by the company to make its sustainability messages explicit and provide greater legitimacy to activities and performance

to enhance organisational value (Ali 2021). Companies can enhance shareholder value by implementing sustainable practices that enable efficient resource utilisation (Gomez-Bezares et al., 2017). Agency theory suggests that management may maximise shareholder interests by pursuing projects that have positive net present value (NPV) and generate future cash flows that increase shareholder value. From this viewpoint, non-financial CSR/ESG sustainability activities can be interpreted as allocating firm resources to programmes that do not prioritise the shareholders' best interests but may benefit other stakeholders (Rezaee 2016).

Ultimately, the board and management must have the necessary mindset and knowledge to prioritise the long-term growth of the company, anticipate emerging trends, cultivate necessary skills, and consistently create innovative business models. In addition, they must concurrently prioritise the creation of economic and societal value rather than solely pursuing profit. Kurznack et al. (2021) devised a model to aid organisations in formulating strategies and evaluating the long-term worth and sustainability of their investment and lending portfolios. The strategy surpasses the goal of increasing immediate shareholder value. The central idea of this approach is around the notion of a "transition curve" specific to a particular sector. This graph depicts the progressive transition of customer demand in a certain industry from traditional products and services to more environmentally friendly and socially responsible alternatives, driven by societal trends. The position of any organisation on the curve is determined by its capabilities.

## **5. Conclusion**

This systematic literature review examined 27 studies that used the PRISMA methodology to investigate the relationship between sustainability performance and the creation of value through the real choices approach.

The findings suggest numerous studies demonstrate a positive association between sustainability performance and value generation. Higher ESG ratings and effective management of environmental and social impacts are linked to increased revenue, decreased costs, reduced risk exposure, innovation advantages, and long-term prosperity. Nevertheless, certain research produces inconclusive findings that vary based on the specific industry, region, and period being examined. Scholars have employed multiple theories, including stakeholder value, signalling, legitimacy, and real choices theory, to elucidate the relationships between sustainability and value. The stakeholder hypothesis posits that organisations should generate value for all stakeholder groups, rather than solely focusing on shareholders. Furthermore, firms can foster positive reputation and confidence among stakeholders by skillfully handling

relationships and attending to their needs and concerns through sustainable practices. This can increase the generation of wealth over time by improving both financial and non-financial performance. Out of these choices, the real options approach is advantageous since it considers the adaptability of sustainable investments and enables a more flexible evaluation in unexpected circumstances.

In summary, effectively implementing a sustainability plan that is closely aligned with company objectives can generally result in the production of long-term value, even though the financial impacts may not always be straightforward.

The analysis of the chosen papers suggests certain deficiencies, such as a dearth of empirical research on this topic, a paucity of studies within businesses or countries, and so on. Future scholars should thoroughly analyse these limitations and do research based on a more empirical approach.

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# Diversity, Equity and Inclusion at Boehringer Ingelheim

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## ABSTRACT

Societal changes and the evolving workplace dynamics have created the necessity for corporate diversity, equity, and inclusion play a pivotal role in driving competitive advantage, enhancing innovation, and ensuring sustainable business success. This article examines the theoretical framework of diversity, equity, and inclusion and the practice of the global pharmaceutical company Boehringer Ingelheim through qualitative case study method. Furthermore, in depth-interview was conducted with Head of Diversity, Equity & Inclusion at Boehringer Ingelheim Germany. As a result, the key findings of this study highlight the transformative impact of DEI initiatives on corporate culture, employee satisfaction, talent acquisition and overall productivity.

**Keywords:** diversity; equity; inclusion; global trends; Boehringer Ingelheim; company; workplace; strategy; employees

## 1. Introduction

In the context of demographic change, global trends and the shortage of skilled workers, the business environment has undergone a significant transformation in the recent years. The world of work is becoming increasingly flexible, and digitalization and globalization are leading to innovation. (Matusiewicz & Kaiser, 2018) This is evident not only in human interactions within our society but also in our everyday work life and the way we handle corporate institutions. In order to remain competitive in an ever-changing market, diversity, equity, and inclusion (DEI) has become essential for employers. According to the McKinsey report “Diversity Matters”, companies that fall, within the top 25% in terms of “racial and ethnic diversity” are 35% more probable to achieve financial returns higher than their national industry medians. Moreover, companies in the top quartile for “gender diversity” have a 15% increased probability of reaching financial returns above their relevant national industry medians. In contrast,

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companies without diversity and inclusion programs are more likely to perform below average in terms of their returns. (Hunt et al., 2015)

Similarly, the study "Diversity Trends.", conducted by the Charta der Vielfalt showed that two-thirds of all companies see specific benefits associated with diversity management. This includes not only an improved corporate image but similarly an increased attractiveness for existing and new employees. As well as the promotion of innovation, motivation, and creativity. Additionally, the study highlighted that 63% of companies in Germany expect diversity management to become even more relevant in the future. (Charta der Vielfalt e.V., n.d.-a)

The growing importance of diversity, equity and inclusion is creating new challenges for employers. Companies will only be successful if they focus not only on economic growth, but also on DEI. This is because the performance and motivation of the workforce, and therefore the operational success of a company, depend decisively on it. As a consequence, in order to achieve sustainable operational success and exceptional business results, companies need to implement and sustain a DEI program. (Hunt et al., 2015)

The aim of the research was to explore and illustrate the DEI practices of a global company. In this context, two research questions arise: (1) How does a global company implement DEI aspects into its operations? and (2) What are the results of an implemented DEI strategy for a global company?

## **2. Theoretical background**

Before discussing diversity, equity and inclusion, it is important to first explain and define the meaning of the terms.

Diversity is generally understood in international discourse to mean variety, uniqueness, or multiplicity. When applied to business entities, it includes both the disparities and commonalities within a group, marked by individual personality attributes and distinct lifestyles. (Bernstein et al., 2020) When applied to business entities, it includes the disparities as well as the commonalities within a group, marked by individual personality attributes and distinct lifestyles (Schach, 2023). Thus, the concept of diversity encompasses not only visible traits but also unseen characteristics that are reflected in employees' subjective attitudes, viewpoints, and outlooks (Sherman et al., 2021). When considered comprehensively, six primary dimensions can be discerned: gender and gender identity, age, sexual orientation, disability, ethnic origin and nationality, and ethnicity, religion, and belief. (Arndt et al., n.d.)

Equity refers to fair involvement, equality, and justice. It involves ensuring equal opportunities and rectifying existing disparities by including privileges and eliminating obstacles (Rynarzewska et al., 2024). However, it does not imply identical treatment for all individuals. Instead, equity represents equal opportunities and rights tailored to individual needs, aiming to optimize each person's performance and fully realize justice and fairness. (Sherman et al., 2021) In a business environment, achieving equity involves crafting individual strategies that cater to the diverse needs of various individuals. (Schach, 2023) It is important to note that there is no one-size-fits-all strategy that companies can adopt concerning equity. Instead, the specific corporate structure determines the necessary actions to ultimately establish equal opportunities and dismantle existing structural, institutional, and cultural barriers. Within this framework, equity requires a thorough examination of current inequalities arising from social background, gender, ethnicity, sexual orientation, religion, or mental and physical disabilities. (Charta der Vielfalt e.V., n.d.-b)

In sociology, 'inclusion' refers to the mechanisms of integration within social systems, aligning with the principles of participation and non-discrimination in human rights. It represents equal involvement, signifying respect and acknowledgement of all individuals, regardless of their unique characteristics. (Rynarzewska et al., 2024) Therefore, the aim of inclusion is to modify the social system itself to ensure equal access for everyone, rather than molding individuals to fit into it. This requires establishing structural and legal frameworks that offset disadvantages and facilitate participation. (Bernstein et al., 2020) Often, it is necessary to dismantle old structures and reconstruct them with diversity in mind to rectify disadvantages and align them with legally enforced principles. Consequently, diversity and inclusion are considered interconnected concepts, with their interaction being vital for a stimulating and productive work environment. (Hedderich et al., 2016)

Embracing diversity in all its forms not only creates an inclusive environment where everyone is treated equally, but it also enhances decision-making, creativity, and innovation by incorporating and valuing diverse perspectives and ideas (Bernstein et al., 2020). The focus should be on providing equal opportunities, recognizing individual needs, and fostering a culture of respect and appreciation. In this regard, corporate diversity is primarily seen as an economic and social advantage, as companies can boost their employees' performance and simultaneously enhance their well-being by creating an inclusive work environment. (Charta der Vielfalt e.V., n.d.-b)

Over the past few years, the themes diversity, equity and inclusion have become increasingly important in the Workplace. Like the McKinsey report from 2015 already stated “Diversity

matters” and not only in our daily lives but also especially in the corporate world. In addition, the 2021 Statista survey "Where do you think German companies need to catch up when it comes to diversity" shows that there are still several areas that need improvement when it comes to diversity in companies. For instance, "promoting older employees" and "equal opportunity for promotions" have the highest rate of need for improvement with 50.6%, and 50.5%, but more than 40 to 50 percent of respondents thought that integration and inclusion of people with disabilities and women in leadership positions and flexible work hours and family friendly work were also important. (StepStone, 2021b) It is particularly surprising that women hold only 17.5 per cent of all executive positions in the 100 largest companies in Germany. (Statista, 2023-a) This is because these topics have the potential to improve business performance, foster innovation, and increase employee engagement and retention. (Hunt et al., 2015)

It is essential for internationally operating companies to have a positive corporate image and good employer branding. Diversity is a key factor that has a positive impact on this. According to the StepStone Diversity Report published in August 2021, 65.7% of respondents believe that workplace diversity is a success factor in building a positive corporate image. To underline this aspect, another survey conducted by Statista in 2021 shows that the biggest benefit of diversity management for companies is employer branding. Nearly 70 percent of respondents agreed. (StepStone, 2021a)

Dr. S. Gokula Krishnan (2020) drew attention to the importance of the integration of diversity and inclusion in global workplaces. She states that only by “becoming more diversified from all possible dimensions, especially diversity in workforce” a company can remain competitive in the business world. Furthermore, she states that Managers must consider the importance of a diverse environment for attracting and retaining employees. (Krishnan, 2020) In the same way 66% of the people surveyed in the Michael Page's 2021 “Internal Success and Change through Diversity Management” stated that a good diversity management leads to an attractive employer branding (Michael Page, n.d.).

Another important factor is creating an inclusive culture both internally and externally. This is especially true for global companies that operate in diverse markets with customers, clients and stakeholders from different cultural backgrounds (Arndt et al., n.d.). By embracing diversity and creating an inclusive external and internal culture, these companies can better understand and respond to the needs and preferences of their diverse stakeholders. This leads to a better and enhanced understanding of the marketplace, resulting in a competitive advantage. (McKinsey & Company, 2022) Moreover, a McKinsey study from 2020 indicates that companies with effective diversity strategies experience a significant 56% increase in job



performance. Conversely, a single incident of exclusion can cause a 25% decline in an individual's performance within a team project. This shows that, when employees feel included, it leads to an inclined performance at work. As a result, performance levels can improve significantly, leading to higher-quality outputs. (McKinsey & Company, 2020)

In the light of this the Michael Page study from 2021 also highlights that 52% of the respondents mentioned an improved cooperation within the team, since their company has an implemented diversity management (Michael Page, n.d.). Likewise another survey conducted by Statista in 2021 revealed that 55% of respondents considered the prevention of discrimination to be an advantage in terms of internal perception (PageGroup, 2021)

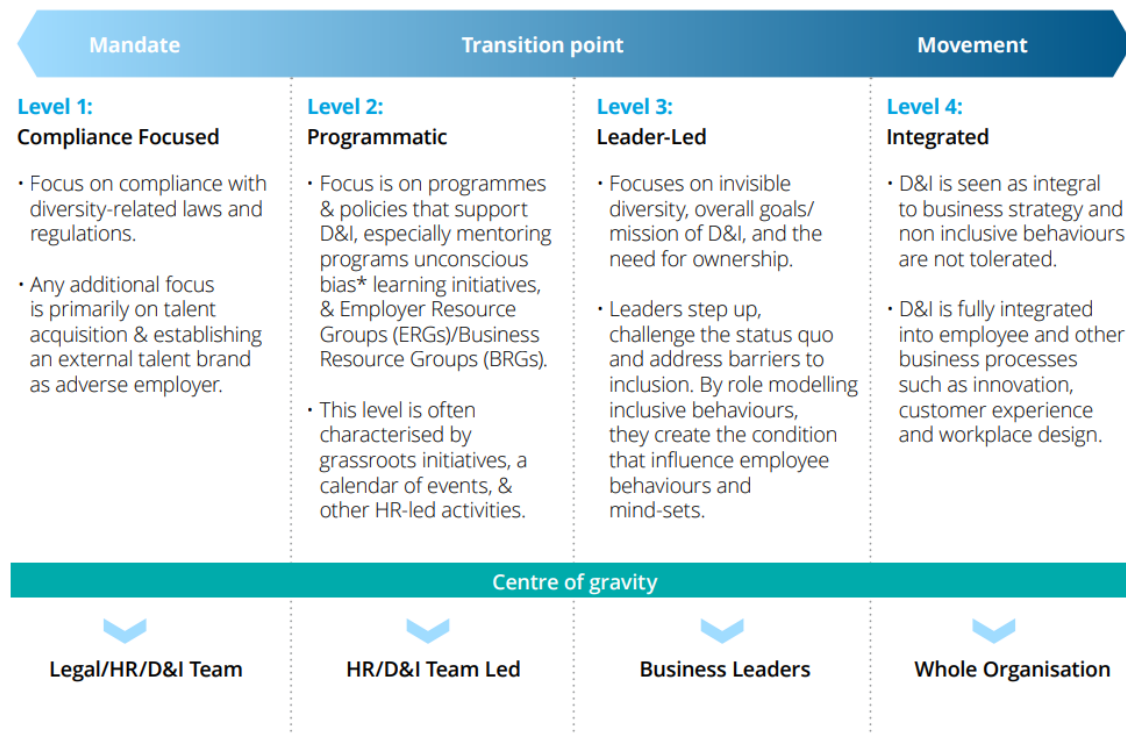
Another important benefit of a diverse and inclusive workplace is that it fosters creativity, innovation and problem-solving. This shows the newest report from “Charta der Vielfalt” from 2020, where 82% of the companies surveyed stated that diversity promotes their innovative strength. The reason is that complex challenges can be solved best when there are as many different roles as possible in the team since different perspectives can be considered. Innovation is only possible when there is knowledge from different origins and acceptance and respect for opinions. Allowing everyone in the company to live out their potential creates a corporate culture characterized by innovation, solution orientation, and productivity. (Charta der Vielfalt e.V., n.d.-a)

Furthermore, another aspect of Michael Page's 2021 "Internal Success and Change through Diversity Management" study shows that diversity also increases employee satisfaction and retention. 50% of respondents reported higher retention and 47% reported greater employee satisfaction. Therefore, accepting diversity and differences contributes to a better working atmosphere. (Michael Page, n.d.)

Nevertheless, implementing measures to promote diversity, equality and inclusion requires a comprehensive and strategic approach in global companies. Since it includes developing complex policies, programs and initiatives which include and support all employees at all levels of the organization. (Schach, 2023)

*A DEI case study in the pharmaceutical industry shows that a culture of inclusion must be initiated by the leader, involving employees and external stakeholders (Sakitri, 2015). However, the Deloitte diversity and inclusion maturity model distinguishes between four levels: (1) compliance, (2) programmatic (3) leader-led (4) integrated, the last being the most advanced, where business value creation is at the core.*

**Figure 1:** *Diversity and inclusion maturity model*



Source: (Deloitte, 2021)

### 3. Research Questions and Methodology

#### 3.1. Research questions

Based on the literature review, two research questions were formulated: (1) How does a global company implement DEI aspects into its operations? (2) What are the results of an implemented DEI strategy for a global company?

#### 3.2. Case study as research method

The research methodology used is a case study to explore the questions as to why the implementation of DEI in global companies is of particular importance, how DEI measures can be implemented in a global company and the results of an implemented DEI strategy for a global company. This case study is based on a multi-stage approach, allowing for comprehensive examination. It incorporates both qualitative and quantitative methods, as well as theoretical and practical research to ensure a holistic understanding of the topic of diversity, equity, and inclusion in the corporate context. (Baxter & Jack, 2008) In general, does research methodology embody the systematic application of techniques, procedures, and instruments for data collection and analysis to achieve specific research objectives. In this case, theoretical

research methods, as well as the use of a best practice example are employed to examine the significance of DEI in global companies, analyze the effective implementation of DEI measures, and evaluate the results of an implemented DEI strategy. (Merriam & Tisdell, 2015)

This research methodology has both advantages and disadvantages. For example, a benefit of using a multi-stage approach is that it enables a more thorough analysis of the issue and contributes to the validity of the results (Noor, 2008). Furthermore, the combination of qualitative and quantitative methods provides a broader perspective and enables the understanding of complex interrelationships. Additionally, the use of a best-practice example delivers practical insights and identifies implemented strategies. However, there are also disadvantages, such as the fact that the selection of a best practice example as a case study may lead to limited generalizable findings. (Dul & Hak, 2007) Resulting in findings that might not be transferable to other companies. In addition, relying on existing data and reports may lead to limitations in terms of information availability and completeness. Moreover, the research methodology demands a significant time investment for data collection, analysis, and interpretation. (Rajasekar & Verma, n.d.)

For the case study at hand two main types of research methodology were used: qualitative and quantitative. Qualitative methods involve content analysis of internal company documents, reports, and personal work experience to assess the implementation and outcomes of DEI measures and gain insights into the company's DEI initiatives. Quantitative methods include analysis of statistical data and metrics to evaluate the importance and influence of DEI. On top of that, already conducted surveys of employee satisfaction and perception of DEI efforts have been analyzed. (Widdowson, 2011)

### 3.3. Case selection

In order to gain a more comprehensive insight into the topic of diversity and inclusion at global workplaces, it is examined using the company Boehringer Ingelheim as an example. This company was chosen since it is one of the world's leading pharmaceutical companies and is very globally and internationally positioned with numerous locations around the world. Furthermore, this organization was chosen as it had been awarded for the third year in succession as a „Global Top Employer”, being one of the world’s 15 best employers. (Boehringer Ingelheim, 2023-a) In addition, Boehringer Ingelheim has a well-known and cherished diversity, equity and inclusion program and employees just in Germany over 101 (Boehringer Ingelheim, 2019). To emphasize Boehringer Ingelheim's passion for diversity, equity and inclusion, it is important to mention that they are one of the signatories of the "Charta

der Vielfalt”. Moreover, Boehringer Ingelheim is also mentioned and introduced as a best practice example in the “Charta der Vielfalt” and recognized for their diversity, equity and inclusion project. (Charta der Vielfalt, 2024)

### 3.4. Data collection

At the start of the data collection process, reports and published articles from Boehringer Ingelheim were reviewed to determine the significance of the topic in the company's context and gain an overview of the current situation within its corporate structures. In addition, the company's website was thoroughly analyzed. Following this, an internal conversation was held with the “Head of Diversity, Equity & Inclusion at Boehringer Ingelheim Germany”. Therefore, this facilitated the gathering of pertinent information and resolution of any outstanding queries. Furthermore, the authors of this paper were granted access to internal drives, networks, and articles. This enabled the identification of a majority of the information needed for the case study and the consolidation of internal information. Finally, all the obtained and gathered information was combined and assessed in the case study presented in this paper.

## 4. Case study

### 4.1. Company portrait

Boehringer Ingelheim is an internationally operating, family-owned pharmaceutical company that was founded in 1885 by Albert Boehringer in Ingelheim am Rhein. Originally, the company was involved in the production of tartaric acid salts for pharmacies and dye works. Today, Boehringer Ingelheim is one of the world's leading pharmaceutical companies. The company has a total of 142 subsidiaries and employs more than 52,000 people. Boehringer Ingelheim's main business is the research, development, manufacture, and sale of medicines for humans and animals. The drugs are produced in the indication areas of oncology, cardiovascular, metabolism, respiratory, immunology and central nervous system. The company has set itself the goal of creating new value through innovation in areas of unmet medical need. The company's business areas include Human Pharmaceuticals, Animal Health and Biopharmaceuticals. (Boehringer Ingelheim, 2022a)

Over time, Boehringer Ingelheim has expanded its portfolio and established new sites. There are now four sites across Germany: Ingelheim, Biberach, Dortmund and Ochsenhausen, which employ a total of around 17,000 people. (Boehringer Ingelheim, 2022a)

#### 4.2. Vision and Values

Boehringer Ingelheim has the primary goal of improving the health of people and animals. In particular, the focus is on rare diseases for which no satisfactory treatment options exist so far. The company is strongly committed to developing innovative therapies that can improve and prolong patients' lives. With the overarching goal of improving the health of humans and animals to the best possible extent, Boehringer Ingelheim has the vision to be a globally leading, research-oriented company that creates value. Therefore, the company specializes in the research and development of new therapeutic approaches to address unmet medical needs. Nevertheless, the patient is always at the center of the company's activities, and the company strives to prolong the lives of both humans and animals. (Boehringer Ingelheim, 2022b)

Boehringer Ingelheim stands for not only bringing generations together and taking responsibility for the community but also for advocating for its employees and creating a diverse, collaborative, and open environment. Boehringer Ingelheim's vision is to maintain quality in everything we do with a passion for improving the overall health of patients. In addition, BI values collaboration within the company, including accountability, agility, and intrapreneurship. Furthermore, the company aims to handle decisions responsibly, be open to external and internal changes, and work together with customers to find innovative solutions. Boehringer Ingelheim's core values are centered on driving innovation to improve lives. This translates into a culture that values both collaboration and respect for diverse perspectives. They believe this combination is key to achieving long-term success in their mission of creating groundbreaking healthcare solutions. (Boehringer Ingelheim, 2022b)

#### 4.3. Introduction in diversity, equity and inclusion at Boehringer Ingelheim

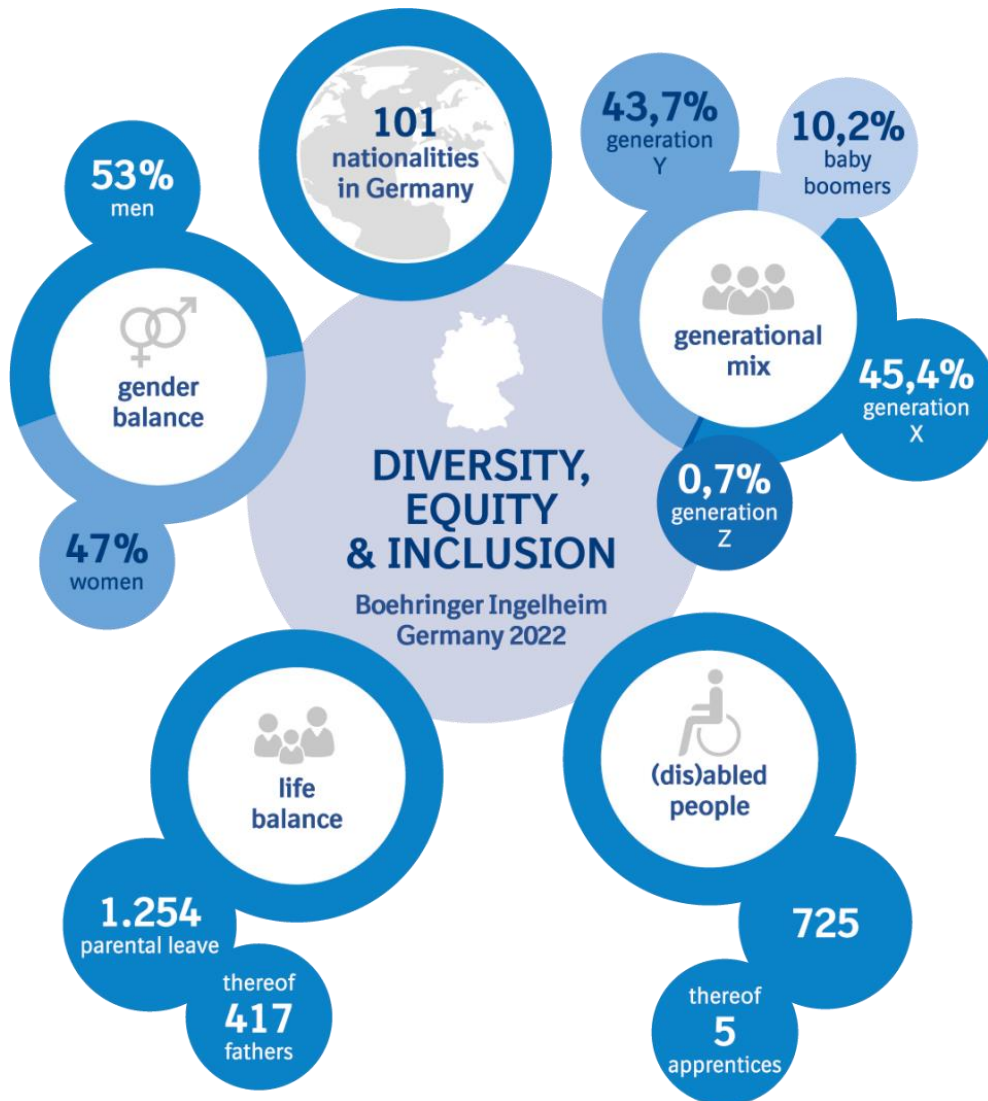
At Boehringer Ingelheim, diversity, equity and inclusion is considered a guiding principle that is crucial for the health and quality of life of employees and customers. Boehringer Ingelheim strongly believes that diversity is a tremendous asset for the company. Since the company can better understand its customers and markets and drive innovation through the diversity of its employees and their perspectives. Therefore, the company aims to leverage the diversity and variety of its employees to create new value in order to improve the health of humans and animals in the long term and sustainably. (Boehringer Ingelheim, 2019)

Boehringer Ingelheim prioritizes diversity, equity, and inclusion driven by the motto of "Diversity based on conviction". As a result, the company values mutual respect, which benefits both individuals and the organization as a whole. Therefore, BI is committed to creating a trusting environment where every individual's opinion is valued, and diverse perspectives are

openly acknowledged. Besides global obstacles, the pharmaceutical company Boehringer Ingelheim has been recognized for its commitment to diversity, equity and inclusion. Boehringer Ingelheim has enforced several initiatives such as its Diversity Charter, mentoring programs, and flexible work arrangements. Additionally, the DEI strategy and its associated goals, which will be discussed in chapter 9.4, also improve the company's reputation as an employer and assist in the global search for talent. In general, to ensure continued success, the company acknowledges the significance of a diverse workforce, including individuals of different genders, ages, cultures, worldviews, sexual orientations, and abilities or disabilities.

The following overview shows the areas of diversity within the company: nationalities, gender, generations, family friendliness and disability (Figure 2).

**Figure 2: Boehringer Ingelheim's diversity areas**



*Source: Authors' own figure based on Boehringer Ingelheim, 2019*

In 2022, Boehringer Ingelheim had a diverse workforce consisting of 101 nationalities, including 725 individuals with disabilities. On top of that, the gender ratio was almost equal, with men accounting for 53% and women for 47% of the workforce. Besides that, the company also values generational diversity as a key factor in its sustainable success and ongoing growth. Most of the workforce, 89.1%, belongs to 'Generation Y' and 'Generation X'. However, the company also has a diverse age range with representation from Baby Boomers and Generation Z, accounting for 10.2% and 0.7% of employees, respectively. Additionally, Boehringer Ingelheim supports family-friendly policies, as demonstrated by its 1,254 employees on parental leave. (Boehringer Ingelheim, 2019) By analyzing Boehringer Ingelheim as a best

practice example, we can gain insights into effective strategies for developing and implementing DEI measures in a global company and their results.

#### 4.4. The DEI-Strategy at Boehringer Ingelheim

It is important to note that the authors of the paper are employees of Boehringer Ingelheim and work in the Diversity, Equity and Inclusion department. Therefore, no external sources are cited in the following texts, as the information is based solely on their work experience and the intranet at Boehringer Ingelheim.

Boehringer Ingelheim promotes diversity, equity, and inclusion at both local and global levels. At the global level, Boehringer Ingelheim aims to better understand the needs of patients and customers and create an inclusive culture that drives innovation. At the local level, the company creates conditions that allow employees to develop individually and ensure their well-being. Equal opportunities and a respectful cooperation among employees are the top priorities. Therefore, the overall aim is to improve innovation potential and customer understanding, as well as increase the attractiveness as an employer both internally and externally. (Internal HR Strategy)

The company implements various strategies to achieve this goal. In Germany, BI has developed a DEI strategy for the years 2021-2025, which is divided into four strategic drivers: cultural and social development, creating the necessary framework, LEARN/Qualification and company reputation. (Internal diversity strategy)

Figure 3 shows Boehringer Ingelheim's DEI system with the strategic drivers, the desired outcomes and the implementation ideas.



**Figure 3:** Boehringer Ingelheim's diversity, equity and inclusion strategy system in Germany



*Source:* Authors' own figure based on internal references

#### 4.4.1. Cultural and social development

For Boehringer Ingelheim the focus of this driver is on raising awareness for DEI while considering the various roles both within and outside the company. Therefore, Boehringer Ingelheim takes its social and societal responsibility seriously and plans to support sustainable development through various initiatives and partnerships. In 2012, the company signed the 'Charter of Diversity', which is a significant initiative aimed at promoting diversity within the organization (Charta der Vielfalt, 2020). For instance, Boehringer Ingelheim has several diversity networks, such as the BI Rainbow Network Germany and the BI Fathers Network Germany (Boehringer Ingelheim, 2023-b). These networks aim to facilitate the exchange of information, represent interests, establish new contacts, and initiate various processes.

For example, the BI Rainbow Network offers a secure platform for Boehringer Ingelheim employees to share their common experiences and showcase the diversity of the company through collaborative initiatives. The members of this network identify as having a different sexual orientation, gender identity, gender expression, or gender characteristics than the majority of the population. Similarly, the BI Fathers Network Germany provides fathers with the chance to internally exchange and network with colleagues on relevant topics. This ensures individual compatibility between work and private life. (Boehringer Ingelheim, 2023-b)

#### 4.4.2. Creating the necessary framework

The driver 'Creating the necessary framework' encompasses the implementation of collective bargaining and legal requirements related to DEI. This involves various business processes, works agreements, and infrastructural activities. Boehringer Ingelheim establishes a framework through work agreements and operational regulations, including the group works agreement, to regulate internal coexistence and promote successful cooperation. However, the company also incorporates other new laws such as the Self-Determination Act (Die Bundesregierung, 2023) and the Severely Disabled Persons Act (behinderung.org, n.d.). For instance, the Self-Determination Act aims to simplify and standardize regulations on gender identity, while the Severely Disabled Persons Act promotes the self-determination and equal participation of people with disabilities in society (Boehringer Ingelheim, 2016).

#### 4.4.3. LEARN/Qualification

Boehringer Ingelheim promotes the professional and personal development of its employees through various learning and qualification opportunities in the 'LEARN/Qualification' driver. These opportunities include e-learnings, integrity minutes, and coaching sessions, with a focus on DEI topics. (Internal DEI strategy documents)

One of the e-learnings offered is training on unconscious biases in everyday life. This training provides knowledge about diversity, its different forms, and helps to identify and reduce unconscious biases. On top of that, the training explains the importance of inclusion and how to make daily work more inclusive. (Internal DEI strategy documents)

Integrity Minutes on the topic of anti-discrimination are a part of the learning environment at Boehringer Ingelheim. These short presentations aim to provide insight into the company's values and visions, with a focus on inclusion, anti-discrimination, and fair treatment. Employees can take a targeted break with these Integrity Minutes at the beginning of meetings or events to better understand and sensitive themselves to the topic. (Internal DEI strategy documents)

In addition, Boehringer Ingelheim offers a range of coaching services, including Role Discovery Coaching. This service provides support to female leaders and professionals in defining their position in relation to their career and family, identifying their needs under existing conditions, setting priorities correctly, managing time effectively, and developing an action plan for their next steps. Hence the aim is to support and encourage talented female professionals and leaders, especially during the period of starting or expanding their family. (Boehringer Ingelheim, 2023-b)

#### 4.4.4. Company reputation

Another aspect is the ‘Company reputation’, which is the final driver of the DEI strategy in Germany. In fact, the company is perceived as an attractive employer in the field of diversity, equity and inclusion, both internally and externally. Boehringer Ingelheim is highly regarded by employees, customers, and partner organizations, particularly for its DEI attitude and activities. Therefore, Boehringer endeavors to maintain and enhance its reputation through media appearances, social media, events and conferences. Consequently, the company presents itself as a strong employer brand with unified and structured social media channels, such as LinkedIn and Instagram, conveying its values and visions. Nevertheless, Boehringer Ingelheim's attractiveness is also supported by its active participation in events and interests. The company has participated in several events, including Christopher Street Day in Mainz, where they promoted diversity with the motto 'We show #FlagforDiversity'. (LinkedIn, 2023) Additionally, Boehringer has contributed to the successful execution of the Prout at Work conference through plenary discussions (Prout at work, 2023).

Figure 3 shows Boehringer Ingelheim's DEI system with the strategic drivers, the desired outcomes and the implementation ideas.

### 4.5 Results

Considering all of these aspects, it is evident that the implementation of DEI strategies at Boehringer Ingelheim has resulted in several positive outcomes. By integrating the topic into the company context and promoting DEI both externally and internally, Boehringer has benefited in many areas.

#### 4.5.1 Corporate Culture

In connection with corporate culture, strong DEI programs can have a significant impact. This impact is likely due to the enriched set of experiences and perspectives that a diverse workforce brings to the table. It shows that workplaces that foster inclusion experience increased collaboration and innovation. The fostered sense of belonging, in turn, can lead to improved decision-making, problem-solving within the organization, as diverse teams are better able to identify and address challenges from multiple perspectives (McKinsey & Company, 2023). Boehringer Ingelheim has enforced several initiatives such as its Diversity Charter, mentoring programs, and flexible work arrangements. This resulted in the creation of a corporate culture which is founded on mutual respect, empathy, tolerance, and trust. Boehringer is one of the

largest pharmaceutical companies in Germany, with steadily growing revenues and a pipeline of new products that are the result of an enhanced corporate culture that encourages the exchange of information and perspectives. (Statista, 2023-b)

#### 4.5.2 Employee Satisfaction

The employee satisfaction is a top priority and result in this regard. Since the inclusive and open work environment makes employees feel valued and respected, it also leads to higher satisfaction and productivity. Hence, Boehringer Ingelheim was awarded the 'Glassdoor Best Employer' award in 2022, founded on voluntary and anonymous feedback from employees. This recognition demonstrates that the employees at BI feel comfortable in the inclusive and diverse work environment. (Boehringer Ingelheim, 2022c)

Additionally, implementing DEI measures can enhance and promote the company's public image. As a result, the successful implementation of a DEI program has a significant impact on Boehringer Ingelheim's reputation and employer branding.

#### 4.5.3 Talent acquisition

Developing talent acquisition is an important achievement. By actively promoting diversity, equity and inclusion, the company enhances its standing as an employer of choice. This makes BI more appealing to potential talent and simplifies talent acquisition. Besides that, the positive perception as a diversity friendly organization plays a crucial role in attracting and retaining talented professionals. Boehringer Ingelheim's commitment to fostering a diverse and inclusive workplace is exemplified by its recognition as a “Global Top Employer” by The Top Employers Institute for the third year in succession. Therefore, this makes Boehringer Ingelheim one of the 15 best employers in the world. (Boehringer Ingelheim, 2023-a) Furthermore, this certification also underscores the company's commitment to prioritizing the mental health of its employees. Boehringer's diverse presence and numerous opportunities provide everyone with the chance to join the company. Particularly in times of skill shortages, globalization and demographic change offers this a competitive advantage for Boehringer Ingelheim. (Boehringer Ingelheim, 2023-b)

#### 4.5.4 Customer Satisfaction

Furthermore, promoting diversity within the company can enhance customer satisfaction. By considering DEI issues, Boehringer can gain a better understanding of its customers and more effectively meet their needs. For instance, Boehringer has developed a sign language avatar to translate package inserts, making it the first pharmaceutical company to do so. This provides

the hearing-impaired with easy access to product information and applications. By scanning a QR code, customers are redirected to a website where they can access explanatory videos in animated sign language. This innovation can improve customer satisfaction and ultimately contribute to customer retention and acquisition. (Internal HR information)

#### 4.5.5 Productivity

Additionally, a workforce that embraces diversity has the potential to enhance productivity and foster innovation by leveraging a wide range of experiences, perspectives, and knowledge. This, in turn, can lead to better decision-making, increased productivity, and ultimately, the improvement of products and financial performance. (Boehringer Ingelheim 2019) This statement is further supported by the fact that BI is ranked as the third-largest pharmaceutical company in Germany based on revenue (Menzel, 2021).

Another important factor is, that an implemented diversity, equity, and inclusion program can also increase market share. Maria Tereno, Global Head of Diversity & Inclusion at Boehringer Ingelheim, says: "Strong, diverse teams are our most important resource, because it is these teams that develop good ideas. Studies show that many companies do not utilize the diversity of their workforce: Around 40 per cent of all marketable product ideas fall through the cracks - mainly because there is a lack of support. Diversity of thought ensures that we always have plenty of good ideas in the pipeline. Ultimately, this also leads to growing market shares." (Boehringer Ingelheim, 2017) Accordingly, it becomes evident that a diverse workforce can significantly impact and enhance market opportunities by introducing new and innovative ideas to the company.

These results demonstrate the significance of promoting and implementing diversity, equity, and inclusion measures within a company. By prioritizing DEI, not only do employees benefit from the inclusive working environment, but the company as a whole can also gain numerous advantages and benefit from the diversity of its corporate culture.

## 5. Discussion

This work examined the topic of diversity, equity and inclusion using the example of the global pharmaceutical company Boehringer Ingelheim. Due to societal and demographic changes, the topic of diversity, equity and inclusion is becoming increasingly important in human interactions within our society, in our everyday work life and in corporations. This presents employers with many new challenges in terms of implementing these measures, but also offers many new opportunities.

Our first research question was how Boehringer Ingelheim implemented DEI aspect into its operations. Boehringer Ingelheim signed the diversity charter in 2012 (Charta der Vielfalt, 2024). It has since introduced several measures as part of a process of development over a period of around ten years. The analysis revealed that BI implements various strategies globally and locally to effectively incorporate DEI into the work context. By developing a local strategy for Germany, the company is actively addressing the current needs of society and its employees. This strategy can be divided into four strategic drivers: 'cultural and social development', 'creating the necessary framework', 'LEARN/Qualification', and 'company reputation'. With the four strategic drivers, all important topics related to DEI are addressed in the daily work routine, covering all relevant aspects for employers, employees, and customers.

The measures introduced as part of the cultural and social development strategy driver are the establishment of a wide range of diversity networks, such as the BI Rainbow Network Germany or the BI Fathers Network Germany. As part of the "Creating the necessary framework" strategy driver, Ingelheim creates a framework which outlines all the values, visions and goals that drive the company, which applies to all employees worldwide. In addition, there are works agreements and company regulations for the German sites. These include the company works agreement, which sets out the rules for living together and working together successfully. The company also incorporates new laws, such as the Self-Determination Act and the Disabled Persons Act, into its day-to-day operations. (Internal DEI strategy documents)

Under the strategic driver LEARN/Qualification, Boehringer applies various learning and qualification opportunities on DEI topics for the professional and personal development of its employees. These include e-learning, integrity protocols and coaching sessions.

The measures introduced for the strategic driver "corporate reputation" were a consistent and structured presence on social media channels such as LinkedIn or Instagram, presenting the company as a strong employer brand and communicating its values and visions. (Internal DEI strategy documents)

Our second research question was what the results of an implemented DEI strategy for the company were. Through the example of Boehringer Ingelheim, in line with the literature Boehringer Ingelheim (2019) it became clear that the implementation of DEI measures had not only positively influenced the corporate culture but has also created a respectful work environment that fosters long-term commitment from employees. Additionally, at Boehringer Ingelheim they have been able to successfully improve not only the performance of their workers but also their corporate image and culture, as highlighted in a number of literatures as

a benefit of DEI Boehringer Ingelheim (2017) and Boehringer Ingelheim (2019). Therefore, their diversity concept has led to an increased productivity, greater employee satisfaction, and higher levels of talent acquisitions, which is in line with what Boehringer Ingelheim (2017) describe. Besides that, they were able to establish a work environment which includes individuals with physical and mental disabilities in the development of new products. Thus, the company acts as a pioneer for many other companies, contributing positively to greater equality and giving voice to those affected. Boehringer Ingelheim having an established framework and concept for diversity and inclusion, has maximized its profits and gained a competitive advantage as written in several literatures. (Statista, 2023-b)

However, it should be noted that an implementation of diversity, equity and inclusion systems and measures must be seen as a long-term project that requires the participation of all employees. Building a truly inclusive workplace goes beyond just hiring a diverse workforce. Deloitte's Diversity and Inclusion Maturity Model offers a framework for organizations to assess their progress in creating an environment where everyone feels valued, respected, and empowered to contribute their best. The model outlines four stages of maturity (Compliance, Programmatic, Leader-Led, Integrated). According to the Diversity and inclusion maturity model from Deloitte (2021), Boehringer Ingelheim is at the fourth integrated level. This is shown through various aspects. For instance, leadership commitment. At Boehringer Ingelheim senior executives are vocal advocates for DEI, integrating it into their strategic vision and holding themselves and others accountable for progress. This becomes obvious through Boehringer's various leadership development programs. (Boehringer Ingelheim, 2022c) Furthermore, through the fostering of an inclusive corporate culture, BI strives to establish an environment where diverse perspectives are valued and heard. Teams are built to leverage these differences, leading to more creative and innovative solutions. Additionally, the talent Acquisition and Development actively seeks diverse talent and provides inclusive onboarding and development opportunities to ensure everyone can thrive. (Boehringer Ingelheim, 2017) However, Boehringer's success at level 4 does not mark the end of the journey. It is a continuous process of refinement and adaptation. Nonetheless, their commitment to integration ensures a workplace where everyone feels included and can contribute to their full potential.

DEI also presents the company with several challenges. One of these is the implementation of DEI-enhancing measures through various communication channels. Due to the complex structure of the company, it is not always easy to pass on information, as employees are often not informed about measures or are informed with a delay, which leads to communication problems and an imbalance of information. In the future, it will be very important for the

company to find ways to ensure consistent and comprehensive communication. Especially for companies of Boehringer Ingelheim's size, transparent information sharing can be challenging due to the complex and extensive corporate structure (Dühring, 2022). Another challenge that companies may face is the time and costs associated with implementing diversity, equity, and inclusion measures. Not all companies have the time and resources to establish a dedicated DEI department or a long-term strategic plan with various measures. However, every company can begin with small steps and work towards a fair and sustainable future. Nevertheless, once these hurdles are overcome, DEI signifies progress. (Ofer, 2012)

## **6. Conclusion**

In conclusion, while the establishment of DEI measures within corporate structures presents challenges, the overall positive aspects for both employees and employers outweigh them. However, it is important to note that a major global company such as Boehringer Ingelheim must implement DEI structures to remain competitive in an ever-changing marketplace. Particularly considering global political changes, more and more people will seek and demand a respectful work environment, making the consideration of DEI not only a short-term goal but also an increasingly significant societal role in the future.

This research suggests that there is potential for further development of the concept and additional research into DEI strategies for global companies. Further questions arise from this case study. For instance, whether implementing diversity, equity and inclusion programs should be legally mandated to ensure that companies are taking the realization seriously. Similarly, if diversity metrics and goals should be standardized across industries, or should they be tailored to each organization's unique needs and challenges? Besides that, how can companies ensure that their DEI programs lead to real cultural change, rather than just being superficial? Another research question to be considered is the extent to which executives and board members are responsible for driving DEI efforts in multinational companies.



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# Refining Brilliance: A Multiple Case Study on Sustainable Innovation in Fine Jewellery

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*Please note that not all analyses have been written due to confidentiality issues. Some results are based on confidential exchanges.*

## ABSTRACT:

This study aims to determine pathways for sustainable innovations in business models for the fine jewelry sector. Luxury companies are trend-setters and often precursors. In the transformation to sustainability, their attempts at innovation are slowed by their traditions. However, sustainability is imperative for the industry to continue to deliver a value proposition in which people can dream without making them feel guilty as they consume. To find a way forward, this research asks: How can the fine jewelry industry innovate its business model to make it more sustainable and respectful of the environment while meeting customers' expectations? This research will be carried out through multiple case study jewelry houses categorized by "heritage."

**Keywords:** Sustainability – Luxury – Fine Jewelry Industry – Business Model – Innovation

## 1. Introduction

In today's world, which is focused on consumption and even overconsumption, it is urgent to rethink business models to mitigate the harmful effects of climate change. The luxury sector is no exception to this imperative. As the world faces growing sustainability challenges, adapting and innovating becomes crucial. Consumer expectations are changing; more and more people are looking for brands that demonstrate responsibility towards the environment and respect human rights. To stay ahead of a competitive market and avoid being boycotted, luxury brands must refine their business practices to align with these new consumer values. However, luxury customers maintain high standards and expectations of their favorite brands despite the shift towards sustainability. It is, therefore, essential that these companies creatively rethink their

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business models. In doing so, they can effectively combine sustainable practices with the high standards expected by their customers. This dual approach is essential to meet customer expectations and contribute positively to the environmental objectives that challenge today's global community.

According to McKinsey (Sabine Becker, 2021), by 2025, the fine jewelry industry is supposed to grow, gaining 3 or 4 percent per year. Also, this sector "is poised to send waves of change throughout the industry." Indeed, as consumers become more conscious and aware of their actions as individuals, they tend to be more demanding and scrutinizing of their purchases. So, to prove that they understand their customer's expectations and are not greenwashing to have a great brand image, jewelry houses are expected to implement viable, sustainable solutions. This trend allows customers "to look good and feel good about their purchase," and surfing this trend, demand for sustainable and ethical fine jewelry is set to grow in the coming years. Indeed, the challenges are numerous, from ensuring the company's long-term viability to complying with global regulations and legislation to meeting customer expectations and ensuring keeping luxury positioning. However, implementing a new, more responsible, sustainable business model is no mean feat. Indeed, innovation becomes essential to change a way of working while maintaining efficiency and productivity. Laboratory diamonds are among the best-known consumer innovations. The manufacturing process ensures quality, ethical production, and a low carbon footprint. From a physical point of view, laboratory diamonds are "optically, physically, and chemically identical to an earth-grown diamond." These diamonds are, therefore, gaining in popularity with young consumers, who are attracted by the promise of more sustainable production. However, although laboratory-grown gems are a more sustainable technological feat, the luxury industry has been reluctant to adopt gems not derived from so-called natural sources. The Natural Diamond Council had ruled that only diamonds extracted naturally (by mining) could be perceived as luxury due to their rarity, the difficulty of extraction, and the natural time it takes to create them, which is counted in millions of years. Conversely, lab-grown diamonds were defined as worthless and of little value.

Despite traditional resistance within the high and fine jewelry industry, the LVMH group's massive investment in a laboratory for producing synthetic (lab-grown) diamonds marks a significant turning point. This decision led to lab-created diamonds being officially recognized as luxury items, as highlighted in a 2022 Forbes article by Danziger (Danziger, 2022). Marty Hurwitz, the founder of The MVEye, a company specializing in the industry of jewelry, believes that LVMH's commitment to the development of synthetic diamonds indicates that

these synthetic stones are about to have a significant impact on the luxury segment: “LVMH’s investment in the lab space is a statement that lab-grown are going into luxury in a big way.”

Brands must innovate their business models to stay competitive and reach young generations. If they want to maintain their attractiveness, they should act now. McKinsey says (Sabine Becker, 2021), “By 2025, an estimated 20 to 30 percent of global jewelry sales will be influenced by sustainably minded consumers.” The desire to consume better and more sustainably is becoming increasingly important, and neglecting these consumer expectations would be a fatal mistake.

In recent years, consumers have increasingly recognized that jewelry is not just an accessory but a piece that carries its own story. This awareness has led to increased interest in the second-hand jewelry market (Robert, 2024), a sector that mirrors the strong trend already seen in fashion. Today, more than ever, enthusiasts understand that buying antique jewelry is not simply an acquisition of beautiful objects but an investment in unique and often irreplaceable objects.

The luxury goods industry must also comply with global legislation. To be seen as sustainable, jewelry houses must obtain several certifications. In particular, a council seeks to convert the entire value chain of the jewelry industry into a more sustainable one. It is called the Responsible Jewelry Council. The Council offers its members two standards: the RJC Code of Practices (COP) and the RJC Chain of Custody. The first is designed to help the supply chain change its management practices. This certification demonstrates a company's commitment to sustainable practices and increases confidence in the supply chain. The second certification guarantees the sourcing and origin of our products and materials for greater transparency. (Responsible Jewellery Council, s.d.)

This review aims to answer the question, "How can the fine jewelry industry innovate its business model to make it more sustainable and respectful of the environment while meeting customers' expectations?" by focusing on the environmental aspect. This study considers the need to balance industry practices with ecological preservation. In addition, the research raises awareness of the imperative to align these sustainable practices with consumer expectations and demands, a vital aspect of the luxury sector. This ensures the industry contributes positively to environmental management and meets its customers' ever-changing standards and desires. It promotes a responsible and progressive approach to business within the sector while keeping a business dynamic to ensure perennity. What is more, according to this extensive research, this subject has yet to be covered.



## 2. Case study

In the luxury goods sector, it is common for many prestigious houses to be integrated into larger companies such as LVMH, Richemont, or Kering. Within these groups, sustainability decisions can be taken at the central director level rather than just at the brand level. Consequently, it is necessary to have a holistic understanding of business models across the group. For this reason, the first part of this case study will examine the sustainability policies implemented at the group level. The second segment of the case study will carefully explore and categorize the business models of various jewelry houses. This analysis will be structured around a transparent classification system, which organizes these houses into distinct categories. These categories are designed to reflect each house's different characteristics and business strategies within the broader context of the luxury market. This structured approach will provide a detailed comparative analysis of how jewelry brands implement and adapt their business models within the constraints and opportunities presented by their parent group's policies. As a reminder, the classification is as follows:

- Category A: Houses with a strong heritage in the jewelry sector that belong to a large group or have such a renowned image that they have substantial net revenues. These houses are selected for their long history and significant influence in the industry: Cartier, Chaumet, Tiffany & Co., Van Cleef, and Arpels.
- Category B: Houses that are less than a century old in the fine jewelry sector and are better known for haute couture and leather goods than for jewelry due to their fashion heritage: Chanel, Hermès, Dior, Louis Vuitton. They offer a unique perspective on jewelry innovation brought by established fashion brands.
- Category C: New jewelry houses created in the last 15 years and not inherited from another sector.: Gemmyo, J.E.M., Courbet, Héloïse et Abélard. These brands represent emerging trends and innovative approaches to sustainability in the industry.

### *i. Sustainable actions by Groups.*

To get an overall view of the actions implemented in the jewelry industry, starting with those implemented at the group level is essential. Significant groups such as Richemont, LVMH, and Kering are increasingly scrutinized for their sustainability actions. These large groups, often listed on the stock exchange (LVMH and Kering on the Paris Stock Exchange, Richemont is

listed on the Swiss stock exchange.), have to undergo significant audits submitted to firms such as KPMG, EY, Deloitte, or PWC to ensure that they comply with standards and regulations (Boisseau, 2024). These companies have published part of their sustainable strategy and ambitions in their annual reports for several years. LVMH has a section dedicated to integrating the responsible model in luxury, entitled "A responsible model for excellence," in the company's annual report. The Richemont Group also published an ESG (environment, social, and

governance) report for the first time in 2023 (RICHEMONT, 2023). This report contains a part with a global approach to the impact of their environmental actions. Still, a part dedicated to the supply chain focuses on essential jewelry materials such as gold, diamonds, and gemstones. Kering is following the trend and publishing a business report for its 2022 financial year, which includes a section on sustainable development (KERING, 2023). These publications testify to the need for major corporations to go green. These three groups share a common goal: to reduce greenhouse gas emissions and respect the three scopes to quantify and manage greenhouse gas emissions. The Greenhouse Gas Protocol defines them (Greenhouse Gas Protocol, 2024). This is part of the drive to limit temperature rises to 1.5 degrees Celsius, an agreement of the COP27. To meet its sustainable objectives, Richemont has set up a means of measuring its environmental impact using the GHG (greenhouse gas) protocol (<https://ghgprotocol.org>, s.d.). The idea is to track its indicators to minimize its carbon footprint. The Cartier group also plans to transition to 100% renewable energies by 2025. "These programs were created in response to the emission impact assessment of POSM and packaging, primarily linked to production and transportation. Both programs aim to reduce GHG emissions by matching supply with demand while optimizing physical distribution" (RICHEMONT, 2023). The Kering group focuses on innovation in materials and processes to reduce its carbon footprint. It relies, in particular, on the Sustainable Innovation Lab (SIL) for materials in the jewelry and watchmaking sectors. The Group also invests in start-ups such as VitroLabs, which works with leather grown in the laboratory from animal cells. Although leather is not directly linked to the jewelry sector, innovation in more sustainable leather can be used in jewelry packaging, particularly in boxes. For the group, creative, modern luxury is inseparable from sustainable development.

The LVMH group is investing in its Life 360 program (LVMH Initiatives for the Environment), an environmental direction, and a roadmap for all LVMH houses for the 3, 6, and 10 years following 2020 (LVMH, 2020).

These major groups are increasingly adopting sustainable practices by adopting circular economy principles, a notable example being Richemont's innovative Bloomify platform (RICHEMONT, 2023). This internal platform revolutionizes the reuse of resources within the company by allowing employees to purchase used office items and accessories. This initiative is a practical application of sustainability, as it extends the lifespan of everyday objects, thereby significantly reducing waste by promoting internal repurchase. By implementing such a system, Richemont promotes environmental responsibility and encourages its internal workforce to actively participate in sustainable development efforts actively, fostering a culture of conservation and reuse within the company environment.

Large groups like Richemont and LVMH seem proud to announce their accreditation under the Science-Based Targets Initiative (STBi) climate label in their annual report, thus affirming their compliance with global environmental standards. However, the credibility of this label has been called into question since the inclusion of carbon credits in the evaluation criteria of these companies. Carbon credits allow organizations to offset their emissions by financing projects such as reforestation and conservation of coral reefs, thereby balancing their carbon footprint without reducing emissions in their value chain. This method of offsetting emissions with carbon credits has sparked significant debate. Critics argue that this approach could lead to greenwashing (Bellan, 2024), where companies appear responsible for the environment without reducing their carbon emissions and environmental footprint. The main criticism is that these efforts rely on offset activities rather than direct actions to reduce emissions. Critics advocate a more global approach in which companies focus on reducing emissions and contribute to biodiversity restoration and other environmental projects. This dual strategy is considered a more honorable and effective way to combat climate change and promote environmental sustainability.

While simply investing in environmental preservation or biodiversity restoration programs may be considered "greenwashing" by some, if not accompanied by other tangible environmental actions mentioned above, financially supporting organizations dedicated to these causes is no less crucial. Luxury groups have recognized the importance of these initiatives, leading them to contribute considerable financial resources and establish strategic partnerships to support biodiversity and ecology. A notable example of this proactive approach is LVMH's collaboration with UNESCO's Man and the Biosphere (MAB) Program (LVMH, 2019). The world's leading luxury goods company to participate in scientific research projects in biodiversity and the sustainable and rational use of resources. By participating in these initiatives, LVMH and other similar organizations demonstrate their willingness to integrate

corporate responsibility into their business models, aiming to impact the planet's ecological health positively. In partnership with L'Occitane, Kering has founded "Climate Fund for Nature". This project aims to protect and restore biodiversity while promoting women's independence (KERING, 2023). The Richemont Group continued its partnership with the Peace Parks Foundation. In particular, this foundation aims to restore terrestrial, freshwater, and marine ecosystems in cross-border conservation areas in southern Africa (RICHEMONT, 2023). This means that large groups have responsibilities to meet, and the resources they have at their disposal enable them to act. However, making the changes that houses need to implement on their scale can seem ambitious, especially as groups have houses attached to different sectors of activity. This is why leaving a margin of flexibility for each home to act on its behalf for sustainability seems necessary.

*ii. Sustainable actions by House of category A.*

Before going into the case study details, here is a brief presentation of the jewelry houses classified in category A.

Cartier was founded in Paris in 1847 by Louis-François Cartier and has become one of the world's most famous jewelry houses. It is easily distinguishable by its famous red box and creations featuring a panther, its symbol. Tiffany & Co. is the emblem of American luxury, Cartier's great rival, renowned for its iconic blue. Bulgari is an Italian jewelry house founded in 1884 by Sotirio Bulgari in Rome and distinguished by the use of striking colors in its creations. Chaumet is a Parisian jewelry house, an institution on Place Vendome, founded in 1780 by Marie-Etienne Nitot and renowned for its tiaras. The jeweler notably became the official jeweler of Napoleon and Empress Josephine. Van Cleef & Arpels is the youngest house in its category, founded in Paris in 1906 by Alfred Van Cleef and his brother-in-law Charles Arpels. The house draws inspiration from gardens and fairy tales and is notably famous for its "Mystery Set" technique, in which the stones are set invisibly. All these houses are over 100 years old and have a strong legacy that has stood the test of time. However, the above list is not exhaustive; other houses could also feature.

The public scrutinizes big houses with international reputations, such as Cartier, Tiffany & Co, Bulgari, Chaumet, Van Cleef, and Arpels, and the slightest misstep can damage them and hurt their reputation. Today, sustainability and ecology are essential issues that must be addressed and adequately integrated into business models to guarantee action and progress in ecology.

Category A companies are all part of a large group and, as such, have obligations that come from the group's management independently of that of the companies. This flexibility allows each company to adapt its business model to its sector of activity (in this case, the watch and jewellery sector). Cartier is committed to sustainable jewelry and is among the 14 founding members of the Responsible Jewelry Council (RJC). From an environmental point of view, the company is committed to reducing energy and water consumption and managing waste responsibly (CARTIER, 2024). In 2020, Cartier created a fund called "Cartier for Nature," which aims to protect flora and fauna for future generations. This takes the form of grants to non-profit organizations such as China Green Foundation, whose mission is to preserve the snow leopard - a symbolic choice for the company as the panther is its emblem- COMACO. This organization aims to protect wildlife and encourage poachers to adopt sustainable agriculture (Cartier, 2024). Like Cartier, Tiffany was one of the founders of a global organization that seeks to make the jewelry industry more sustainable: IRMA (Initiative for Responsible Mining Assurance). Over time, the house, which recently joined the LVMH group, has committed to establishing more sustainable jewelry by taking on the model role. In 2009, in particular, it opposed the Pebble mine project in Bristol Bay, Alaska (Tiffany & Co., 2024); five years before, the house stopped selling jewelry made from coral to promote the preservation and protection of the corals. The renowned American house, famous for its iconic blue boxes, appears to have been actively involved in environmental protection for over twenty years. After stopping the production of coral-based jewelry, the company has also introduced a collection called "Tiffany Save The Wild" to support the conservation of endangered African species such as elephants, lions, and rhinoceroses. Profits from this collection are donated to the Wildlife Conservation Network association, which contributes to the preservation of these species (Tiffany & Co., 2024). In addition, the Tiffany Foundation has allocated \$100 million to various philanthropic and environmental initiatives supporting these organizations. Also, because every act counts, the House has announced that in 2023, one of its buildings on 5th Avenue will be sustainable with renewable energy sources and LED lighting (Tiffany & Co., 2023). The aim is to reduce environmental impact and carbon footprint.

Another major point concerns traceability. Like Cartier and other major houses, it attaches paramount importance to diamond traceability, although the specific details of these traceability methods are private. The world-famous Italian house Bulgari promotes that the gold it uses is 100% recycled. Moreover, it uses blockchain to increase and improve the transparency of its gold sourcing (Bulgari, 2024). Still, regarding raw materials, all the diamonds the company buys are certified under the Kimberly process. Also, all its suppliers are members of the World

Diamond Council. Bulgari conducts audits to ensure more precise monitoring and control of its suppliers. The aim is to ensure that all suppliers follow sustainable and ethical practices and respect human rights (Bulgari, 2024). Surprisingly, Van Cleef & Arpels has no section dedicated to environmental initiatives. Instead, the company highlights its philanthropic initiatives. However, according to the Richemont Group's ESG 2023 report, the company has participated in sustainability workshops. This suggests that the company does not wish to communicate openly on its ecological actions but rather on its contribution to safeguarding heritage and know-how.

A new trend is emerging: the circular economy. Indeed, high and fine jewelry houses seem keen to adopt such a model to improve their environmental impact.

Jewelry Houses of Category A are often attached to two leading organizations: the World Diamond Council and the Responsible Jewelry Council. They also follow the prerequisites of the Kimberly Process. This participation illustrates a proactive approach at a global level, where recognized and esteemed organizations take the lead in awarding well-established certifications. These certifications guarantee uniform sustainable standards and trust criteria, demonstrating a commitment to maintaining integrity and consumer confidence in the practices of these luxury jewelry houses. It seems easier for companies to finance or seek sponsorship for animal protection, environmental protection, or biodiversity restoration projects. A large number of them do so and promote it on their websites. Some even advertise using recycled gold or the desire to improve the traceability of precious gemstones. However, the companies remain discreet about their business model innovations, probably for strategic reasons, so the competition needs access to all the information.

The heritage of these great jewelry houses does not seem to bother them when it comes to implementing sustainable practices; on the contrary, it pushes them to reconnect with their original DNA and refocuses their creativity on their primary sources of inspiration, such as the garden (flowers and insects), nature, animals and so on. Moreover, being part of large groups can help them in terms of budget to make colossal efforts through investment, and their international renown can give them significant negotiating power. On the other hand, what can limit the implementation of sustainable practices is a highly hierarchical organization. Establishing and implementing new actions involves several departments and is time-consuming. Also, having several entities in charge of sustainability in these groups can limit productivity (between the group and the company).

*iii. Sustainable actions by House of Category B.*

The B category mainly comprises Chanel, Louis Vuitton, Hermès, and Dior. These houses are world-renowned and highly regarded for contributing to fashion and leather goods. Louis Vuitton was originally a French luxury leather goods company. It was founded in 1854 by Louis Vuitton. Since its acquisition by Bernard Arnault in 1989, the company has diversified into fashion, perfumery, and more. However, it was in 2001 that it officially launched its jewelry business. The world-famous Chanel brand is synonymous with chic and elegant. It was founded by a strong woman - Gabrielle Chanel - nicknamed Coco. It was in 1910 that Chanel inaugurated her empire, starting with the manufacture of hats. She stepped further into fashion in 1915 by opening her first couture house. In the 1920s, she diversified into the perfume and beauty industry by launching her famous Chanel No Five perfume and a make-up range. In 1932, she took a step towards high jewelry with the introduction of her “Bijoux de Diamants” collection, but it was not until 1993 that the “Chanel Joaillerie” section was created. Hermès is a company specializing in equestrian products (saddles, harnesses, etc.), founded in Paris in 1837 by Thierry Hermès. Today, it is a famous luxury house renowned for its fashion creations, leather goods, and perfumes. It has also established itself in the jewelry and high jewelry sector, reviving the essential codes of the house. Dior is an internationally renowned luxury house owned by LVMH. It debuted in haute couture in the late 1940s, and today, it is also a significant player in the beauty perfume industry. The French house entered the jewelry and watchmaking markets in 2000 and 2010 by pursuing a strategy of developing and diversifying global luxury products. These houses have a place in the fine jewelry sector, but they also start in other sectors, such as fashion, leather goods, and even equestrian goods. However, in just a few years, thanks to their legacy and brand image, these houses have established themselves and developed their business in what is known as "hard luxury." Category B houses belong to the following groups: Louis Vuitton and Dior are in the LVMH group. Hermès is part of Hermes International, which also owns "Petit H." Chanel is an independent luxury house and owns Maison Michel and Lesage.

Because of their reputation and influence, these companies must promote sustainability and the environment. Moreover, their worldwide reputation gives them significant sales and the means to implement large-scale actions.

Like other significant houses and groups, Louis Vuitton must meet climate objectives, which involve minimizing global warming by limiting the rise in temperature to 1.5 degrees Celcius. In line with this initiative, the first house in Bernard Arnault's group aims to reduce its carbon footprint. The Science Based Targets (SBTi) initiative has validated its initiatives and strategy.

The company is committed to increasing its site's energy efficiency to optimize this resource and limit losses. It also seeks to use all renewable energy sources. The company also opts for more sustainable transport to reduce its carbon footprint, gradually switching from air to rail and sea (Louis Vuitton , 2023). Since digital technology significantly contributes to global warming and greenhouse gas emissions, La Maison is committed to responsible computing with its Responsible Digital program. It is a pioneering initiative because as the world becomes increasingly digital, it is essential to understand the impact of digital technology so that everyone can take action daily to reduce greenhouse gas emissions (Louis Vuitton, 2023). This initiative is accompanied by in-house training and awareness-raising for employees, which is very important if everyone is to understand the full impact of their actions, no matter how small they are.

Furthermore, raising team awareness in the digital communication strategy can boost creativity and help find solutions that are less energy-consuming and less polluting. Indeed, according to Alban Mayne for the Journal du Luxe, they avoid “the use of white on the e-commerce site because it is the most energy-intensive “color.” (Journal du Luxe, 2023) By being aware of this, digital teams can innovate in the presentation of products on the house's website. As part of its strategy to reduce its digital footprint, the company partners with companies that promote refurbished technology and mobilizes in-house forces to extend the life of digital devices. In parallel with its greenhouse gas reduction objectives, Louis Vuitton is committed to biodiversity with its “LOUIS VUITTON & PEOPLE FOR WILDLIFE” program. Its ambition is to become the first regenerative luxury brand, which is coming to fruition with the partnership with the People For Wildlife Association in 2023. The goal is to restore biodiversity in an Australian reserve. This project also helps the group which wishes to restore 5 million hectares of habitat for fauna and flora by 2030 (Louis Vuitton, 2024). All these actions seem to pay off since Forbes ranks Louis Vuitton as the 42nd “Best Brand for Social Impact.” This makes it the first luxury house in the ranking and demonstrates its influence and consumer recognition of its sustainable practices.

Regarding the second house of the LVMH group, Dior, its founder, celebrated the beauty of flowers in his collections. Thus, the house's heritage is directly linked with the flora and, by extension, the fauna. However, the house has a "Dream in Green" program, which is structured around three central pillars: the protection of natural resources by promoting sustainable materials and recycling, the climate contribution, including the renovation of stores, and the commitment of employees. From home, they can get involved at any level in sustainable projects. Despite these pillars, the house only partially dwells on its actions or sustainable



practices. This may raise questions regarding the home's involvement in environmental causes. However, the luxury sector is initially discreet, so the house may want to avoid explicitly communicating its actions.

The Chanel house, for its part, has a “Net-zero 2040” objective; it is committed to playing a role in restoring nature and the climate. In particular, it is committed to having zero greenhouse emissions by 2040 across the entire value chain. This objective was validated like many others by the SBTi, which is today an initiative accused of greenwashing (Bellan, 2024). Independent of this label, the Chanel House tends towards responsible and sustainable sourcing and wishes to innovate to be a more sustainable company. Like the Louis Vuitton house, it is turning towards less polluting means of transport. This large house has also partnered with the ENS to promote research into climate solutions. The Hermès group seems, at first glance, to want to contribute on a larger scale to environmental issues and the preservation of biodiversity. Like most houses, the house with the horse emblem wants to use 100% renewable energies to ensure that sourcing and suppliers are as reliable as possible and learn how to properly manage resources and waste to reduce its environmental footprint. At the same time, Hermès protects and preserves endangered species and animal welfare (Hermès Paris, 2024).

Category B fine jewelry houses have a strong influence thanks on their diversified activities. Thanks to their powerful reputation, they have considerable resources to implement impactful actions. Their heritage can be compatible with the development of more sustainable jewelry. However, the organizations are very hierarchical, and the diversified activities of the same house require consistency in whatever sector of activity (fashion, leather goods, perfume, jewelry), which can slow the establishment of sustainable business models.

#### *iv. Sustainable actions by House of Category C.*

Category C jewelry houses are fine jewelry houses that are much less well-known than the previous ones. Although others may be created in other countries worldwide, the study will focus on French women like Jem, Gemmyo, Courbet, Héloïse, and Abélard. Maison Gemmyo was created in 2011 by Pauline Laigneau and her husband Charif. The objective of founding this house was to modernize jewelry by considering today's luxury expectations. The promise of this house is 100% French artisanal manufacturing (Gemmyo, 2024). JEM is a French jewelry house created in 2009. It takes its name from "Jewelry Ethically Minded» because the primary desire to create this house combines aesthetics and ethics (JEM, 2024). It has shaken up the codes of jewelry to teach consumers to question themselves and open their minds to the

impact of jewelry on the environment and human rights. The Maison Courbet was founded in 2018 by Manuel Mallen and Marie-Ann Wachtmeister in France; the house wishes to place ecology and ethics at the top of its priorities. As for the Héloïse & Abélard house, the youngest in the selection, it was founded in 2019 by Héloïse Schapiro, who worked for different big houses such as Chaumet, Chanel, and Louis Vuitton, an acceptable expert in the jewelry sector. The economic model of this house is based on a circular model (Bolzer, 2024). These houses have one thing in common: they communicate their sustainable and ethical aspects because these are values at the heart and the reason that motivates their foundation. Thus, jewelry houses founded in the 21st century are surfing on new expectations linked to ecological and sustainability issues. These new houses attest to the use of recycled gold in their creation, proof of their sustainable commitment and desire to reduce the industry's carbon footprint. Also, these houses have production based in France, but according to the founder of Gemmyo, everything made in France or Switzerland is scarce, even in the big houses (Journal du Luxe, 2023).

Because fine jewelry houses are based on the dynamics of sustainability and responsibility, their economic model is often at the heart of their communication. Indeed, the Courbet house, for example, uses synthetic diamonds. The brand image has been created on this technological feat, the house communicates its use, and consumers know the origin of the diamond (Courbet, 2024). The company certifies that the gold is recycled and traceable, which meets an essential need to know the origins of this precious metal. Also, to go further in environmental initiatives and reduce the carbon footprint, Courbet offers its customers the option of selecting a reusable "Hipli" package option so that this box can be reused for other shipments and thus extend its life expectancy. This initiative demonstrates the global sustainable approach implemented by Courbet to present itself as a committed jeweler alternative to the big names of Place Vendome. This initiative demonstrates the global sustainable approach implemented by Courbet to present itself as a committed jeweler alternative to the big names of Place Vendome.

The JEM house stands out in the jewelry industry by using synthetic diamonds, like Courbet. However, JEM takes a different approach to gold sourcing. This echoes this house's very name, "Jewelry Ethically Minded." Instead of using recycled gold, JEM consciously sourced it ethically and responsibly. Its commitment to using only certified "Fairmined" gold attests to this desire. Gold that bears the "Fairmined" label is assumed to be of ethical origin. These are typically small-scale mining operations with a strong emphasis on sustainable practices and fair treatment of all employees. This ensures that mining activities adhere to high ethical standards and contribute positively to the communities concerned by continuing to develop their economies respectfully and not exploitatively. By choosing "Fairmined" gold, JEM supports

ethical mining practices and promotes the well-being and consideration of individuals working within these mining communities (JEM, 2024).

Regarding the practices adopted by Gemmyo, the Maison has chosen to source responsibly, whether for colored stones or by only working with diamond dealers who follow the Kimberley process. This commitment underlines the desire to use ethical and responsible business practices. Additionally, Gemmyo has strategically focused on sustainable production methods by manufacturing most of its items based on customer orders. This approach offers multiple advantages. First, it improves inventory management, allowing the company to achieve significant cost savings. However, more importantly, this method plays a vital role in reducing the environmental impact of the business by avoiding overproduction. The houses significantly reduce the need for storage facilities, helping to minimize electricity consumption and other resources. This conscientious production strategy aligns with global sustainability goals and reinforces Gemmyo's commitment to reducing its carbon footprint (Gemmyo, 2024).

Like Gemmyo, the Maison Héloïse et Abélard also adopts a made-to-order jewelry production strategy, which minimizes waste. However, Héloïse et Abélard is distinguished by its sourcing strategy since it mainly uses old jewelry to transform it into new creations. This process, known as upcycling, gives the house new life to previously used materials and modernizes beautiful gemstones. The methods used by this Parisian jewelry house were highlighted in an article in the French newspaper *Le Figaro*. The article uses chemist Lavoisier's famous quote, "Rien ne se perd, rien ne se crée, tout se transforme," to underline the sustainable business ethic of Héloïse et Abélard. This quote sums up the essence of their business model, reflecting their commitment to sustainable development and their innovative approach to jewelry-making, where historic pieces are not simply recycled but artistically transformed into modern, desirable objects. This approach not only preserves the heritage of these materials but also demonstrates respect for resource conservation and environmental responsibility.

Category C jewelry houses are founded on the need to act for sustainability while perpetuating the know-how of the fine jewelry sector. However, they have different approaches to sustainability, whether using the latest technologies such as lab-grown gemstones, reasoned production, or upcycling methods. They are catching on, and consumers appreciate their innovative, sustainable approach.

*v. Highlight the differences between the categories.*

While ecology and sustainability are increasingly crucial concerns today, jewelry houses in different categories do not have similar action plans; even within the same category, significant divergences can exist in the initiatives pursued and the business models adopted. Concretely, jewelry houses classified in categories A and B, known worldwide, are held to certain obligations. These obligations were notably established in response to international agreements such as those at the COP21 summit. The objective is to limit environmental impact by reducing carbon emissions and slowing global warming.

These houses use the Science Based Targets Initiative (SBTi) label certification to authenticate and validate their environmental strategies and action plans. This label demonstrates their commitment to measurable, science-based goals that align with environmental goals. Additionally, these companies often express their efforts to improve transparency and traceability throughout their supply chains. They publicly communicate on their websites or annual reports their commitment to these principles, reflected in collaboration with member companies of the RJC or the Kimberley Process. They also invest in various organizations that campaign for preserving biodiversity and climate protection. These efforts underscore their commitment to complying with regulatory requirements and actively participating in the global movement toward environmental management and sustainability.

Unlike jewelry houses classified in category C, those in categories A and B often take a more reserved approach when disclosing their strategies regarding using recycled materials or synthetic diamonds. This reluctance could be deeply rooted in their philosophy, reflecting a choice not to openly communicate their sustainable development initiatives, thus retaining a certain humility. It may also be a strategic decision to hide critical strategic information from competing companies or to avoid potential disappointment among specific segments of their customer base who may have traditional views on luxury goods.

In these two categories, many jewelry houses are part of more giant conglomerates, such as LVMH, Hermès, Kering, etc., encompassing a wide range of sectors, alternatively, like Chanel, an independent house with varied activity. Therefore, Category A houses can often be grouped with Category B houses because they share centralized entities that manage sustainability for all business sectors and CSR departments that focus specifically on sustainability. Jewelry and watchmaking. Given their global reputation and significant revenues, these houses exercise significant influence and have the financial resources necessary to launch ambitious sustainable development initiatives. However, the typical hierarchical structure of these large organizations can sometimes slow down the implementation process. Despite their capacity and intention,

turning plans into actions across various departments and sectors can be lengthy, reflecting the complexity and scale of the efforts involved.

Despite this, they remain an example, and houses that continue to inspire dreams and their influence can change the codes more efficiently and, therefore, facilitate the sustainable transition. However, if some houses prefer to remain discreet in a quiet luxury strategy, others similar to loud luxury could communicate more efficiently and raise awareness among the population about sustainable issues and prove that fine jewelry and sustainability are not incompatible.

On the other hand, jewelry houses classified in category C communicate more actively about their sustainable and ethical practices, mainly because these principles are fundamental to their brand identity and DNA. These houses have intentionally built and shaped their brand image around the core values of sustainability and ethics. In addition, being relatively less known, these category C houses have greater agility and flexibility to experiment with innovative practices regarding ecology and innovations. This position allows them to act as pioneers within the industry and can serve as sources of inspiration for larger, more established houses worldwide. Their innovative approaches set them apart in the market and allow them to influence broader industry trends in sustainability. Their main limitation, however, comes from budget, as the costs for a smaller production can be huge.

### **3. Conclusion and recommendations**

The fundamental research question was: “How can the fine jewelry industry innovate its business model to make it more sustainable and environmentally friendly while meeting customer expectations?” The underlying premise involved categorizing fine jewelry houses based on their heritage, membership in a larger group, and the diversity of their sector of activity. Three distinct categories emerged, denoted A, B, and C.

After conducting an in-depth case study and a series of qualitative interviews (which were not analyzed because of confidentiality), it became evident that houses in categories A and B share many similarities regarding sustainability approaches and business operations. This awareness led to the conclusion that these two categories have enough common characteristics to justify their combination into a single consolidated category. This grouping reflects their common attributes and their responses to the challenges and opportunities of the fine jewelry market. So, on one side of the spectrum, there are large, very hierarchical jewelry houses characterized by the implementation of often lengthy internal processes. These Houses generally operate with

substantial budgets, but their size and complex structure can lead to decision-making times and slow implementation of new initiatives. Conversely, there are more agile companies that continually strive to innovate and possess the flexibility to adapt to market changes or technological advancements quickly. However, these younger houses often need more budgetary, which can restrict their ability to scale up operations or invest heavily in new businesses despite their innovative capabilities and rapid adaptability.

Based on the results, the fine jewelry industry has the potential to innovate its business model from a team management perspective significantly. Effective change within an organization relies, above all, on the motivation and dedication of its internal teams. These teams must be well-equipped and informed to ensure successful and sustainable changes. This preparation involves comprehensive training focused on sustainability and ecological practices and in-depth support throughout the adoption of new strategies. Such educational and support measures are essential to facilitate smooth transitions for all different categories of homes in the area, regardless of size or assets. Ensuring that all team members are involved and aware of the goals and methods of implementation not only contributes to smoother execution but also fosters an environment of collective accountability and enthusiasm for achieving sustainable development goals. In addition, particularly for Grande Maisons, it is crucial to empower the teams in the CSR and sustainable development departments by granting them legitimate authority and influence over other company departments. As highlighted by interviewee 6, it is optimal for the head of the CSR and sustainability department to report directly to the CEO or anyone with ultimate decision-making power regarding the company's strategic direction. This structural alignment under senior company leadership facilitates rapidly implementing new processes and initiatives.

By positioning sustainability leadership close to the CEO, the organization ensures more efficient and smoother communication channels. This, in turn, accelerates the approval and deployment of sustainability initiatives, enabling the company to respond more dynamically to emerging challenges and opportunities by maintaining responsible business practices.

Ideally, the sustainability team structure should be comprehensive, with each member having expertise in a specific aspect of the business such as retail, marketing, sourcing, quality control, transportation, and business development - corresponding to the diversity and range of the company's activities and services. This would enable each department in the company to have a dedicated sustainability expert who fully understands the department's unique challenges and nuances and provides day-to-day guidance on various sustainability-related tasks and projects. Additionally, such a setup facilitates the integration and hybridization of positions (e.g.,

positions such as sustainable marketing project manager) that would serve as a transition point for sustainability efforts. This approach improves the effectiveness of sustainability initiatives and allows the sustainability manager to focus more on overall strategic goals rather than overloading with purely operational matters.

For category C houses, there is no need to use a dedicated team since they are built on sustainability and ecological principles. In addition, the hierarchy is not pyramidal and as segmented as that of large houses, and employees can speak directly with the CEO about implementing sustainable practices.

One of the most significant and anticipated innovations in the jewelry industry concerns sourcing and using raw materials. As mentioned, synthetic diamonds have become an essential topic within the industry. However, their acceptance is only sometimes universal in the jewelry industry. In particular, the category C houses are well placed to adopt this type of diamond without risking disappointing their customers. These houses are generally innovative and firmly committed to sustainable development, deeply rooted in their brand identity. They can effectively integrate synthetic diamonds into their narrative, presenting it as a choice that aligns with their ongoing commitment to innovation and environmental responsibility. This strategic incorporation reflects their DNA and heritage and allows them to meet the evolving expectations of a clientele that values modernity and sustainability. This also applies to colored gemstones.

For category A or B houses, recognized for their innovative approaches, using synthetic diamonds in specific collections offers the opportunity to evaluate customer reactions. This approach allows these brands to experiment with alternative materials while adhering to their core values and brand philosophy. These houses can maintain a consistent brand image by developing compelling storytelling that aligns with the brand's heritage. For houses that prioritize using sustainably sourced or recycled diamonds to preserve the history and authenticity of the stones, there is an exciting possibility. They could consider using synthetic gems for tiny sparkles or brilliants while retaining natural stones for the central stones of the jewelry. This approach would allow them to maintain continuity with their traditional heritage while integrating more environmentally friendly practices. By adopting this strategy, these houses could highlight their commitment to sustainability and showcase exceptional stones. This would balance innovation and respect for traditions, aligning their product offering with contemporary ecological and social responsibility values.

However, traceability must be maintained even for gold and other metals, whether a jewelry house uses lab-grown gemstones or sustainably sourced natural diamonds. This is particularly crucial because jewelry is often considered timeless and can be recycled, upcycled, or resold on the second-hand market. It would be very advantageous if a digital passport accompanied the new gemstones. This digital document must provide detailed information, including the precise origin of the stone and relevant environmental data that tracks its carbon footprint throughout its life cycle, starting with the extraction process. Implementing such a digital passport is feasible through blockchain technology, which supports the principles of transparency and security necessary to document reliably.

Furthermore, today, given the rise of non-fungible tokens (NFT), creating a digital passport for each piece of jewelry would be entirely plausible and innovative. Such a passport could have a dual objective: verifying the part's authenticity and tracing each component from its origins to its final assembly. This digital document could also include detailed measurements of the environmental impact of each item, capturing data from the extraction of materials through their processing and final use in jewelry. This approach aligns with current technology trends and supports sustainability and responsible sourcing goals within the jewelry industry.

The debate around lab-grown diamonds is still ongoing, and this study seeks to explore meaningful uses of lab-grown gemstones that would meet consumer expectations while preserving the heritage and DNA of the diamonds—marks jewelry houses use them only for small brilliants, for example. Also, blockchain technologies have already been mentioned to improve the traceability of diamonds. However, this research aims to go further by proposing using these technologies to integrate environmental data into registers. The idea is to create a digital passport for each piece of jewelry, allowing you to trace all the elements that make it up. Although gold is not ethically sourced, its recycling is widespread in jewelry houses, so it is less subject to debate. However, the question arises: Will another more ethical and ecological metal replace it one day gold?

Another innovation likely to have a significant impact is packaging. Packaging serves a functional purpose and has become an essential part of the consumer experience, especially with the popularity of the “unboxing” trend on networks. This trend highlights the consumer's first physical interaction with a product, making the packaging an essential element of brand appeal and consumer satisfaction. Therefore, it becomes crucial to review packaging strategies to improve their sustainability. Innovations have been made to develop environmentally friendly materials, mainly fabrics and paper. These advances have created less harmful materials to the environment while maintaining an attractive aesthetic. By promoting these



sustainable materials, brands can significantly reduce their environmental footprint while providing an excellent art of giving and an enjoyable unboxing experience that meets consumer expectations.

Vegetable leathers, such as mushrooms, pineapple, cactus, etc., have also developed strongly. This offers the possibility for jewelry houses to work their cases with noble materials, which are ethical, and even more so for mushroom leather, which is ecological (little water requirement and vertical cultivation). All categories of houses are concerned about packaging and can use those innovative materials to be more sustainable.

The issue of transportation is particularly relevant in today's globalized world, where countless articles cross borders daily. Since jewelry is typically small and lightweight, an effective strategy to reduce economic and environmental costs could involve consolidating shipments. Combining jewelry shipments with other items of different categories or brands within the same group of companies makes it possible to optimize transport logistics. Additionally, the use of sailing cargo ships presents an attractive option for the luxury industry, particularly if these vessels meet the delivery times required by the market. Adopting this mode of transportation could powerfully align with the industry's sustainability goals, making it an ideal solution for businesses looking to minimize their environmental impact while ensuring on-time delivery of their products. This is not possible for category C houses, which produce smaller quantities. Generally, these reaching houses remain known in France and neighboring countries and do not necessarily need to be sent by sea.

This study also highlighted several positive facets of the dominant economic models adopted by jewelry houses. Notably, major jewelry houses are investing significantly in organizations dedicated to protecting biodiversity and restoring the environment alongside efforts to minimize carbon emissions. These contributions are vital because the cumulative effect of multiple actions favoring sustainable development can lead to a more significant environmental impact. However, to deepen their commitment to sustainability, these jewelry houses could consider subsidizing scientific and technological research institutes to develop more sustainable technologies. These companies could play a central role in innovation development by providing financial support to academic establishments such as schools or universities. For example, they could organize challenges whose themes would be centered on “sustainable innovation.” Proposing such challenges as annual student projects would serve several purposes: it would contribute to future generations' education and professional development, promote the generation of new and sustainable ideas that the industry can adopt, and strengthen connections between the business and academic communities. By investing in the academic

sector and engaging students in real-world problem-solving scenarios, jewelry houses can significantly influence the development of new environmentally friendly technologies and business practices that will shape the future of the industry.

In addition, upcycling and recycling are essential concepts for limiting waste and overstocking, so we must continue democratizing them in industry. The advantage is that materials have a second life, and history is perpetuated. Also, given the growing success of the pre-owned watch market, jewelry houses could offer their customers a similar service, whereby pre-owned pieces are refurbished in the house's workshops.

This would ensure that each piece meets the high standards of quality and craftsmanship expected of the brand. Often handed down from generation to generation, Jewelry is sometimes associated with painful memories or is simply out of fashion, prompting its owners to part with it. By offering a second-hand service, jewelry houses not only offer a solution to these people but also appeal to younger consumers, particularly Millennials and Generation Z, who are conscious of sustainability issues.

Additionally, the study highlights the benefits of the build-to-order model, mainly adopted by Category C homes. This approach is strategically advantageous as it helps maintain financial health by reducing insurance and storage costs. In addition, producing goods only when there is demand helps these companies avoid the pitfalls of overproduction, aligning with broader environmental goals by minimizing waste and resource consumption. Although the make-to-order model appears to work effectively for Category C households, it presents more significant challenges for those in Category A and B. This difficulty arises mainly from the complexities associated with international distribution, where production on order could be more optimal due to the logistics involved in scaling to global markets. It is, therefore, crucial for these houses to develop accurate forecasting methods in order to accurately forecast the quantities needed to meet consumer demand without excessive production.

However, even in the face of the challenges of maintaining inventory levels, luxury houses have an advantage; they can justify waiting times for their products when necessary because luxury often means customers are willing to wait longer to acquire a coveted item. This gives these Maisons a buffer to manage production and inventory challenges more flexibly, turning potential inconveniences into an exclusive feature of the buying experience. However, some houses were considering relocating production of items that are more successful in another country to this country to facilitate production in response to high demand. However, this raises

several questions: Will the items be as high quality? Would relocation affect the perception of the jewelry? Or, on the contrary, will it be considered a new production site promoting a more circular business model?

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# Spar hungary's social sustainability efforts

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## ABSTRACT

CSR now plays an important role, and many large companies are integrating it into their operations. In addition to their impact on the environment and society, which the paper reviews throughout, it is also worthwhile for companies to examine how aware their employees are of these efforts. In the competitive environment in Hungary, they must compete with other companies in this area too. The CSR activities of companies can have a positive impact on employee perception and engagement, so it is worth communicating these to them in the most effective way, which the paper traces in the case of SPAR Hungary. Therefore, action is not enough if the visibility of these activities is low for employees and customers. These are the topics this paper will examine.

**Keywords:** CSR, corporation, sustainability, employee, SPAR

### 1. The definition of CSR

Corporate Social Responsibilities (CSR) is a management concept, made for companies to integrate social and environmental concepts to their business operations to the well-being of communities. (Reckmann 2023) But there is increasing pressure to dress up CSR as a business discipline and demand that every initiative deliver business results. That is asking too much of CSR and distracts from what must be its main goal: to align a company's social and environmental activities with its business purpose and values. (Rangan et al. 2015) To date, corporate social responsibility (CSR) has primarily been treated as a corporate issue. The majority of the literature on this topic takes a management perspective. It discusses how companies can best respond to specific demands of largely external stakeholders, which CSR initiatives enhance corporate performance, and what motivates companies to become engaged in CSR (Öberseder et al. 2013). One problem here is that CSR as a concept simplifies some rather complex arguments and fails to acknowledge that ultimately, trade-offs must be made

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between the financial health of the company and ethical outcomes. And when they are made, profit undoubtedly wins over principles. CSR strategies may work under certain conditions, but they are highly vulnerable to market failures. (Doane 2005)

## **2. CSR performance effects on the firm**

A firm's CSR is aimed toward promoting long-term profit and establishing a positive relationship with society and investors' trust, thereby enabling the firm's survival. Evidence increasingly suggests a positive association between CSR and the value of a firm making it a major issue for firms and other interested parties, including individual investors, policymakers, and scholars. (Yoon et al 2018) Perception is a significant factor influencing consumer purchasing intentions. Perception is reality when it comes to greenwashing, as consumers often base their purchasing decisions on how a brand expresses its impact on the environment. (Brand Finance 2023)

## **3. CSR activities in Hungary**

Corporate Social Responsibility is a relatively new phenomenon in Hungary. As the external pressure from the civil society, public authorities and the media has so far been fairly low this important corporate activity emerged only at the beginning of the last decade. However, CSR awareness and implementation are advancing rapidly (Karcagi-Kováts 2012). There are significant differences between the companies with regards to integrating social responsibility into their business programmes and strategies. As for foreign-owned companies, the PR and, less frequently, the HR-departments are simply responsible for the adaptation and practical implementation of the mother company's plan or strategy in Central and Eastern Europe (Ligeti – Oravecz 2008). In principle, the Hungarian Government has objectives "to promote the implementation of the economic, social and environmental dimensions of sustainable development and to create policies, economic and financial rules promoting voluntary CSR" (Karcagi-Kováts 2012).

## **4. Introducing SPAR**

SPAR Hungary is an international food chain that celebrated 30 years of presence in Hungary in 2021. In 2012, the firm started to set up its franchise system in the country, where it's the

fifth largest employer with nearly 14,000 employees. The first and the only one among food retail chains to operate its own Regnum meat plant in Bicske since 2004 and expanded its Regnum meat plant in Perbál in 2020. In 2018, it also opened a SPAR enjoy.convenience sandwich and salad plant. (SPAR 2024)

## **5. Methodology**

The aim of my research was to investigate employees' views on the company's corporate sustainability efforts, to understand how much information about these activities flows within the company and to compare the views of a sustainability expert and employees. In order to achieve this goal, I conducted qualitative research in the form of an online interview with Zsófia Török, Sustainability Specialist at SPAR on 4 April 2024, on the company's sustainability efforts. Questions included how the company communicates these efforts, what the future goals are and what the results are. In addition to qualitative research, quantitative research was also needed to gauge the position of the employees and to explore the issues raised from two different perspectives, so on 3 May 2024, I designed and circulated a questionnaire survey to SPAR employees in email format, with questions asking how informed they were about the company's sustainability efforts and how interested they were. This questionnaire was filled out by 57 employees, giving me the opportunity to get their perspectives and to compare opinions.

Thanks to the quantitative and qualitative research, a deeper insight into SPAR's sustainability efforts was gained, and the employees' point of view was also revealed. The research focused on the employees' access to information, as during the interview the expert mentioned the forms of transmission of this information, and expressed his opinion that the reach of people with the sustainability program is very high, so this statement was the basis of the research. Since the surveyed employees covered a wide range of age groups and years of work at the company, it can be concluded that the results of the answers received can be considered relevant.

## **6. Results**

### **SPAR sustainability efforts/Interview analysis**

Qualitative research was carried out through a semi-structured interview to investigate the operation of the company and the following question:

*Do firms' CSR efforts have a positive impact on employee morale?*

The research involved interviewing sustainability expert who have insight into the company's sustainability operations and CSR activities, and employees who commented on how the company's sustainability efforts affect their perception of the company and their work ethic. Starting from the company's beliefs, through major milestones and employee perceptions. The aim of the research was to find answers to questions that were not revealed by the seconder research, but were relevant to the topic, and to draw conclusions by comparing the information obtained.

### *The core activities*

For more than 25 years, SPAR has been pursuing a CSR strategy, and together with it, its biggest partner in this endeavour is the Hungarian Maltese Charity Service. SPAR is taking an active role in issues affecting the future of the earth, as shown by the fact that from 2019 it has organised this part of its activities into a single framework. SPAR's sustainability strategy is based on 5 pillars: for employees, environment, society, food safety and health. These were created in 2019 based on the SDG targets, each of which can be integrated into the company's objectives. In recent years there has been a shift from SDG to ESG-based typology, but this has not changed the content of the 5 pillars. The environment/society sector stands out in the company's philosophy, as it is the main focus of the company, as its activities demonstrate. Their second largest partner is the National Association for the Protection of Animals, with whom they organise monthly animal food collections. In addition, their activities are spread over 3 months of the year, covering the main periods: May, with the National Association for the Protection of Animals, August, and Christmas with Hungarian Maltese Charity Service. The Christmas campaign is the largest commercial fundraising campaign in the country, with more than 150 stores participating last year, helped by the fact that people's willingness to give is much higher during this period. In addition to these events, there are also ongoing cooperations with their biggest partner, Hungarian Maltese Charity Service, so customers can support the charity with a gift card or buy their canvas bags in any SPAR store and the proceeds are transferred each month to the organisation. This collaboration takes many shapes and forms, with employees able to buy souvenirs from them at work two times a year and by collecting products that are close to expiry, the Hungarian Maltese Charity Service were able to save food in 54 stores.

### *Choosing the collaboration*

All their initiatives are at a national level, the Austrian mother company does not regulate the CSR operations of the Hungarian company, as they know that the people working in the country

have a better understanding of these relationships. When the SPARs from each country come together for a joint meeting, they have the opportunity to present the goals they have achieved and get ideas from the other countries. When selecting partner organisations, it is very important that the given cooperation can be integrated into the core activities of SPAR Hungary. The way the collaborations are currently being set up shows this, as the collections are held in SPAR stores where people can donate the products they buy there, which of course generates profit for the company, while the organisations also have space to set up shop, which allows them to reach more people. In terms of evaluating their activities, they focus mainly on the 3 big events mentioned earlier: the school supplies fundraising and the Christmas fundraising in collaboration with the Hungarian Maltese Charity Service, and the pet food fundraising together with the National Association for the Protection of Animals.

### *Evaluation*

The evaluation criteria are how the numbers compared to previous years' collections, how many shops, how many people, how many tonnes of food were collected and how many people were reached. These events are always accompanied by a PR campaign and social media advertising. For the Christmas campaign, influencers are used to advertise and for all the campaigns articles are published in various press outlets such as Telex, HVG, to reach as many people as possible directly and indirectly.

### *Measurement*

CSR's impact on consumers has not yet been measured by the company, but based on the interview, the sustainability expert said that they hope this will make their consumers see them as a more responsible company. For fundraising and campaigns, they try to advertise with instore communication and flyers to reach as many people as possible. According to the expert, this can give SPAR the impression of a responsible company, which helps its image and also generate profit to the company, but based on no official measurements she based her opinion on the number they reached with each of the activities and the huge amount of advertisement they do.

### *Aspirations for the future*

Future plans include making these activities even more visible to colleagues and customers automating processes. In short, the expert said in the interview:

*"Optimising, looking for new ideas on social responsibility and deepening the existing ones."*

Until now, due to lack of capacity, there were fewer opportunities to do this, but now that the team is expanding, they want to do more to deepen them. These 3 big existing campaigns cover good periods in her opinion, they can be satisfied with that. In the future, the aim is to increase employee engagement by involving them in voluntary activities. This could be a direction of development for the company, so that employees also identify with the company's views on sustainability, but this would require more encouragement from the company.

### *Consumer access*

These efforts are also very well known to consumers, as the expert mentioned press coverage was a form of free marketing that brought information to a wide audience by communicating through different media. They also advertise all their campaigns to employees internally, for example on spar.hu and as a banner on the main website, in the -Myspar newsfeed and in the Supershop newsletter. These sources of information are the same as those provided by the company to its customers, but they are presented more prominently on the platforms used by employees. According to the interviewee, the current forms of advertising are sufficient and extensive and would not change.

### **Employee opinions/ survey analysis**

Quantitative research was carried out, using a questionnaire to assess employees' perceptions of the company's sustainability performance, the extent to which they have access to information on sustainability and their interest in the topic.

More than 60% of respondents were women and most were in the 40-50 age group. Respondents were almost equally divided between those who had been with the company for longer and shorter periods. A total of 57 employees filled in the survey. Based on the results of the questionnaire, the following can be concluded:

The first question focused on where they find out about SPAR's sustainability efforts, listing all the websites and places where information is provided to them, yet the option "friends/colleagues" was the most popular with 34 votes. This conveys to the research the information that the sites listed, with the exception of myspar newsfeed, for which it received 12 votes, the other sites have no information flow to the attention of their employees. Surprisingly, only 11 of them nominated the company's official sustainability page, which they are justifiably proud of as the main channel for their sustainability achievements.

The second question asked whether employees feel that they have access to all information about these activities, and the answers were very mixed. The majority agreed with the

hypothesis, 31 people, but what was less predictable was that some chose the strongly disagree option, which choose with the disagree option all together 15 people, and there was also a high proportion of those who chose the neutral option, which can therefore be counted as neither a positive nor a negative.

The next question asked if employees would like to know more about SPAR's sustainability programme, to which a huge percentage agreed, 41 people. There were only one disagree responses and neutral also 15 people, which shows the curiosity and interest of employees in the topic.

The next question was aimed at the employees' assessment of whether the company's sustainability policy is widely known. For this question, the same number of agreeing and disagreeing responses were received, yet the neutral opinion was the highest with 23 votes. This shows that it is difficult for people to form an opinion about the company's reputation widely due to the probable lack of information.

23 people agreed that they would be happy to participate in a fundraiser organized at work. 6 people of them completely agreed and five respondent voted negatively.

The answers to whether they would participate as a volunteer in this SPAR fundraising event were more divided, 24 of them voted neutral, although in this question this percentage has probably not yet taken a place in the topic, so they would be persuasive. 20 people voted positively, 15 people negatively, although this is not surprising, as volunteering requires a lot of free time and effort, which can be stressful for many people.

Almost all the respondents support that SPAR takes sustainability so seriously, so it can be said to be almost unanimous. In the last question, an answer was sought as to whether it is important when evaluating a workplace if it engages in social responsibility activities. 46 of respondents answered yes, which shows a big change compared to recent years. Here, the proportion of those who answered neutral also decreased, and there was only four person who answered no.

## **Conclusions, practical implications**

### *Information transfer*

The answers to the survey revealed that the employees mainly get information about the company's sustainability events and programs from acquaintances, which means that the promotion of currently operating ads and pages would be of key importance in order for the information to reach them, and also for them in the future be involved in such endeavours.

Also, the question about obtaining information revealed that employees feel that they do not always receive the information they need about social responsibility events and sustainability. This question contrasted with what was said during the interview about how many places information is provided and to how many people. In addition, it should not be ignored that half of the respondents felt that all information reached them, which could also mean that the information network built so far is probably working, the company just needs to find a way to reach people who are not easily accessible.

Based on the answers to the third question, the most important thing that can be seen is that the employees are very open to the company's sustainability efforts, as 41 of 57 respondents want to find out more information on the subject. This also shows that they are aware that something is happening in the background on this topic and that receiving the necessary information would probably help in their support. Since, according to them, not many people have all the necessary information, the answers also show that they have difficulty forming an opinion on how well known the company's sustainability efforts are. They were just as confident in his fame as those who were not, so the large amount of advertising costs and media exposure, which was said in the interview, was not enough to convince them of his fame.

### *Participation*

The questionnaire also measured the proportion of employees who would participate in organized fundraising at the workplace, as there have been similar examples in the past, and in the interview the expert also stated that a greater involvement of employees in these activities was set as a future goal. This aspiration was confirmed by the respondents who mostly supported the realization of such events, and those who responded mostly neutral can be seen as potential participants who only need a good reason or motivation. Since only few people opposed this suggestion, it can be said that the first step in involving employees can be a locally organized event, where those who are just getting to know the world of donation and want to take advantage of the workplace's efforts to ensure this can spend the amount of time they require.

On the question of whether they would also participate in the event as a volunteer, the opinions were more divided, since it would also mean an occupation outside of working hours, which would entail a greater commitment. A lot of neutral responses were received, which can also be attributed to a lack of motivation or information. 20 of 57 respondents still voted yes, which is a high percentage, so the loss of these people would be a serious mistake on the part of the company if it did not give them space to develop this endeavor, as this shows that there are



plenty of committed people among the employees, who would spare no time and energy to stand up for a good cause and probably with this behavior could set an example to the other workers, who until now did not know how to relate to this topic.

### *Judgement*

The fact that the employees support the company's sustainability efforts almost 100% suggests that the company's movements of this kind can easily influence the employees' opinions on this topic. This can also mean that the employees' way of thinking can be very similar to your company's and the company's goals can be easily achieved with employee support. The use of human resources could be a very important direction from the point of view of the sustainability department, not only in the realization of goals, but also in their planning.

When evaluating the workplace, almost 46 of 57 respondents stated that the aspect of sustainability and social responsibility plays a positive role. This is also an underutilized area in terms of the company's PR activities, since if the employee's perception depends a lot on these activities, then they should play a bigger role in communication and advertising. This question is also interesting because, as mentioned earlier, the respondents were present from all age groups, which also means that sustainability is not the only concern of the younger generation, as many believed. The research may also show that if the company were to better integrate sustainability into its visible and well-known activities, it would not only increase its reputation, but also attract potential employees more easily, and it could also play a major role in retaining current employees and increasing their loyalty, if with their contribution to sustainability, they would not only help the company, but they could also record it as personal development and altruism.

Overall, the other supermarket chains present on the market also pursue a sustainability policy, as in today's world the importance of both social responsibility and people's judgment is increasing. As these chains are characterized by a high degree of competition, the sustainability segment is also increasingly characterized by rapid changes and large contributions. In the case of SPAR, it can be concluded that its sustainability efforts have been in operation for a long time and that it pays more and more attention to their visibility and expansion. However, in the case of a multinational company, employees are an indispensable factor in the creation and support of innovations, so these efforts cannot be maximized without their involvement. Since the sustainability department in SPAR was not established long ago and there is no capacity to measure these activities in order to analyze the data and get help on future directions, they operate their activities mainly through collaborations, with reliable and long-standing partners

such as the Maltese Charity Service, with whom the cooperation developed over the years and worked well. Since it is a multinational company, they can reach many people with their events and the number of donations can be very high, although the employees feel that they do not always get enough of this information. However, as the company policy and employee commitment show, they would have a need to help the company with such activities, and to get more information in this regard, regardless of age.

The company's future direction of development can be defined as the greater involvement of employees, as well as the search for those who are willing to participate as volunteers in events and support their efforts. The control of the information system would also benefit the company so that it can communicate more effectively with the employees, as they organize a lot of great events and fundraisers, but if these do not reach the employees, then the positive effect of such efforts on the perception of the company will not be relevant either. Measuring the activities of the sustainability department would also be a useful way to examine the relationship between sustainability and profit, how the organization of fundraising affects store revenues, and how customers think about the company's sustainability efforts. Of course, the expansion of the sustainability department can bring many changes in the future, as well as their growing experience in the field of sustainability.

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# **Flexibility and equality: unraveling the nexus of labor market dynamics and gender equality in developing countries.**

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## **ABSTRACT**

Recent decades have witnessed notable advancements in gender equality. However, improvement in labor market outcomes remains limited especially when for women. On the other hand, regulations related to the labor market have shifted toward greater flexibility. This study investigates the relationship between labor market flexibility and gender equality, aiming to uncover the impact of flexible employment strategies on social inequality. Utilizing cross-country regression models, we analyze the correlation between labor market flexibility indicators and wage equality for a similar work index across 99 developing countries in 2021. The findings indicate that three of the examined indicators exhibit a robust positive correlation with the dependent variable. This suggests that increased flexibility in these areas would potentially reduce gender disparities. Focusing on a wide sample of developing countries, the research implications provide valuable insights for policymakers seeking to address the gender gap in the labor market and promote equal opportunities.

**Keywords:** Labor market Flexibility, gender equality, wage equality, developing countries, work-life balance.

## **1. Introduction**

In the present era, women are showing remarkable advancements across different sectors, making notable strides in education, professional attainment, and social recognition. However, despite these achievements, women still experience huge gaps in the labor market posing serious threats to gender equality in the workplace (H. & L., 2007). Wage inequalities remain one of the major challenges making men earn more than women. Per the ILO Global Wage

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Report 2018/19, women earn on average about 20% less than men do. Moreover, female workers continue to face fewer career options, and encounter mainly routine tasks and low-skilled work (Based on the ILO, at least 72% of occupations in information technology, science, and engineering are occupied by men in 2020). Additionally, there is a huge lack of representation of women in leadership and managerial positions. In fact, according to the ILO, in 2023 women hold only 36% of senior and middle management roles. In addition, one of the major indicators of gender disparities in the labor market is the high unemployment rate among the female labor force. By the latest estimates of the ILO, the jobs gap shows that globally “women are more likely than men to want a job and not have one”, with rates of 13.7 and 9.3 % respectively.

Old theories attributed labor market gaps to discrimination (Anderson, Fryer, & Holt, 2006), (Riach & Rich, 2010), (Blau & Kahn, 2017), (Neumark, 2018). Nowadays, even if we can attribute these disparities in part to social prejudices, more recent researches argue that the structure and the framework of the labor market make equal opportunities in the workplace difficult to attend between the two genders. One of the famous researchers, Claudia Golden has highlighted the importance of flexible work to address the gender gap. The labor market is structured as if the workers are dedicated to their jobs only, and do not have further responsibilities. With traditional long working hours, unpaid care work, and short or nonexistent parental leaves, parents often strive to maintain the work-family balance. It is true that the number of female workers has increased significantly compared to the last decade (L. & L., 2007), however, working wives still find themselves managing their traditional household responsibilities alongside their jobs, often dealing with a greater share of childcare duties (Hochschild & Machung, 2003) (ILO, 2017).

In this regard, and especially after the COVID-19 pandemic, labor market regulations have been shifted toward greater flexibility. Over the past year, the majority of workers have expressed a preference for shorter working hours and remote opportunities (Finn & Donovan, 2013). The increase in the demand for flexibility has imposed huge changes in the labor market regulations including more flexible hiring practices, adjustment in the minimum wage negotiations, reduced working hours, and a shift away from traditional office-based work arrangements. However, the question remains the same: does the labor market flexibility facilitate the dual-career responsibilities for parents and promote the equitable sharing of household and childcare duties between partners?

Although some studies have investigated this issue in developed countries, analyzing the effect of labor market flexibility on gender equality in developing countries remains largely

unexplored. Addressing this gap, this paper contributes to the existing literature by focusing on the ‘flexibility-equality’ relationship across a broader sample of countries.

The originality of this research can be assessed in different areas. Firstly, understanding how flexibility in the labor market affects gender equality in developing nations is crucial for policymakers aiming to foster inclusive and sustainable growth. Additionally, given the diverse cultural and socio-economic contexts of developing countries, exploring this relationship can provide valuable insights into the complex dynamics at play and inform tailored interventions to promote gender equality. Ultimately, by shedding light on this understudied area, the research has the potential to contribute to more informed decision-making and initiatives aimed at advancing gender equality globally. Finally yet importantly, unlike the majority of the previous research that used qualitative methods including interviews and observations, our paper utilizes a quantitative approach.

This paper is divided into sections; each contributes to a complete investigation of the effect of labor market flexibility on gender equality. Initially, the paper introduces the research, highlighting its significance and outlining the research questions. Following this, a comprehensive literature review delves into the characteristics of the gender equality gap in the workplace and previous research on similar topics. The methodology section details the research design, data sources, and analytical techniques utilized in the study. Subsequently, the paper focuses on empirical findings to explore how labor market flexibility impacts gender disparities across developing countries. These findings are thoroughly analyzed in the results and discussion section. Finally, the paper concludes by summarizing key insights, offering recommendations, and suggesting avenues for further research.

## **2. Literature review**

Numerous studies on the impact of labor market flexibility on gender equality have been conducted. One of the most interesting theories from Claudia Goldin, a Nobel Prize laureate in Economic Sciences, suggests that the highest-paying jobs (‘the greedy professions’) require long working hours, and full commitment and may necessitate sacrificing personal goals such as family duties. Given that women predominantly assume household duties and childcare, mothers may find it challenging to pursue careers in these inflexible job categories limiting their access to high-earning jobs. Such a situation can further expand the gender gap. Claudia has supported the so-called ‘pro-family policies’, just as paid family leaves, to create more equitable opportunities for women in the workplace. (GOLDIN, 2021).

(Chung & Van Der Lippe, 2018) have demonstrated that flexible work arrangements enable mothers to sustain their employment hours following childbirth. (Fuller & Hirsh, 2018) (Singley & Hynes, 2005) also got similar results, their findings suggest that flexible work arrangements frequently mitigate the difficulties encountered by mothers, especially those holding university degrees, and remote work from home was found to contribute to reducing wage disparities. Moreover, ‘family-friendly’ regulations that lead to more flexible work are important for employees to manage their job and family responsibilities at the same time (Belwal, Belwal, & Al-Hashemi, 2019). This can potentially lead to gender equality in the workplace. (Al-Asfour, Tlaiss, Khan. S. A., & Rajasekar, 2017) also agreed that the organizational framework can be a barrier to gender equality. Intensive business trips, high workloads, along with challenges related to pregnancy and short maternity leaves may not align with women’s obligations leading to more enhanced gender disparities. Other studies have focused on the impact of labor work flexibility on parent-child interactions. Concluded that flexible working hours are correlated with increased involvement of fathers in household responsibilities and childcare. This can potentially facilitate equitable distribution of daily household tasks between parents and alleviate the burden on women. Other evidence from (Scott, 2023) shows that increased remote work opportunities have enabled numerous mothers to remain in the workforce.

However, it is important to acknowledge the other side of flexibility. While flexibility can positively impact some, it can adversely affect some vulnerable segments of society such as women, immigrants, youth, and low-skilled workers exacerbating their job insecurities and widening wage disparities (Kahn, 2011). Based on Deloitte’s 2023 Women at Work Study, 97% of women reported that requesting a flexible work arrangement would negatively affect their prospects for promotion. Another finding from the same survey suggests that 37% of women who work in a hybrid situation say that they have felt excluded from meetings, important decisions, or informal interactions and 30% say they do not have adequate access to leaders. Moreover, according to (Lott & Chung, 2016) findings, men are expected to utilize work flexibility to invest more in their jobs leading to increased wages. However, women are supposed to use work flexibility to compensate for their house responsibilities.

In summary, although labor market flexibility offers potential benefits for promoting gender equality and enhancing work-life balance, it is important to pay attention to its potential negative consequences, especially for marginalized groups.

### **3. Research design**

In this section, we are going to present the methodology used in this research along with the data and sources.

#### *3.1. Empirical methodology*

This study aims to investigate the impact of labor market flexibility on gender equality, with a focus on wage equality for similar work, across 99 developing countries in 2021.

Based on the following hypothesis, and using SPSS software, we will employ a regression analysis to examine this relationship, controlling for various factors that may influence wage equality.

H0 (Null Hypothesis): There is a positive correlation between labor market flexibility and wage equality for similar work.

H1 (Alternative Hypothesis): There is no correlation between labor market flexibility and wage equality for similar work.

The study anticipates finding evidence supporting the null hypothesis, suggesting a positive correlation between labor market flexibility and wage equality. Additionally, the analysis will provide insights into the influence of other factors on wage equality.



$$W_i = \alpha_i + \beta Lab_i + \gamma X_i + \varepsilon_i$$

Where:

$W_i$ : represents the dependent variable, the wage equality for similar work in the country I.

$Lab_i$ : represents the independent variable labor market flexibility index for country i.

$X_i$ : represents the control variables each for country i.

$\beta, \gamma$  : represent the coefficients of the independent and the control variables.

$\varepsilon_i$ : represents the error term.

### 3.2. Empirical data

In this section, we are going to present a detailed explanation of the data used in our research, the different variables, and their sources.

This paper compiles a dataset of 99 developing countries for which data on the labor flexibility index could be obtained. Labor market flexibility data are sourced from the Fraser Institute's Economic Freedom of the World (EFW) database, incorporating indicators across seven areas: (i) minimum wage (MW); (ii) hiring and firing regulations (HF); (iii) centralized collective wage bargaining (CCB); (iv) hours regulations (HR); (v) mandated cost of work dismissal (MCD); (vi) conscription (CONS); (vii) foreign labor (FL). All indicators are standardized on a 0–10 scale, with the higher value of the indicator representing a more flexible labor market. Each policy area will be explained in detail in Annex I.

We selected the wage equality for similar work index from the World Economic Forum's Executive Opinion Survey (EOS) as our dependent variable. This index is rated on a scale from 0 to 1, where a score of 1 indicates greater parity. Simply put, as the index approaches 1, the gender wage gap for similar work decreases, signifying greater equality in wages between genders.

To enhance the precision and reliability of our analysis, we included both macroeconomic and demographic variables as controls: Population growth (PG), Labor force participation rate,

female-to-male ratios (F/M), and the Economic Participation and Opportunity Index (EPO). The full list of variables, along with definitions and sources are provided in Annex II.

#### **4. Results and discussion:**

We employed a backward method utilizing the statistical software SPSS. This approach involved running various models with different combinations of variables. By systematically removing variables from each model iteration, we aimed to identify the most optimal model that best explained the relationships within the data. This iterative process allowed for a comprehensive exploration of potential variables while focusing on refining the model to enhance its predictive accuracy and explanatory power.

**Table 1** shows the summary of our model. The Durbin-Watson value of 2.069 suggests a lack of significant autocorrelation among residuals in the regression analysis. This indicates that the assumption of independence between consecutive residuals is reasonably met, supporting the reliability of the regression results.

However, the R-squared value of 0.361 signifies that only approximately 36.1% of the variability observed in the dependent variable, the wage equality for similar work could be explained by the independent variables included in the model. This insight underscores the need for further exploration of additional factors influencing gender-related labor market dynamics.

**Table 2** shows that the significance level of 0.001 demonstrates that the regression model attains statistical significance at the 0.05 level. This provides compelling evidence to reject the null hypothesis, affirming that at least one of the independent variables within the model exerts a non-zero impact on the dependent variable.

**Table 3** exhibits that among the seven sub-components of the labor market flexibility index, four have shown a statically significant correlation to the dependent variable.

Starting with the Hiring and firing regulations (HF), the coefficient of 0,491 shows a positive correlation with wage equality for similar work. This suggests that more flexible regulations

related to the hiring and firing process could potentially lead to greater wage equality in the workplace. For instance, if recruiters would put aside the perception of leaders as more aligned with masculine traits (M., H., A., & T., 2011) and the mismatch between leadership stereotypes and gender roles (Rosette A. S., 2010) during the recruitment process, women would likely encounter equal opportunities, enjoy more representation in leadership roles, and enhance prospects for career advancement.

Moreover, acknowledging the tendency for women to experience more career interruptions, even within high-prestige occupations (C., 1998), recruiters often favor candidates who demonstrate a commitment to uninterrupted career trajectories, a characteristic more commonly associated with men. Encouraging flexible work arrangements and destigmatizing career breaks could play a pivotal role in advancing gender equality. By normalizing career interruptions, organizations can create a more inclusive environment that supports both genders in achieving professional success while addressing personal and household responsibilities.

Moving to the second sub-component of the labor market flexibility index, the Centralized Collective Bargaining (CCB), also exhibits a positive correlation with wage equality for a similar work. This aligns with the findings discussed in numerous papers. (ILO., 2004), (Antonczyk, Fitzenberger, & Sommerfeld, 2010), (ETUC, 2015), (Pillinger, 2014).

(CCB) proves to be an important means of promoting gender equality. Fostering dialogue among stakeholders including employers and employees regarding terms and conditions of employment like wages and benefits, leaves, and working environment would point out the gaps between the two genders and prioritize the needs of the workers. Less centralized bargaining power could eliminate disparities in the workplace and ensure that opportunities are divided equally between the two genders.

Similarly, the positive coefficient for hour regulations (HR) implies more flexible working hours tend to enhance wage equality for similar work leading to greater equality in the workplace. Shorter working hours can incentivize fathers to become more involved in household responsibilities and actively participate in childcare duties (Kim, 2018), (Tanaka & Waldfogel, 2007), which can decrease the burden on women enabling them to fully commit to their professional careers. Time allocation flexibility plays a pivotal role in achieving work-life balance allowing individuals to effectively manage their personal and professional obligations. (Clark, 2000), (Claudia, 2015).

However, the Mandate cost of dismissal index (MD) exhibits a negative correlation with the dependent variable. A higher degree of flexibility in the MD index corresponds to reduced

firing costs, effectively representing the trade-off between job security for workers and the ease with which employers can terminate employment contracts. While lower firing costs may enhance employers' ability to adjust their workforce according to changing business needs, they also entail diminished job security for workers. This dynamic underscores the importance of balancing flexibility in labor regulations with safeguards to protect workers' rights and economic stability. Striking this balance is essential for fostering a labor market environment that promotes both employment flexibility and workers' well-being.

**Table 1: Model summary<sup>b</sup>**

Model	R	R square	Adjusted R square	Str. The error of the estimate	R Square change	F change	df1	df2	Sig. F change	Durbin Watson
1	,601 <sup>a</sup>	,361	,306	,0744	,361	6,538	7	81	<,001	2,069

a. Predictors: (Constant), HF, HR, CCB, MD, EPO, PG.

b. Dependent Variable: W

Source: Own work

**Table 2. ANOVA<sup>a</sup>**

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	,253	7	,036	6,538	<,001 <sup>b</sup>
	Residual	,448	81	,006		
	Total	,702	88			

a. Dependent Variable: W.

b. Predictors: (Constant), HF, HR, CCB, MD, EPO, PG.

Source: Own work

**Table 3. Coefficients<sup>a</sup>**

Model	Unstandardized coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics		
	B	Std.Error	Beta			Tolerance	VIF	
1	(Constant)	,198	,070		2,848	,006		
	HF	,024	,009	,491	2,662	,009	,232	4,315
	CCB	,018	,008	,223	2,265	,026	,817	1,223
	HR	,009	,004	,207	2,251	,027	,929	1,077
	MD	-,011	,006	-,364	-2,001	,049	,239	3,191

a. Dependent Variable : Wage equality for a similar work.

Source: Own work

## 5. Conclusion

To summarize, this paper delved into the relationship between flexibility and gender equality in the labor market. Utilizing the labor market flexibility index, and the wage equality for similar work, we used regression models across 99 developing countries in 2021. The findings unveiled that among the seven sub-components of the labor market flexibility index; four have shown significant correlation with the dependent variable. (HF), (CCB) and (HR) are positively correlated with the wage equality for a similar work indicator, suggesting that an increased flexibility in these areas would promote wage equality and potentially reduce the gender gap in the workplace. Promoting equal opportunities for both genders, particularly women necessitates the eradication of stigmas entrenched in the recruitment process, such as gender biases that dictate certain roles as inherently more suitable for men or women. Normalizing career breaks is another crucial step towards gender equality, as it acknowledges the diverse responsibilities individuals may have outside of work and mitigates the penalties associated with taking time off. Moreover, empowering individuals with bargaining power is instrumental in addressing gender disparities in the workplace. Less centralized collective bargaining fosters collaboration and negotiation between employers and employees, amplifying the voices of vulnerable workers and fostering equality.

Furthermore, flexibility in work arrangements plays a pivotal role in achieving a healthy work-life balance. Practices such as telecommuting, part-time work, reduced hours, parental leave policies, and job sharing enable individuals, particularly fathers, to be more involved in household and childcare responsibilities. By sharing these responsibilities more equitably, women are relieved of the disproportionate burden of caregiving, allowing them to remain

engaged in their careers without sacrificing family obligations. Moreover, such arrangements have been shown to enrich parent-child interactions, leading to greater family prosperity and reduced conflict.

Conversely, the Mandate cost of dismissal index (MD) exhibited a negative correlation with the wage equality indicator for similar work, implying that decreased firing costs may not contribute to improved wage equality and could potentially widen the gender gap. This phenomenon is attributed to the inherent threat to job security posed by reduced firing costs. When termination procedures become less burdensome for employers, workers may face increased uncertainty about the stability of their employment, leading to heightened insecurity in the workforce. This insecurity can disproportionately affect marginalized groups, exacerbating wage disparities and impeding progress toward gender equality in the labor market. Therefore, while efforts to enhance labor market flexibility are important, policymakers must carefully balance the need for flexibility with safeguards to protect workers' rights and ensure equitable outcomes for all genders.

One limitation of the current research lies in the weak explanatory power of our model. While some flexibility indicators exhibit a strong correlation with the dependent variables, our analysis suggests additional factors may strengthen the overall fitness of the model. Country contexts matter in our investigation (Kurowská, 2018). Since we analyzed 99 developing countries, it is important to acknowledge that social, economic, and cultural characteristics may differ from one country to another as well as among different organizations within the same country. Moreover, perceptions of flexibility may vary between a more traditional society and a less traditional one. Therefore, future research endeavors could delve deeper into this segmentation of countries, exploring potential variations in outcomes across different contexts. By examining how cultural norms and organizational dynamics intersect with labor market flexibility, researchers can provide valuable insights into the nuanced factors shaping wage equality and gender disparities worldwide.

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## Annex I

5. Data	Source	Description
(i) Minimum wages (area5bi)	World Bank doing business	This sub-component uses the following components: (1) whether fixed-term contracts are prohibited for permanent tasks; (2) the maximum cumulative duration of fixed-term contracts; and (3) the ratio of the minimum wage for a trainee or first-time employee to the average value added per worker.
(ii) Hiring and firing Regulations (area5bii)	World Economic Forum's Global Competitiveness Report.	This sub-component is based on the Global Competitiveness Report question: "The hiring and firing of workers is impeded by regulations (= 1) or flexibly determined by employers (= 7)". The question's wording has varied over the year.
(iii) Centralized collective bargaining (area5biii)	World Economic Forum's Global Competitiveness Report.	This sub-component is based on the Global Competitiveness Report question: "Wages in your country are set by a centralized bargaining process (= 1) or up to each individual company (= 7)". The wording of the question has varied over the years. In earlier years, the actual union density was used to determine ratings for select countries.
(iv) Hours regulation (area5biv)	World Bank's Doing Business data.	This sub-component is based on the Employing Labor section in the World Bank's Doing Business; it uses the following five components: (1) whether there are restrictions on night work; (2) whether there are restrictions on holiday work; (3) whether the length of the work week can be 5.5 days or longer; (4) whether there are restrictions on overtime work; and (5) whether the average paid annual leave is 21 working days or more.
(v) Mandated cost of worker dismissal (area5bv)	World Bank's Doing Business data.	This sub-component is based on the World Bank's Doing Business data on the cost of the advance notice requirements, severance payments, and penalties due when dismissing a redundant worker with 10-years tenure. The formula used to calculate the zero-to-10 ratings was: $(V_{max} - V_i) / (V_{max} - V_{min})$ multiplied by 10. $V_i$ represents the dismissal cost (measured in weeks of wages). The values for $V_{max}$ and $V_{min}$ were set at 58 weeks (1.5 standard deviations above the average in 2005) and 0 weeks, respectively.

(vi)Conscription (area5bvi)	International Institute for Strategic Studies’ “The Military Balance,” and the War Resisters International’s “World Survey of Conscription and Conscientious Objection to Military Service,”	Data on the use and duration of military conscription were used to construct rating intervals. Countries with longer conscription periods received lower ratings.
(vii)Foreign labor (area5bvii)	World Economic Forum, Global Competitiveness Report; Economist Intelligence Unit, Business Environment Ratings.	This subcomponent is based on two sources. (a) The first source is the Global Competitiveness Report question: “To what extent does labor regulation in your country limit the ability to hire foreign labor? (The question’s wording has varied over the years). (b) The second source is the “Hiring of foreign nationals” indicator from the Economist Intelligence Unit. The final rating is the average of whichever of these sources are available, and the data are chain-linked to assure time consistency

## Annex II

Variable	Description	Data source
Wage equality for similar work (W)	Response to the survey question, “In your country, for similar work, to what extent are wages for women equal to those of men?” (1 = not at all, significantly below those of men; 7 = fully, equal to those of men).	World Economic Forum, Executive Opinion Survey (EOS) 2019-2020 or most recent year available
Economic Participation and Opportunity index (EPO)	It contains three concepts: the participation gap, the remuneration gap and the Advancement gap.	Global Gender Gap Report 2021
Population Growth (PG)	Year-on-year percentage change in total population, calculated based on current and previous year. It reflects the number of births and deaths during a period and the number of people migrating to and from a country.	United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2019 Revision.
Labor force participation rate (females to males ratio) (F/M)	Proportion of a country’s working-age (15–64) female population that engages actively in the labor market, either by working or looking for work. (i.e. ratio of the number of women participating in the labor force to total labor force).	International Labour Organization (ILO), ILOSTAT, modelled estimates

# Promoting sustainable food choices with nudging techniques

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## ABSTRACT

This research explores the use of nudging techniques in order to encourage more sustainable food consumption among university students. Nudging, a concept proposed by (Thaler, 2018), offers a novel approach to guide individuals towards desired behaviours without limiting their freedom of choice. Understanding how nudging can be applied in mensas is crucial for promoting sustainable eating habits among students (Kawa et al., 2022).

The research examines nudging strategies employed in mensas in Germany, focusing on choice architecture, menu labelling, and social norms. Data is gathered through observation, short on-site interviews and analysis of existing practices in campus cafeterias.

Choice architecture, through strategic placement of sustainable options and adjusting default choices, significantly influences food selection among students. Menu labelling, featuring calorie counts and environmental impact indicators, empowers students to make informed decisions. Highlighting the popularity of sustainable options through social norms further encourages adoption of eco-friendly eating habits. Implementing nudging strategies in university mensas presents a promising avenue for promoting sustainable food consumption, contributing to healthier lifestyles and environmental conservation among the student community.

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**Key words:** nudging, sustainable food consumption, consumer behaviour, university mensas, choice architecture

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## **1. Introduction**

The global food system stands at a critical point, confronting challenges that extend beyond mere sustenance. Biodiversity loss, climate change, and widening socioeconomic disparities loom large as consequences of our unsustainable food practices (McIntyre, 2024). In the face of such multifaceted crises, innovation becomes imperative; we must reimagine and reconfigure our food systems to foster sustainability and resilience. Central to this imperative is the recognition that all actors within the food supply chain bear a responsibility for effecting change. Yet, among these stakeholders, consumers are key in driving the transition towards sustainability (Pais et al., 2021). As they engage with the food system on a daily basis, their choices wield significant influence over its trajectory. Sustainable food consumption emerges as a complex phenomenon, intertwining social consciousness, environmental stewardship, and economic viability (László, 2022). It necessitates a holistic approach that integrates diverse considerations, from ethical sourcing practices to carbon footprint reduction strategies. However, effecting meaningful change in consumer behaviour presents a formidable challenge, requiring a nuanced understanding of human decision-making processes and psychological mechanisms.

Most healthy eating interventions in Europe provided consumers with information to enable them to make better-informed food choices (Grunert & Wills, 2007) quoted by (Bucher et al., 2016), but behaviour change at the individual level is not effective unless it becomes a habit, which necessitates support and reinforcement through structural or environmental changes in order to ensure that the new behaviour is maintained. While behavioural economics have influenced certain policy interventions, the argument for interventions related to food is still evolving and represents a promising area with the potential to deliver significant social benefits (List & Samek, 2015).

This research aims to explore possibilities for innovation in food systems, with a particular focus on the role of consumers. Specifically, it examines the interplay between awareness-raising initiatives and behavioural nudges as strategies for fostering sustainable consumption patterns. Drawing upon theoretical insights and empirical observations, this study seeks to understand the potential of nudging interventions in reshaping consumer preferences and choices.

## **2. Theory**

*Understanding consumer behaviour through behavioural economics*

Behavioural economics offers valuable insights into the decision-making processes of individuals (Ariely & Erzsébet, 2011; Szakály, 2021; SZÁNTÓ, 2011) challenging traditional assumptions of rationality and self-interest. Consumers do not always behave according to the classical model assumptions of utility maximization and stable preferences; rather, their decisions are influenced by emotions, biases, and situational contexts. Mental biases, cognitive errors, and decision traps shape consumer behaviour, are much more common in that, therefore developing effective intervention strategies should be the key.

In the maze of modern life, consumers often find themselves overwhelmed by choices (Iyengar & Lepper, 2000). This cognitive overload leads to shortcuts in decision-making, which can sometimes result in unsustainable practices, particularly in food consumption. The robust amount of information in the environment might overwhelm consumers, leading to decision-making shortcuts or heuristics. Misconceptions and cognitive biases may result in suboptimal food handling practices and wasteful behaviours. However, by leveraging insights from behavioural science, we can design interventions that steer consumers towards sustainable practices, as according to (Bucher et al., 2016), nudging strategies may be used to promote healthy eating behaviour, offering an effective approach to guide consumers towards more sustainable choices.

### ***Nudging***

Nudging works by altering the environment or choice context to make sustainable options more attractive and convenient. Foodscapes (Mikkelsen, 2011) and food environments contribute to the so-called ‘obesogenic environment (Hill et al., 2003; Hill & Peters, 1998) and influence food choices (quoted by Bucher et al., 2016). For example, displaying eco-friendly products prominently or labelling them with positive descriptors can lead consumer decisions. Leveraging social proof, by highlighting the popularity of sustainable choices among peers, further reinforces this behaviour. By understanding and leveraging these cognitive biases, nudging interventions have the potential to steer consumers towards more sustainable food choices effortlessly.

Nudging, as conceptualized by (Thaler & Sunstein, 2009), offers a promising approach to influencing decision-making by subtly altering choice contexts. Nudging offers framework for steering individuals towards more sustainable behaviours (Thaler, 2018). Rooted in behavioural economics, nudges operate by subtly altering the decision-making environment, thereby prompting individuals to make choices aligned with their long-term interests. By leveraging principles of choice architecture, nudging interventions seek to nudge individuals towards

desirable outcomes without restricting their freedom of choice. In contrast, awareness-raising and educational campaigns adopt a more explicit approach, seeking to empower consumers through knowledge dissemination and skill-building initiatives.

While these efforts aim to enhance consumer understanding of sustainability issues, they often fall short in translating awareness into tangible behavioural change. Blackford (2021) suggests that interventions targeting automatic, intuitive, and non-conscious processes, such as heuristics, mental shortcuts, and biases, are most effective in promoting sustainable food consumption. Nudging, with its emphasis on modifying choice contexts, presents a complementary strategy that augments traditional educational approaches.

### ***Nudging for better food-related choices***

Choice architecture, as conceptualized by Thaler and Sunstein, offers a powerful framework for guiding individuals towards healthier dietary decisions without impinging on their freedom of choice. Leveraging this concept, there are several strategies that could be implemented within mensas to promote sustainable and nutritious eating habits (further discussed amongst the research results). By implementing nudging strategies within mensas, institutions can create environments conducive to healthier food-related choices, ultimately fostering a culture of sustainability and well-being among university students.

As we delve into the theoretical considerations of nudging and awareness-raising, we go towards a case studies and observations conducted at a German University canteen between 2023 September and 2024 February. This empirical investigation serves as a lens through which to examine the efficacy of nudging interventions in influencing consumer behaviour. By theoretical insights with real-world observations, I aim to reveal the practical implications of integrating nudging strategies within food environments.

## **3. Methodology**

### ***Aim of the research***

Aligned with the principles of behavioural economics suggested by Thaler and Sunstein, this study aims to investigate the practical implementation and effectiveness of nudging techniques in promoting sustainable food consumption among university students. By examining real-life examples within university mensas, the research seeks to show effective strategies for nudging individuals towards more sustainable eating habits. Additionally, the study aims to identify and assess awareness-raising tools designed to encourage sustainable food consumption patterns

among students.

The research concentrates on the efficacy of various nudging strategies, focusing particularly on choice architecture, menu labelling, and social norms within German (and Hungarian) mensas. Through observation and analysis of current practices, the study aims to examine the impact of these strategies on students' food choices and attitudes towards sustainability. Theoretical frameworks drawn from behavioural economics and consumer behaviour literature supports the research methodology, providing a robust foundation for analysis and interpretation.

### ***Data collection***

The data collection process was conducted on-site, allowing for an in-depth exploration of the university mensas' sustainability initiatives. Leveraging the fact that I studied in Germany during the previous semester I had an excellent opportunity to examine the operational dynamics of mensas, particularly in Osnabrück and Giessen, totalling five establishments. During some of these visits, I engaged in short on-site interviews with students at one mensa, while at another, I conducted informal discussions to gather insights into students' experiences and perceptions. Upon returning to my institute in Hungary, I have tried to compare the knowledge and observations collected from the German context to assess the sustainability practices within the local mensa. Though faced with some challenges, I focused on documenting instances of best practices (and areas to develop).

## **4. Findings**

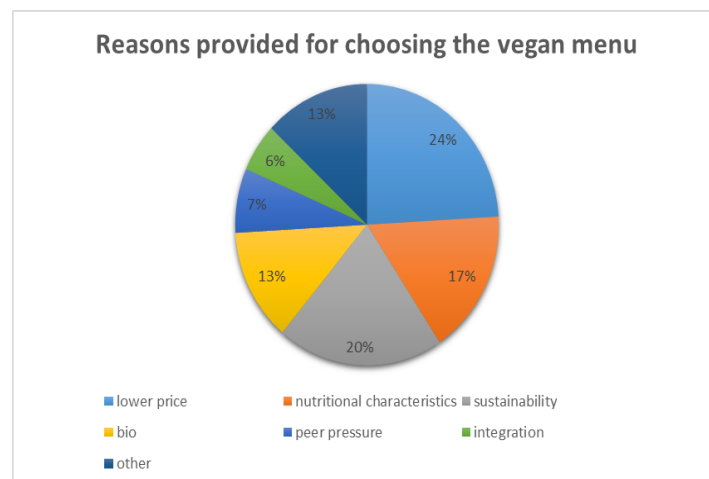
The findings of this research have been systematically organized according to the potential nudging techniques that could be utilized. This approach allows for a structured presentation of the research outcomes, categorizing them based on the various strategies of nudging that may be employed.

### ***Affordability***

The affordability of healthier food options plays a crucial role in influencing individuals' dietary choices, particularly among price-sensitive demographics such as students. The observations made in Osnabrück and the disparities between the German and Hungarian mensas highlights the significance of pricing strategies in promoting healthier or sustainable eating habits.



**Graph 1:** *Reasons provided for choosing the vegan menu (n=34) Osnabrück, 2023*



*Source:* Self-edited figure

Reducing the price of healthier food options is not only a practical strategy but also aligns with classical economic principles aimed at boosting sales. By making nutritious choices more financially accessible, institutions can effectively incentivize healthier eating habits among students, thereby contributing to their overall well-being and academic success. In the German mensa context, the affordability of healthy choices stood out, with nutritious options often priced lower than fizzy drinks or biscuits. This pricing strategy not only encourages students to make healthier selections but also reflects a commitment to promoting health within the university community.

In contrast, my observations in Hungarian mensas revealed a disparity in pricing between fruits and bakery products or sweets. Fruits were either relatively expensive or entirely absent from the mensa, while less nutritious alternatives remained readily available and affordable. This discrepancy underscores the need for concerted efforts to address pricing barriers and make healthier options more economically viable for students.

By addressing affordability barriers and implementing pricing strategies that prioritise healthful choices, such initiatives contribute to fostering a culture of health and sustainability within university campuses, ultimately benefiting the holistic development and academic success of students.

### ***Fostering a good choice only by making it easy***

Simplifying the process of making healthier choices is a fundamental nudging technique. In the dining environment, this can be achieved by streamlining the selection process and eliminating barriers to sustainable practices. For instance, addressing the inconvenience of disposing of

leftover food (like in the mensas of Giessen) by providing easily accessible containers encourages students to opt for appropriate portion sizes. Additionally, offering the option to use food boxes or takeout meals promotes eco-friendly practices without compromising convenience. Furthermore, integrating information and awareness materials into mobile applications enhances accessibility and facilitates informed decision-making, ultimately making it easier for individuals to choose well-balanced and sustainable options. By prioritizing ease and accessibility, dining establishments can effectively nudge students towards healthier and more environmentally conscious choices.

### ***Making the better choice also trendy***

By making the better choice appear popular, nudging can effectively influence behavior. Social norms play a significant role in decision-making, and suggesting that others have opted for a certain choice can sway individuals to follow suit. For example, highlighting the growing demand for organic food signals that choosing organic options is not only beneficial but also aligned with current trends and societal values. Similarly, promoting sustainability initiatives, such as the "climate plate" at Osnabrück Student Service, emphasizes the collective effort towards environmental stewardship and encourages individuals to participate by selecting eco-friendly options. By leveraging social influence and aligning choices with prevailing trends and values, nudging can motivate individuals to make more sustainable and socially responsible decisions.

### ***Empowering informed food choices through nutritional disclosure***

In today's health-conscious society, younger generations are increasingly mindful of the nutritional content of their food (Lau et al., 2013). Within this demographic, factors beyond price, such as the nutritional characteristics of menu items, emerge as influential drivers of choice. The German mensa experience provides a compelling example of how disclosing comprehensive nutritional information empowers individuals to make informed dietary decisions. By prominently presenting nutritional characteristics and calorie counts, mensas effectively guide students towards choices that align with their health and sustainability values. This practice not only fosters transparency but also reinforces the notion that sustainable options are inherently better for consumers' well-being.

In Osnabrück mensa, for instance, a notable 17% of students opted for the vegan menu due to its favourable nutritional profile (see the Figure above). This statistic shows the significance of nutritional disclosure as a potent nudge, encouraging students to prioritize sustainability and healthfulness in their food choices. By embracing nutritional disclosure practices, mensas can

facilitate a culture of informed decision-making among students, empowering them to select options that not only meet their dietary preferences but also contribute to their overall well-being. Furthermore, such initiatives align with the evolving expectations of consumers, particularly younger generations, who seek transparency and accountability in food procurement and consumption.

### ***Fostering health through specialised menus***

In addition to the awareness-raising materials within campus environments, mensas can introduce specialised menus tailored to meet the needs and preferences of various demographic segments, such as the "Mensa Active" option designed for individuals committed to a fitness-oriented lifestyle in Osnabrück mensa (studentwerk-osnabrueck, n.d.).

The communication surrounding these menus extends beyond mere nutritional values and pricing considerations, employing compelling messaging to highlight their benefits. By positioning the "Mensa Active" menu as vitalizing and balanced, mensas effectively convey the message that these offerings are not only nutritious but also conducive to achieving and maintaining optimal physical well-being. This integrated approach to menu presentation serves as a persuasive nudge, encouraging students to make choices that align with their health and fitness goals. By presenting the positive impact of these menu options on overall health and vitality, mensas empower students to make informed decisions that support their well-being. The implementation of specialized menus reflects a commitment to catering to the diverse dietary preferences and lifestyle choices of students, thereby fostering a supportive and inclusive dining environment within the university community.

### ***Placement of products***

The strategic placement of food products within dining environments can significantly influence consumer choices. Placing healthier options, such as salads, at eye level ensures they are prominently displayed and easily accessible, increasing the likelihood of selection. Conversely, positioning unhealthy items a few steps away requires individuals to exert additional effort, subtly nudging them towards healthier alternatives. Moreover, the layout of food offerings can impact decision-making. In German mensas, salads are typically placed at the beginning of the food line, while desserts are located towards the end. This arrangement encourages individuals to prioritise healthier options initially, but may leave out dessert purchases due to tray space (or money) constraints.

In contrast, some mensas often place chocolate and similar products prominently at the beginning of the food line, while healthier alternatives like fruits or yoghurt are less readily

available. Additionally, the inconvenience of requesting certain items, such as sandwiches, further discourages healthier choices. This layout not only undermines nudging efforts but also limits the availability of nutritious options, presenting a significant challenge in promoting healthier eating habits.

## **5. Conclusion**

In conclusion, this research focused on the application of nudging techniques aimed at fostering more sustainable food consumption behaviours among university students. Rooted in Thaler, (2018) concept, nudging offers a nuanced approach to guiding individuals towards desired behaviours while respecting their autonomy. Understanding and implementing nudging strategies within mensas are essential steps in promoting sustainable eating habits among students (Kawa et al., 2022). The examination of nudging strategies and good practice collection, deployed in German mensas, with a focus on choice architecture, menu labelling, and social norms, has revealed several effective interventions. Through observation and analysis of existing practices in campus cafeterias, valuable insights have been gained into the mechanisms driving food choices among students.

The strategic arrangement of food options within choice architecture, coupled with adjustments to default choices, holds power over food selection behaviours. Menu labelling, incorporating calorie counts and environmental impact indicators, empowers students to make informed decisions about their choices. Furthermore, leveraging social norms to highlight the popularity of sustainable options reinforces the adoption of eco-friendly eating habits among students. By fostering healthier lifestyles and contributing to environmental conservation efforts, these initiatives have the potential to positively impact the well-being of the student community and beyond. However, challenges persist, particularly in addressing placement and accessibility issues within mensas. The layout of food offerings and the availability of certain items can undermine nudging efforts and limit the availability of nutritious options.

Considering these findings, it is essential for institutions to continue exploring innovative strategies to enhance the effectiveness of nudging interventions in promoting sustainable and healthier food choices among students. By prioritizing affordability, accessibility, and transparency, mensas can create environments that foster a culture of health and wellness, ultimately contributing to the holistic development and well-being of university communities.

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# Factors deterring African SMEs from adopting sustainable practices.

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## ABSTRACT

The objective of this study is to identify the factors that prevented and encouraged Ghanaian SMEs from adopting sustainable business practices (SBP) in their enterprises. Secondly, this study aims to examine the discussion amongst academics and practitioners on sustainability in SMEs based in Ghana. To fulfil this objective this study adopted a qualitative research philosophy and used a systematic literature review (SLR) to analyse the literature discussing this phenomenon. Only eleven articles were included in this study's sample based on the search criteria established in this study. Furthermore, using thematic analysis, this study identified four themes within the sample of articles: supply chains were the most prevalent topic, sustainability reporting (SR) was the second most prevalent topic, whereas green strategy and sustainable business practices (SBPs) were the least prevalent topics. Lastly, this study found that there was a dearth of literature focusing on green strategy and SBPs in SMEs based in Ghana. As a result, this study recommends that more studies should be conducted that explore how green strategy and SBPs may be implemented in SMEs based in Ghana.

**Keywords:** Africa, Ghana, sustainable practices, SMEs, enablers, and barriers.

## 1. Introduction

The advancement and development of Ghana have relied extensively on small and medium-sized enterprises (SMEs). For example, in 2016, ninety-three percent of all enterprises registered were SMEs (Johnson et al.2020). In addition, according to Adjabeng and Osei (2016), in Ghana SMEs contribute approximately 70% to the country's GDP. Furthermore, Amoah and Amoah (2018) found that SMEs employ roughly 82 percent of the country's working population. Selase and Woelanyo (2018) explain that SMEs in Ghana have played a

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critical role in alleviating poverty in the country, creating employment, and stimulating economic growth.

Despite SMEs' importance to Ghana's economic development and growth, Ghanaian SMEs still face many challenges that, according to Johnson et al. (2020), stem from the country's political, economic, and sociocultural environment. Johnson et al. (2020) and Okeniyi et al. (2020) argue that Ghana's socio-economic structures favour royal families at the expense of common families, which has hindered the growth of SMEs as common families have limited access to resources. In a study by Adjabeng and Osei (2022), restricted credit access, unfavourable regulatory environments, and technology are some of the challenges SMEs face in Ghana. Additionally, Johnson et al. (2020) explained that factors such as corruption, a limited number of skilled labours, high levels of risk, and lack of technology were detrimental to the development of SMEs in Ghana.

Access to finance for SMEs is a challenge that is not unique to Ghana but is common throughout West Africa as well. According to a report by the World Bank (2021), access to finance and financial services is one of the biggest challenges SMEs encounters in West Africa. The World Bank (2021) explains that this challenge may be amplified due to the size and inexperience of these enterprises, as well as their undocumented performance. According to Quartey et al. (2017), in the Economic Community of West African States (ECOWAS) access to funds from commercial banks (which are primarily responsible for providing credit to enterprises) is influenced by several factors, including the age, size, experience of the enterprise's top management, legal rights, credit information of these enterprises, and the performance of the firms in question. In addition, Quartey et al. (2017) elaborates that compared to SMEs large enterprises can obtain credit from commercial banks more easily since they have enough collateral and can demonstrate and prove their creditworthiness.

ECOWAS consists of fifteen countries (Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo) that are based in West Africa. The biggest economy amongst the member states and Africa is Nigeria: this country has a GDP of roughly 443 billion USD in 2020 (UNEC,2024; Rojik,2024). In 2022, according to the African Development Group (AFDB), Ghana was the second largest economy in West Africa, and Cote d'Ivoire the third largest economy. The 4th largest economy in West Africa is Burkina Faso, a neighbouring country of Ghana, which is vulnerable to climate change like other countries in the region (AFDB, 2023). In spite of the fact that West African countries contribute the least to global warming, climate change has had adverse effects on the region (UNEC ,2016). For example, AFDB (2022) has explained that



climate change has posed a threat to the region's economic growth, access to water, and to energy security and supply.

West Africa has found it challenging to address the threats posed by climate change (AFDB,2022). According to AFDB (2022), the region would need roughly 400 billion USD for the period 2020 until 2030 to address these challenges. However, as AFDB (2022) explains, the region has not been able to secure those funds. Burkina Faso, for example, according to AFDB (2023), has encountered challenges in securing climate finance. In addition, the report also states that accessing these funds has been extremely challenging for the private sector. As a result, very few climate funds are available in the country for its enterprises (AFDB,2023). According to AFDB (2023), transitioning to more sustainable practices is expensive in Burkina Faso, particularly for SMEs and large enterprises. Lastly, AFDB (2023) explains that there is a lack of knowledge among SMEs and large enterprises regarding how to access these funds.

This study has focused on Ghana because in comparison to Nigeria (ECOWAS' and Africa's largest economy), which has an Sustainable Development Goal (SDG) Index score of 54, and Burkina Faso, which has an SDG Index score of 53, Ghana has the highest SDG Index Score of 62 (Sustainable development report, 2024). The SDG Index is an important index that compares and ranks the Organization for Economic Cooperation and Development (OECD) countries to track their progress in achieving the UN's SDGs (Bidarbakht-Nia, 2020). Environmental sustainability has become a crucial issue for West Africa and the rest of the globe. This study will assess the factors that both encourage and hinder SMEs from adopting sustainable practices in Ghana. This study has focused on SMEs because of their pivotal role in the economic growth and development of Ghana. In addition, this study focused on SMEs because, according to a study conducted by Bakos et al. (2019), SMEs create seventy percent of the pollution globally.

## **2. Literature Review**

SMEs play a crucial role in the economic growth and development of West Africa (AFDB,2022). While economic growth remains crucial for Ghana, it is also important to examine the impact that this growth will have on the environment (Aboagye, 2018). For instance, a study concerning Sub-Saharan Africa conducted by Aboagye and Kwakwa (2014) revealed that the industrialization of these countries harmed the environment due to increased pollution, degradation, CO<sub>2</sub> emissions, and energy consumption during this period. In the scope of the present paper, the next section will provide the study's background context and will

additionally discuss some of the literature underpinning sustainability especially in the light of SMEs in Ghana.

### **3. Ghana**

Ghana is located in West Africa, and in 2013, it had the highest per capita GDP in the region (Ho and Iyke,2020). Ghana is a member of the Economic Community of West African States (ECOWAS). ECOWAS was created to promote cooperation and integration among countries in the region (Ogisi and Omozue, 2022). According to Ogisi and Omozue (2022), the purpose of ECOWAS was to create a large trading block across the region, to achieve collective self-sufficiency for its member states, and to serve as a peacekeeping force. Furthermore, Ghana has also entered into a trade agreement with the European Union (EU), providing duty-free access to the EU market, making the EU one of Ghana's main trading partners for its agribusiness products (European Union,2022).

### **4. SMEs**

On the African continent, SMEs are crucial for the continent's growth and socio-economic development. As Pulka and Gawuna (2022) explain, SMEs contribute significantly to employment, poverty reduction, industrialization, and enhancing the country's technological capabilities. In Sub-Saharan Africa for instance, SMEs account for ninety-five percent of all enterprises (Muriithi,2017). In the Republic of South Africa (RSA) SMEs contribute approximately forty-five percent to the country's GDP and have created roughly sixty-one percent of jobs (Enaifoghe and Ramsuraj,2023). In a study by Pulka and Gawuna (2022) it was found that roughly ninety percent of enterprises in Nigeria were SMES. Additionally, Pulka and Gawuna (2022) also found that Nigerian SMEs contributed extensively to the country's GDP, employment, new technology adoption, and the production of novel products and services. As an example, according to the World Bank (2021), SMEs account for eighty percent of jobs created in Nigeria.

In Ghana ninety-three percent of all enterprises registered are SMEs (Johnson et al.2020). Furthermore, SMEs contribute approximately 70% to the country's GDP (Adjabeng and Osei ,2016). Abor and Quartey (2010) argue that SMEs contribute to roughly ninety-two percent of Ghana's GDP. Thus, as explained by Selase and Woelanyo, (2018) the survival, growth, and development of SMEs is crucial for the economic growth of Ghana. Since Ghana gained

independence in 1957, its economic performance has decreased significantly. According to Okeniyi et al. (2020), SMEs have also contributed to the slow economic growth of the country. Furthermore, Okeniyi et al. (2020) explains that Ghana's political, economic, and socio-cultural factors have negatively affected the growth and development of its SMEs. In Ghana, SMEs have a high failure rate: Asumah et al. (2023) explain that forty percent of SMEs fail within five years of conception. There are varying definitions of SMEs adopted in different African countries. In Ghana, for instance, the Ghana Enterprises Agency (GEA) defined SMEs according to the number of employees and fixed assets they have (GCB,2023). The GEA defined SMEs as enterprises with fewer than ten employees and fixed assets below ten million cedis (GCB,2023).

Globally SMEs face numerous challenges while simultaneously trying to remain competitive; these factors can affect SMEs' ability to adopt sustainable practices (Jayasundara et al., 2019). In Côte d'Ivoire, for example, SMEs have found it difficult to access climate funds (AFDB,2023). This has made it difficult for both SMES and large enterprises to adopt more sustainable practices (AFDB,2023). In Côte d'Ivoire, private climate finance remains low, the country's climate finance deficit continues to grow, and this deficit is worsened by the absence of sovereign funds (AFDB,2023).

## **5. Sustainability**

Sustainability has become a prominent topic among many countries due to the potential impact of climate change on economic development and socioeconomic infrastructure (Agyei et al.,2016). Among forty-six countries in Sub-Saharan Africa, Ghana was ranked eighth and 168th on numerous environmental sustainability indicators (Agyabeng-Menah et al.2024). It is argued by Agyabeng-Menah et al. (2024) that Ghana should enhance its environmental initiatives in order to improve the country's environmental sustainability. According to Anaman et al. (2023), sustainable enterprises meet their customers' and stakeholders' needs without harming the environment or limiting future generations' ability to meet their own needs. Sustainability consists of three main constructs: the social, environmental, and economic constructs. Bakos et al. (2019) explained that environmental sustainability focused on reducing pollution, eradicating practices that cause harm to the environment, and the act and process of being able to renew resources. According to Asumah et al. (2023), sustainable practices are essential as they aid enterprises in managing economic, social, and economic risks. Caladera et al. (2019) clarified that sustainable business practices are activities or tactics designed to be

environmentally friendly. Asumah et al. (2023) expound that sustainable practices are essential as they create many opportunities for enterprises which they can capitalize on. Additionally, a study conducted by Asumah et al. (2023) found that the development of environmental dynamic capabilities amongst SMEs is crucial as it helped improve SMEs sustainability performance in Ghana. This study will analyse the following research question:

Research question 1: What are the factors that hinder or facilitate the implementation of sustainable practices by small and medium-sized enterprises (SMEs) in Ghana?

## **6. Methodology**

This study has utilized a systematic literature review (SLR) to answer the study's research question. Mengist et al. (2020) explain that a SLR differs from a narrative review because the process used to collect and analyse data is transparent, replicable, and scientific. According to van Dinter et al. (2021), a SLR is a method that researchers can use to identify, assess, and synthesize information on a particular phenomenon in order to answer the study's research questions. The next section will discuss the screening criteria used to include and exclude articles from the SLR. Furthermore, the SLR will provide descriptive information on the sample of articles selected and explain how the different themes were chosen.

## **7. Screening Criteria**

The screening criteria, according to van Dinter et al. (2021), is used to determine whether an article should be included or excluded from a SLR. This study will only analyse articles published in peer-reviewed journals. Additionally, only articles written in English and focusing on sustainability among SMEs in Ghana will be reviewed. Lastly, only articles published from 2022 to 2024 will be included. This study will use the following keywords: Ghana, sustainable practices, sustainability, enablers, and barriers. For the keyword 'enablers' the researcher also used the keyword 'motivation' as a synonym. In addition, for the keyword 'barriers' the researcher also used 'challenges' as a synonym. The next section will provide descriptive information on the articles selected to be part of this study's SLR.

### **Descriptive information on the articles selected to be part of this study's SLR**

The researcher created an Excel spreadsheet as part of the SLR to identify and analyse articles. Only eleven articles were selected based on the screening criteria and keywords. After analysing

the spreadsheet, the researcher used the Scimago database to determine the quartile ranking of the journals. The table below shows the journals from which articles included in the SLR were retrieved, along with their respective quartile rankings according to the Scimago database.

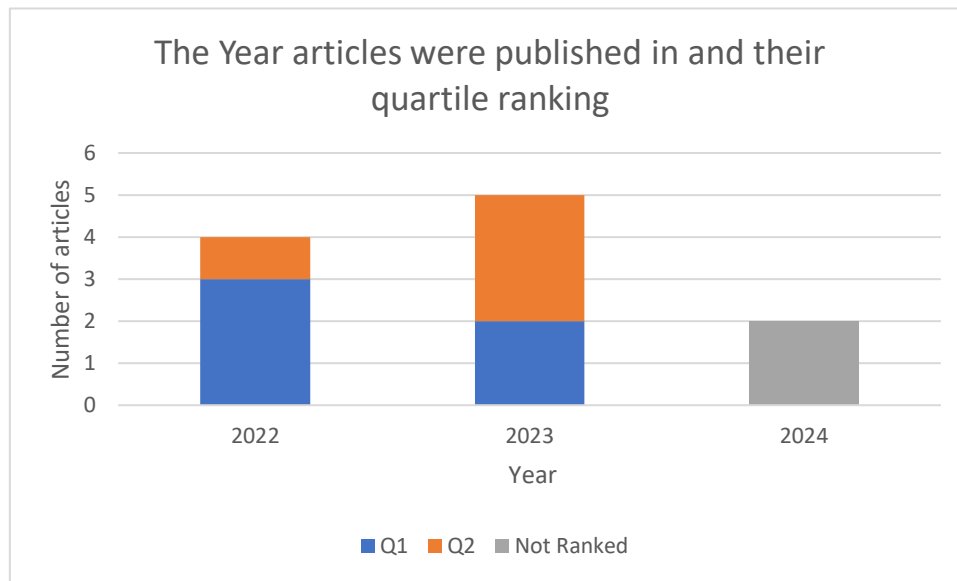
**Table 1:** Quartile ranking of journals from which articles were retrieved

<b>Name of Journal</b>	<b>Ranking of the Journal</b>
International Journal of Physical Distribution & Logistics Management	Q1
International Journal of Productivity and Performance Management	Q1
Journal of Business & Industrial Marketing	Q1
Journal of Environmental Planning and Management	Q1
Journal of Manufacturing Technology Management	Q1
Business Perspectives and Research	Q2
Cogent Business and Management	Q2
Journal of Global Responsibility	Q2
Small Enterprise Research	Q2
Journal of Contemporary Marketing Science	Not ranked on Scimago
Technological Sustainability	Not ranked on Scimago

*Source:* Author's own compilation

**Table 1** illustrated that all eleven articles included in this SLR were retrieved from eleven different journals. Furthermore, the table shows that five articles included in the SLR were retrieved from Q1 journals, while another four articles were retrieved from journals classified as Q2 according to Scimago database. Lastly, only two articles from the sample were not found in the Scimago database.

**Figure 4:** Number of articles published each year and quartile ranking



*Source:* Compiled by the author

**Figure 1** illustrates how many articles for this SLR were published between the years 2022 and 2024. As illustrated in Figure 1, in the sample of articles, four articles were published in 2022, three were retrieved from journals ranked in Q1, and one from a journal ranked in Q2. For the year 2023, two article was retrieved from journals ranked in Q1, and three from a journal ranked in Q2. Lastly, for the year 2024, only two articles were retrieved, and the two articles retrieved using the Scimago database were not ranked.

### **Theme Identification**

In order to identify the themes amongst the sample of articles the researcher has conducted a thematic analysis. Thematic analysis is a method researchers and practitioners use to identify, analyse, and report patterns in data (Braun and Clarke, 2006). As Alhojailan (2012) explains, thematic analysis is useful for extracting information from a dataset, identifying relationships between variables, and comparing them. This study will follow the thematic analysis process suggested by Braun and Clarke (2006) as referenced by Vaismoradi (2013):

- Scanning and reading the data
- Creating initial codes within the dataset
- Searching for patterns within the data set and collecting all the information required for each potential pattern and theme.

- Assessing whether the themes that were identified are aligned with the different codes extracted from the dataset.
- Naming the themes and communicating what the themes encompass of.

To identify and analyse the themes or patterns amongst the literature the researcher utilized an Excel form. By using the Excel form, the researcher was able to analyse and compare the sample of articles, as well as their purposes, findings, methodologies, and their sample size. Only eleven articles were reviewed based on the keywords suggested in this SLR. From the sample of eleven articles four themes emerged: Supply Chains, Green Strategy, Sustainable Reporting, and Sustainable Business Practice. The following section will discuss the different themes that were identified in the sample of articles.

### **Themes emerging from the sample of articles**

#### **Theme: Supply Chains**

The topic of supply chains has become prominent in literature focusing on sustainability because this issue plays a pivotal role in linking numerous actors such as producers, retailers, distributors, and consumers (Taghikhah et al., 2019). In the sample of articles for this SLR, supply chains emerged as a prominent theme and included four quantitative articles. Interestingly, three out of the four articles shared the same first author, Agyabeng-Mensah. The communality amongst all four articles is that they all focused on supply chains, however, all the articles had different objectives. For example, the article by Mumin et al. (2024) investigated whether information and communication technology (ICT) capabilities had an impact on supply chain fraud in SMEs based in Ghana. In contrast, the article by Agyabeng-Mensah et al. (2022) examined the different factors that may affect the circular supply chain performance of SMEs based in Ghana.

**Table 2: Supply Chains Theme**

Theme : Supply Chains				
Authors	Purpose of the study	Sample and Method	Research Questions	Research Findings
Agyabeng-Mensah et al.(2023)	“This study examines the relationships between SCEL (supply chain ethical leadership), CSC practices, internal EO (Environmental orientation), external EO and corporate sustainability performance (CSP) through the theoretical lenses of leader-member exchange theory (LMXT) and contingency theory (CT)”	122 SMEs in Ghana Quantitative	This study had two research questions. The first research question investigated whether the relationship between SCEL and CSC practices was positive. The second research question investigated whether internal and external EO moderated the relationship between CSP and CSC practices	The results from the study proved that ethical behaviour did push the implementation of CSC practices across the supply chains of manufacturing SMEs in Ghana.
Agyabeng-Mensah et al.(2022)	This study offers insight into the different factors that drive circular supply chain performance of small and medium enterprises in Ghana.	153 SMEs in Ghana Quantitative	This study had 7 research hypotheses. These research hypotheses analysed the role of Green supply chain learning (GSCL), Green organizational citizenship behaviour (GOCB), Green employee creativity (GEC) in achieving circular supply chain performance (CSCP)	The results from the study proved that SCL did not have a significant positive effect on CSCP. In addition, the study’s results suggest that CSC thrives in SMEs on more than just information and skills acquired from their customers and suppliers.
Agyabeng-Mensah et al.(2022)	“Exploring the role of external pressure, environmental sustainability commitment, engagement, alliance and circular supply chain capability in circular economy performance”	124 SMEs in Ghana Quantitative	This study had only one research question. This research question inquired whether external pressure would positively affect the ESC of SMEs in Ghana?	The results from the study proved that external pressure did have a significant impact on ESC. Secondly, this study found that ESC positively impacted ACA, ENC and circular supply chain capability.
Mumin et al.(2024)	Focusing on Ghanaian SMEs this study examined whether information and communication technology (ICT) capabilities had an impact on supply chain fraud	102 SMEs based in Ghana Quantitative	“RQ1. What are the effects of ICT capability and supply chain fraud on supply chain sustainability? RQ2. What is the mediating effect of supply chain fraud on the linkages between ICT capabilities and supply chain sustainability?”	The results of the study illustrated that ICT capabilities in Ghanaian SMEs did decrease supply chain fraud.

*Source: Author’s own compilation.*



### Theme: Green Strategy

Green strategy, according to Rathore (2018), is a business strategy that places sustainability at the core of the enterprise's value proposition. According to Rathore (2018), enterprises adopting green strategies are environmentally aware and are trying to ensure that their operations and activities cause minimal environmental damage. This theme consisted of two quantitative articles; both articles had a sample size of more than 200. Even though these articles were part of the same theme, they covered different aspects of the green strategy and had different objectives. For example, the article written by Afum et al. (2022) investigated whether green market orientation (GMO) enhanced green value-based innovation (GVI), green reputation (GR) and enterprise social performance (ESP) in Ghanaian SMEs. In addition, it investigated whether GMO reinforced the implementation of lean management. In contrast to the article written by Afum et al. (2022), the article written by Nyameye et al. (2024) investigated the impact that green communication, green technology had on new technology implementation. Additionally, the article investigated the impact of new technology implementation on green corporate performance.

**Table 3: Green Strategy Theme**

Theme : Green Strategy				
Authors	Purpose of the study	Sample and Method	Research Questions	Research Findings
Afum et al.(2022)	This study examined the role of lean management (LM) in the relationship amongst green market orientation (GMO), green value-based innovation (GVI), green reputation and enterprise social performance (ESP)	217 managers from SMEs  Quantitative	“Q1: Does GMO strengthen GVI, GR and ESP? Q2. Does GMO significantly reinforce the implementation of LM? Q3. Does LM provide an indirect mechanism through which GMO impacts GVI,GR and ESP?”	“The empirical results of the study suggest that although green market orientation has a positive impact on green value-based innovation, the effect is not significant. However, the results confirm that green market orientation has a significant positive impact on green reputation and enterprise social performance.”
Nyameye et al. (2024)	This study tested the study’s proposed framework. This framework assessed whether green marketing initiatives strengthen the implementation of new technology which focuses on improving green corporate performance, underpinned by institutional isomorphism	225 employees from SMES  Quantitative	This study had three different research hypotheses. These hypotheses assessed the impact that green communication, green technology had on new technology implementation. Additionally, the research questions assessed the impact of new technology implementation on green corporate performance.	“This study found that green communication and green strategy alignment have a significant predictive effect on new technology implementation. Cultural isomorphism significantly moderated the effects of implementing new technology (i.e. green communication and strategy alignment)”.

*Source: Author’s own compilation*

**Theme: Sustainability Reporting**

An enterprise’s sustainability report (SR), according to Traxler et al.(2020), communicates the enterprise’s triple bottom line, which consists of economic, social, and environmental dimensions of sustainability. In addition, Hamad et al. (2020) expounds that SR enables an enterprise to both measure and report their enterprises’ impact on the economy, society, and environment. A study conducted by Amoako et al. (2023) that was based on SMEs in Ghana found that internal audit effectiveness, risk management process, and sustainability sensitivity had a significant positive relationship with SMEs’ sustainability audits. Another study conducted by Owusu et al. (2022) found that in terms of the three pillars of sustainability (environment, social, and economy) 65% of SMEs in Ghana reported their economic impact, 26.5% of the enterprises reported their environmental impact, and 23.3% of enterprises reported

their social impact. As a result, Owusu et al. (2022) found that SMEs in Ghana report an average of 38% sustainability performance across the three pillars of sustainability. In contrast to the articles written by Amoako et al. (2023) and Owusu et al. (2022), the article written by Kwarteng et al. (2023) examined the different ways that accountability presents itself in a circular economy. SR is one of the themes identified in the sample of articles for this SLR. This theme consisted of three quantitative articles.

**Table 4:***Sustainability Reporting Theme*

Theme : Sustainability reporting				
Authors	Purpose of the study	Sample and Method	Research Questions	Research Findings
Kwarteng et al. (2023)	The purpose of the study was to examine how accountability presents itself in a circular economy	35 Qualitative	“RQ1. How is accountability manifested in the CE in contemporary times? RQ2. How accountability manifestations contribute to the sustainability of the firm?”	This study found that in both formal and informal processes within a circular economy accountability may present itself in various ways
Amoako et al. (2023)	The purpose of this study was to examine whether internal audit effectiveness, risk management processes and sustainability sensitivity had a relationship with sustainability audits.	1340 SME managers	This study had four different research hypotheses. These hypotheses examine the influence of risk management, sustainability sensitivity, and internal audits effectiveness on sustainability audits. Additionally, the research hypotheses examine how enactment, policies and standards influence sustainability.	The results from this study proved that internal audit effectiveness, risk management process, and sustainability sensitivity had a significant positive relationship with sustainability audits.
Owusu et al (2022)	This study examined the different perspectives held by SMEs on sustainability performance reporting in Ghana. Additionally, it examined the different factors that both encourage and discourage the SMEs’ decision to participate in sustainability performance reporting	183 SMEs in Ghana Quantitative	This study did not have clear research questions. However, the questionnaire examined participants’ sustainability reporting practices	The findings of this study revealed that amongst SMEs based in Ghana the sustainability performance reporting was thirty-eight percent. Additionally, this study identified factors that discourage SMEs form participating in sustainability performance reporting.

*Source:* Author’s own compilation

Theme: Sustainable Business Practice

Sustainable business practices (SBP), as defined by Yacob et al. (2022), refer to the policies and activities of an enterprise that focus on resolving the enterprise’s environmental and social problems whilst ensuring that the enterprise remains profitable. There were only two articles

on this theme related to SBP. The first article was a qualitative study conducted by Anaman et al. (2023). To collect data Anaman et al. (2023) interviewed eight participants and identified three main themes: Environmental stewardship, Process excellence, and sustainability-oriented culture. In addition, the study's research participants identified these three themes (Environmental stewardship, Process excellence, and sustainability-oriented culture) as crucial to their SBPs. The second article included in this theme was a quantitative study by Akomea et al. (2022). This study examined how sustainability practices may impact SME performance through EO. Furthermore, this study found that sustainability practices acted as a mechanism by which EO influenced SMEs' performance in Ghana.

**Table 5:** Sustainable business practice amongst SMEs

Theme : Sustainable business practices				
Authors	Purpose of the study	Sample and Method	Research Questions	Research Findings
Anaman et al. (2023)	This study focused on Ghanaian MSMEs. It examined their sustainable business practices (SBPs) and the nature of these SBPs amongst the MSMEs. In addition, it assessed the effects that SBPs could have on MSMEs.	8 SMEs in Ghana were interviewed  Qualitative	This study did not have clear research questions	Three main themes emerged from the interviews conducted by the researcher: Environmental stewardship, Process excellence, and sustainability orientated culture. According to the research participants, the three themes constitute sustainable business practices in MSMEs in Ghana
Akomea et al. (2023)	This study examines how sustainability practices may impact the performance of SMEs through EO	323 CEOs of SMEs in Ghana  Quantitative	This study had four different hypotheses. The four hypotheses examined the effect of EO on performance and the mediating effect of sustainability practices on this relationship.	Based on the results of this study, sustainability practices acted as a mechanism by which EO influenced SMEs' performance in Ghana. In addition, this study found that at high levels of competitive intensity, the relationship between EO and sustainability practices is at its weakest.

*Source:* Author's own compilation

## 8. Results and Discussion

The objective of this study was to identify the factors that encourage and discourage SMEs in Ghana from adopting sustainable practices. Through the use of a SLR, the researcher collected articles that focused on this phenomenon in the Ghanaian context. As part of the study's screening criteria, the keywords 'Ghana', 'sustainable practices', 'sustainability', 'enablers', 'motivation', 'challenges', and 'barriers' were searched on both Taylor & Francis and Emerald databases, focusing on the period 2022 to 2024. Based on the study's screening criteria, only

eleven articles were found to be relevant for this SLR. In addition, from the sample of articles four themes emerged: supply chains were the most prevalent topic, SR was the second most prevalent topic, and green strategy and SBPs were the least prevalent topics.

From the sample of articles in this study, only two articles were found that discuss SBPs in Ghanaian SMEs. Due to the limited number of articles that focused on SBPs in Ghanaian SMEs, this study was unable to adequately address the study's research question. According to Anaman et al. (2023), the adoption of SBP in SMEs is crucial due to their environmental impact on the planet. Caldera et al. (2018) further explains that it has become essential for SMEs to adopt SBPs because of the high amount of pollution that these enterprises produce. For example, a study by Bakos et al. (2019) found that roughly seventy percent of pollution is created by SMEs.

Despite the lack of literature on SBP in Ghanaian SMEs, SBPs have become increasingly important in many developed and developing countries, which resulted in the emergence of SR. According to GRI (2017) and Owusu et al. (2024), SR communicates to various stakeholders the measures and progress the enterprise has made towards addressing its economic, environmental, and social concerns. In addition, according to GRI (2017), SR is important as it enhances the enterprise's transparency with investors and stakeholders. A study conducted by Owusu et al. (2024) explored the different perspectives that SMEs in Ghana had on sustainability reporting (SR). This study found that 65% of SMEs in Ghana reported their economic impact, 26.5% of the enterprises reported their environmental impact, and 23.3% of enterprises reported their social impact.

As a conclusion, this study shed light on a variety of topics related to sustainability in SMEs in the Ghanaian context, such as supply chains, SR, green strategy, and SBPs. In addition, the SLR showed that there is a limited number of articles on this phenomenon in the context of Ghana, particularly in areas such as green strategy and SBPs. Lastly, the recommendations section of this study suggests areas for further research within the context of SMEs in Ghana.

## **9. Limitations**

This study found that there were a limited number of articles available on sustainability that focused on Ghanaian SMEs. As a result, the number of articles analysed for this study's SLR's was low, as only eleven articles were analysed. However, similar studies focusing on sustainability in SMEs also have a relatively low sample size. For example, Opoku- Mensah et al. (2023) evaluated sustainable procurement in Ghana from 2007 until 2023 but only had a

sample size of 25 articles despite focusing on a longer time frame. Another SLR conducted by Martins et al. (2022) focused on developed countries, primarily European ones, and had a sample size of only 42 articles despite the longer time period and the availability of literature on developed countries.

## **10. Recommendations**

- As there are varying definitions of sustainability, this study recommends that stakeholders and students should agree on what sustainability is and what it entails. The lack of clarity regarding sustainability and what it entails has negatively affected the use of this concept (Salas-Zapata and Ortiz-Munoz,2018).
- Additionally, this study found that there was a dearth of literature focusing on SBPs in SMEs in the Ghanaian context, thus this study recommends that more studies should be conducted on this phenomenon in the Ghanaian context.
- A study conducted by Caldera et al .(2018) explains that there is a lack of consensus on what constitutes as SBPS. Furthermore, Caldera et al .(2018) argue that there should be a well-established method that stipulates how SBPs may be incorporated into SMEs. Thus, this study recommends that more studies should be conducted that explore how SBPs may be implemented in SMEs based in Ghana.
- This study recommends that the Ghanaian government should provide support and incentives to SMEs that have adopted SBPs. In addition, this study recommends that the incentives provided by the government should be provided based on SMEs sustainability performance.
- Furthermore, this study recommends that Ghana should create laws and institutional mechanisms that evaluate the progress that SMEs have made towards adopting SBPs.
- This study recommends that more information should be provided to SMEs about sustainability and the impact that pollution has on the country and the region, as this may encourage more SMEs to become environmentally conscious and aware.

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# “Thrifty fit check”: Generation Z's knowledge-attitude-practice gap in second-hand clothing consumption - a preliminary study

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## ABSTRACT

Second-hand fashion consumption is a notable alternative for those seeking a sustainable source for clothing acquisition. This study aimed to examine how young consumers from Generation Z perceived the discourse surrounding second-hand clothing - an area that received relatively limited attention. This paper provided first a literature review of existing theories and then insights from three focus groups. The main findings did not support a consistently positive correlation between the level of knowledge and improved perception or higher frequency of second-hand purchases. Instead, they revealed a gap between knowledge-attitude-practice, which can vary significantly among individuals.

**Keywords:** Perception of second-hand clothing, Generation Z, social media, knowledge-attitude-practice (KAP) gap, Sustainable Consumption Communication (SCC)

## 1. Introduction

For people living in the Western world, mass consumption of fashion is likely not an uncommon concept. Clothes seem to no longer be viewed as a valuable commodity as they were in the past, but rather as disposable objects by modern consumers. The constant turnover of trends and availability of low-cost garments, along with many other reasons, have encouraged consumers not only to purchase more but also to discard clothes at an alarming rate (Vasquez, 2022; **Ozdamar-Ertekin, 2016**). Mass fashion consumption has led to various problems, including strained natural resources, unsustainable and unethical production methods, growing textile waste, etc (Vasquez, 2022).

There are many options for more ethical and sustainable fashion consumption, but these avenues are often inaccessible to a young audience that still needs to prioritize affordability.

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For example, the “slow fashion” market, which is an aspect of sustainable fashion that supports clothing and garment manufacture with respect to people, the environment and animals (Clark, 2008), is also burdened with the seemingly impossible endeavors of defining “truly” ethical and sustainable production. Radicalized approaches such as the zero-waste movement, or minimalism often have little consideration or even trivialize the existence of marginal consumers whose personal styles and consumption principles do not align with them.

As society grapples with the consequences of this relentless pace of consumption, there is a growing awareness of the need for more responsible approaches to fashion consumption, emphasizing quality, longevity, and ethical production practices. Second-hand clothing (often referred to as thrift clothing) with its distinctive attributes emerges as an elegant answer to these problems, continuing to captivate enthusiasts around the world. Since the early 1990s, the second-hand clothing industry has rapidly expanded (Hansen, 2010; NARTS, 2023). Evidence shows that clothing resale is a multi-billion-dollar industry and is among the fastest-growing segments in retail (ThredUp, 2023).

Buying second-hand fashion has always been a topic of much debate. Although embracing second-hand fashion can be a conscious choice that promotes a variety of benefits such as affordability, mindfulness, ethical consumption, and environmental responsibilities, there are certain concerns and risks associated with it.

## **2. Research purposes, specific aims and objectives**

The drive for this thesis was generated primarily by a personal interest. As a student, I am a frequent visitor to different thrift stores in Budapest when I need cheap clothing and accessories. I consider myself to be a mindful consumer, in that I always attempt to lower my frequency of purchases and opt for the choices that I consider to be more ethical. I often reflected upon my second-hand clothing purchases as a somewhat “superior” option to engaging in the mainstream market: with proper filtering the clothes are often very cheap; I feel good about not relying on an apparel industry that perpetuates unsustainable and unethical production practices; and most importantly, they are unique pieces that also align with my personal style.

Additionally, I realized that my preference for second-hand clothing was developed after long-term exposure to thrifting-related content on social media, notably those made by a fashion creator called “*bestdressed*”. Among her most famous videos are “thrift hauls” (showing a collection of items bought in one or multiple visits to second-hand stores), “thrift flips” (altering or tailoring thrifted clothes for sizing or other fashionability-related purposes), and “thrifted

outfits lookbook” (the showing of fashionable outfits consisting of second-hand garments). These contents, which I watched in my adolescent years, totally transformed my view: I went from associating second-hand clothing with hygiene risks, outdated silhouettes and strange patterns to recognizing the significance of the circular fashion industry and appreciating the uniqueness and vibrant personalities that second-hand clothes can bring.

After observing my classmates who have different fashion consumption habits, I wondered if there are any differences between their perceptions and mine, what the driving forces could be among groups who choose to get involved with the second-hand market at different levels, and whether other experienced thrift shoppers also went through the same perception formation process through social media as I did.

Though there have been some previous academic materials done on the motivations and barriers of consumers towards second-hand clothing, there is still room for further examination. One of these shortcomings is the lack of discussion on the gap between a consumer’s knowledge, attitude, and practice of consumption (KAP gap), as well as comparison among groups who choose to commit to second-hand fashion and those who do not, and the recognition of various levels of sustainable consumption awareness within each group. Given the research background and that the purpose of this thesis is to research second-hand shopping, an empirical study with three focus groups is conducted to explore the concepts mentioned above. In particular, the main research questions are formulated as follows:

- (1) Are there any similarities or differences between groups in terms of knowledge, perception/attitude, and consumption practice for second-hand clothing? Why do such differences exist?
- (2) Can social media be recognized as an effective tool for sustainable consumption communication (SCC), capable of bridging the knowledge-attitude-practice (KAP) gap in the second-hand clothing industry?

### **3. Structural outline**

This paper is based on secondary and primary research, providing first a literature review and then insights from three focus groups conducted with GenZ-ers who are at different levels of commitment to thrifting. The following section will deal with the existing literature concerning the perception of the second-hand clothing market in different eras of history, and the background conditions for the revived popularity of thrifting in the 21<sup>st</sup> century. There will also

be an examination of the motivations and barriers to shopping second-hand, and how sustainable consumption communication (SCC) can potentially be used to address the gaps between consumers' knowledge, perception, and consumption behaviors.

The methodology used for this investigation is described and explained in the next chapter. Focus groups were determined as the best strategy for answering the research questions. This chapter will finish with an examination of the methodology's shortcomings and limitations. Following the theoretical framework, next, I will present the findings in a descriptive manner, and interpret what they truly mean. The research questions will also be addressed in this section. Finally, the paper will finish by summarizing the results, evaluating their implications, and making recommendations for future research.

#### **4. The backdrop for the renewed popularity of second-hand fashion**

From my desk research, it is evident that academic research on the topic was sparse in the 20<sup>th</sup> century but has steadily grown in number since the beginning of the 21<sup>st</sup> century. This is no coincidence, as this surge in academic materials occurred around the same time as the destigmatization and revived popularity of the second-hand clothing markets. The revived popularity of second-hand fashion in the 21<sup>st</sup> century was the result of a combination of different factors. However, I will examine two elements that I believe are the most relevant: Generation Z and social media.

##### *Generation Z*

Generation Z, often short as GenZ, is defined as the group of people born in the late 20<sup>th</sup> century to early years of the 21<sup>st</sup> century (Elridge, 2023). As of 2023, this generation is entering the workforce and emerging as the new major consumer generation. There are two big factors that set Generation Z apart from previous generations. Firstly, they are the first generation to grow as true digital natives. Most Gen Z-ers have grown up in a time of ubiquitous access to social media and the digital world (Elridge, 2023). Secondly, in terms of economic background, Gen Z-ers, have been undeniably shaped by the Great Recession of 2007–09 and the COVID-19 pandemic (Elridge, 2023). This has undoubtedly set GenZ apart for their outlook on consumption and consumerism. There has been a shift from ease and volume to an emphasis on quality of consumption with limited financial resources, which is what has been setting the background for second-hand fashion to step back into the spotlight. Additionally, GenZ's

presence on social media in the fashion field is often paired with critics of consumerism, heightened sustainability, as well as environmental and ethical awareness. The act of buying clothing second-hand is now assessed in a different light by a generation that has a growing interest in economical and sustainable fashion consumption. Buying clothes second-hand, or thrifting is viewed as an “ethical” alternative to the “problematic” mainstream realm dominated by fast fashion. Whether or not thrifting is truly a good replacement for mainstream apparel is still a matter of debate, but it is undeniable that buying clothes second-hand has captivated GenZ enthusiasts all around the world.

### *Social media*

Social media have been interwoven into almost every single aspect of our lives, especially that of young people belonging to the Z generation (Kastenholtz, 2021). Social media also play a part in influencing decision-making in the garment sector (Bilah et al 2014). Platforms such as Facebook and Twitter, are the most widely utilized tools for facilitating quick and effective communication, as well as the medium for disseminating information to a larger audience (Merchant, 2012; Irwin et al., 2012; Kimmons, 2014). Hence, the power of such social media could be further harnessed for the benefit of growing the second-hand market. The nature of communication surrounding second-hand clothing, and how its benefits and drawbacks are highlighted on social media, can have influential and sometimes unpredictable impacts on the future of the resale industry. Interest of second-hand fashion and other related agendas such as sustainability, ethical consumption, economic value, etc have been gaining more and more traction on the internet. The sheer volume of content and the growing number of creators specializing in second-hand fashion have undoubtedly increased thrifting’s presence in the fashion realm.

## **5. Potential motivations and barriers for second-hand clothing consumption**

### *Motivations*

The values identified among second-hand clothing consumers include economic motivations, hedonic motivations, and environmental concerns (Hur, 2020, Hansson and Morozov, 2016).

The motivations for shopping second-hand are predominantly believed to be economic factors (Williams, 2003). While not all second-hand shoppers have to rely on second-hand shopping out of financial necessity, it has been proven that those who are skilled at thrifting and buy



second-hand apparel for economic reasons frequently have lower-than-average incomes. (Christiansen and Snepenger, 2005). Apart from economic necessity, Guiot and Roux (2010) also proposed additional economic motivation: the desire to receive products at a fair price and the desire to get more for less (gratification effect of pricing). They also proposed in 2008 that frugality - price concern and being thrifty - was positively associated with economic and critical incentives to shop second-hand.

In most cases, economic and hedonic-oriented agencies often co-exist (Williams and Windebank, 2005), although the degree to which these factors impact each population can vary greatly. Various hedonistic agencies have been identified and examined in previous studies, including concepts such as treasure hunting, originality, nostalgia, etc (Williams, 2003, Bardhi and Arnold, 2005, Roux, 2006). The hedonic pleasure of treasure hunting deriving from shopping in second-hand stores is supported by studies conducted in 2003 by Williams and in 2005 by Bardhi and Arnold. For these shoppers, thrifting is an exciting and fun hobby that allows them to hunt for things that fulfill their desires (wants rather than needs). People treasure uniqueness and individuality, especially in a field that is closely knitted to self-expression and identity like fashion. Clothes in the mainstream markets like fast fashion brands do not provide the same level of individuality and personality as thrifted clothes. Taking this a step further, thrifted retro or vintage clothing was even used to construct an individual identity separated from the mainstream and to show how one belongs to a group of like-minded people (Jenss, 2005). This is why thrifting is often particularly popular among members of certain alternative subcultures, for example, punk second-hand fashion boutiques (Sklar et al, 2022). Nostalgia has also been coined as one of the hedonic agencies that drive people towards thrift shopping. Consumers of fashion may discover hedonic values in their attraction to items that are old rather than new, either because they are thought to be more authentic, have a history, or evoke the past (Roux, 2006).

Some consumers are concerned about resource scarcity and thus want to reject waste and consumption (Roux, 2006). This is a motivation that Guiot and Roux (2010) termed critical motivations as by buying second-hand, they avoid throwing away usable things and fight waste. Buying second-hand clothing is in keeping with their values (Roux, 2006). Overall, there is evidence that there is a rise in environmental concern regarding fashion which in turn impacts consumers' purchases of clothing (Beard, 2008). Yan, Bae, and Xu (2015) also claim that young adults who buy used apparel are more environmentally conscious than non-shoppers. They do, however, comment that environmentalism does not appear to be an indicator of how frequently a customer would buy used apparel. Furthermore, they propose that just because a student is

concerned about the environment doesn't necessarily mean that they are well informed about environmental issues or that they would act on them (Yan et al, 2015).

### *Barriers*

On the other hand, there are various barriers that might prevent consumers from shopping for second-hand clothing, including fear of contamination, the garments' characteristics, and personal values (Roux, 2006, Yan et al, 2015)

The fear of contamination associated with second-hand clothing can be either rational or irrational. For instance, for some consumers, used clothes are associated with being too "contaminated" by the previous owner (Roux, 2006). The psychology of possession reveals that we often imbue owned items with an essence that defines their identity (Hood, 2014). Clothing is considered to be an extension of the self and may symbolize the owner, therefore even when discarded, the "contamination" of the previous owner cannot simply be washed away (Roux, 2006). Furthermore, according to Baxter et al. (2017), fighting irrational fear of contamination with reasoning is particularly difficult. Contamination can also manifest in second-hand clothing in tangible and physical form, such as bad odor, stains, etc. According to Yan, Bae & Xu (2015), the more the previous consumer has touched a product, the more contaminated that garment seems to be, and the less likely customers will purchase it.

Price alone was insufficient to guarantee a consumer's decision to buy used apparel (O'Reilly et. al, 1984), consumers are usually much more likely to purchase clothes that can satisfy multiple utilitarian standards outside of the price factor. The items available in thrift stores are not always in the most modern colors, patterns, or silhouettes, simply because these pieces of clothing have had a previous life before being donated or sold as second-hand merchandise. Other utilitarian factors such as proper sizing and body fit constitute another element that might function as a barrier (Kristoffersson, 2015), since sizing in second-hand garments often falls short of catering to all body types. Even for customers who do not feel the need to be fashion-forward, these characteristics of the garments available can greatly decrease their purchase desire.

Another point of view is that some consumers believe that thrifting through second-hand apparel is a negative thing. Buying second-hand does not indicate thriftiness or saving money to them, but rather the inability or failure to purchase newly made products (Roux, 2006). Furthermore, there exists the belief that second-hand clothing doesn't boost originality, on the contrary, wearing someone else's clothes makes them feel less unique (Roux, 2006).

## **6. KAP gap and SCC discourse in second-hand clothing consumption**

The phenomenon of people being knowledgeable about the issues surrounding a certain production practice (in this case: mainstream newly made garments) but their engagement is not adjusting in accordance has been examined in previous studies and coined the knowledge-attitude-practice gap (short as the KAP gap). Cohen et al (2001) and Vermeir et al (2006) found that there was an inconsistency between the positive attitudes consumer expressed towards sustainability and their behavioral patterns. Thus, consumers' buying behaviors do not reflect their positive attitudes toward ethical products.

“Sustainability is often denounced as a bulky, blurry, fuzzy, ambiguous and wicked term, an empty or buzzword” (Weder F. et al, 2021). Sustainable Consumption Communication (short as SCC) promoting second-hand clothing is particularly challenging because it involves many multifaceted arguments. I believe targeting and addressing the KAP gap can be the key to substantially increasing second-hand consumption. How the KAP gap manifests itself within different individuals can vary greatly, because of people's varying levels of awareness of the complex set of ethical, technological, legal, and societal considerations (Godemann, 2011). Therefore, a one-size-fits-all approach is not feasible, which can make addressing the drawbacks and boosting the benefits of second-hand clothing a much more meandering endeavor. Advocators for second-hand clothing should examine how the motivations or barriers had different levels of influence on individuals to construct a communication objective and plan that can cater to various fashion consumers. Given the indication of connectivity and that none of the listed motivations and barriers above seem to contradict each other, I can summarize all these factors in a framework. I will do this by adapting some elements of Hansson and Morozov's framework in their 2016 paper. The framework is visually demonstrated in Appendix I.

## **7. Methodology**

### *The focus group method & sample characteristics*

An empirical study was conducted on second-hand clothing perception focusing on the correlation between the level of knowledge about second-hand clothing and consumers' perception of it and how different perceptions might influence or alternate consumption behaviors. The focus groups were also meant to evaluate social media as a potential Sustainable

Consumption Communication (SCC) tool, by exploring different groups' level of content exposure on social media platforms.

Each focus group session lasted from 45 to 60 minutes; all discussions were recorded and transcribed. The focus group meetings were friendly and informal in nature, emulating daily conversations. I also decided against video recording of the meetings in hope of increasing the participants' willingness to freely share their opinions. Instead, a note-taking assistant was present at the meetings to document and observe the dynamics, attitudes, and tones of the participants (for example, sarcasm or humor) which could not be displayed in the audio recording. These on-site accounts later further aided me in the interpretation of the content.

Data for the study were collected from a convenient sample based on the researcher's judgment, and the sample was chosen by using personal networks and connections. Given that the research is still at the preliminary stage of the investigation and is exploratory in nature, the sampling is justifiable (Denscombe, 2017). Furthermore, I also believe that this sample consists of people who have a wide variety of perceived motivations and barriers for shopping second-hand.

A total of 15 participants were carefully selected and categorized into 3 focus groups based on their level of involvement with thrifting/second-hand clothing purchases. The first group are Non-Thrifters, consisting of 5 people having no previous experience with thrifting, and only buy their clothes new. The second group are Novice Thrifters, with 6 participants who had little to no experience with thrifting, and do not rely on thrifting to acquire most of their clothes (less than 30% of clothes are thrifted). The third group are Avid Thrifters, with 4 participants identifying as relying on thrifting for the majority of their clothes (more 70% of clothes owned are thrifted) and having shopped second-hand at least once in the last month leading up to the focus group.

The final questionnaires contain 11 questions. The complete questionnaires are provided in Appendix II and III.

### *Limitations*

Now that the main focus of this paper has been clearly stated I have to briefly mention the implicated limitations of my study. Due to my location, the research will be based on the existing resources in Budapest, Hungary. This will account for the selection of the focus group participants. This research focus on retail second-hand stores and briefly mention online

channels, I will be mostly talking about thrift or charity shops as they are prevalent in my geographic research area, even though in practice there can be many other categories of outlets.

The use of a small convenience sample is another significant limitation of this study. I am acquainted with the majority of the respondents. As a result, it is possible that some participants did not express their true thoughts but instead provided a self-filtered response out of respect. Another drawback is that all participants were university students in Budapest who were well-educated and more open-minded. As a result, they did not accurately represent the general public. Furthermore, this paper will exhibit qualitative research as it was found to be the most suitable approach for answering the research question and providing the necessary insights. As a result, the findings of the research should not be generalized, and no statistical inferences should be drawn.

## **8. Findings**

A summary of the study's findings is provided in Appendix IV. Among the total number of participants, 20% had a mixed perception, most people either had a highly positive or highly negative perception of second-hand clothing.

However, all three groups unanimously agreed on the economic value that second-hand clothing brings. No participants expressed any perceived embarrassment or shame towards second-hand consumption; their concerns were mainly reserved for more practical issues, the primary of which is fear of contamination. Furthermore, all 15 participants recognized the risks and concerns associated with second-hand clothing. These barriers were particularly more influential on people of the first two groups, preventing them from purchasing second-hand garments. Avid Thrifters participants had a tendency to compromise and often overlooked some drawbacks that are present in second-hand clothing.

Interestingly, it is not the Avid Thrifters group who were the most conscious about the environmental and social impacts of their fashion consumption habits, or the potential altruistic side that thrifting may bring, but the Novice Thrifters. Compared to the other two groups, the Novice Thrifters seemed to be more knowledgeable about the environmental and social aspects and were overall more mindful and practical consumers. The second group identified economic values as their primary motivations for shopping second-hand, while the Avid Thrifters heavily gravitated towards hedonistic agencies such as fashionability, uniqueness, treasure-hunting, etc.

### *Non-Thrifters group*

The findings confirmed that people who did not engage in the second-hand clothing market often have a negative perception of thrifting. Newly manufactured clothes made up the majority of their wardrobe, and all respondents identified fast fashion brands such as H&M, Bershka, Pull&Bear, etc. as their main source of obtaining clothes. Some other minor sources included hand-me-downs from family members and designer brands.

All five participants recognized the tangible and practical economic value of second-hand clothing. However, to them, the lower price range itself was insufficient to justify purchasing used clothes, due to some risks and concerns. This confirms O'Reilly et al (1984)'s suggestions that price alone might not be sufficient motivation. All participants associated second-hand clothing with negative vocabulary, mainly those related to fear of contamination, which was also the identified primary barrier preventing them from thrifting. Other barriers included culturally rooted superstitions and stigmas (Four out of five participants came from Eastern countries, whose cultures have superstitions about used clothes bringing misfortunes), and outdated or obsolete fashionability that do not align with their personal style.

The participants pinpointed some issues and negative consequences around fashion production practices such as exploited cheap labor and negative environmental impacts. Interestingly, all five participants were aware of and expressed dissatisfaction with some items' low production quality when buying from fast fashion (which is where the majority of their clothes come from), but four out of five participants stated that they were unwilling to modify their purchase patterns and would maintain their fashion consumption behaviors in the future. This has confirmed the existence of the KAP gap, as explained in the previous chapters. Only one participant expressed some interest in potential future purchases of second-hand clothing and other sources such as mid and high-end sustainable brands.

The participants also named some reasons explaining their preference towards newly made clothes, namely fast fashion. These included: accessible price ranges, easiness of finding basic and neutral garments, and the availability of items that could be harmoniously styled with clothes they already owned. Overall, the Non-Thrifters group had a minimalist approach to fashion, were unwilling to explore styles out of their comfort zones, and viewed buying clothes second-hand as something risky, both in terms of hygiene and fashionability.

The Non-Thrifters had a high frequency of engagement with social media, reporting daily use of applications such as TikTok, Instagram, YouTube, etc. They are often exposed to mainstream fashion content such as neutral outfit styling videos, influencers' fashion, clothes hauls, etc.

Social media was also their main source of information about second-hand clothing, and they knew about the growing popularity of thrifting culture. All five participants of this group believed that social media did not have a big impact on their personal style or choice of fashion consumption. Instead, they used social media as a minor additional frame of reference when styling their clothes and creating outfits.

### *Novice Thrifters group*

This group included participants who had had some thrifting experiences in the past and were willing to rely more on second-hand clothing in the future. Overall, the participants who were on the higher end of the commitment spectrum to second-hand clothing held more positive perceptions, while three participants who had purchased less than 3 items were more skeptical and had mixed opinions. Other than thrifting, they also listed fast fashion brands as the main source to buy clothes from. One other minor method of obtaining clothes is hand-me-downs from family members and friends.

The participants associated second-hand clothing with both negative and positive vocabulary. Some respondents mentioned a few hedonic motivations like treasure hunting, but all emphasized that economic value was the key factor driving them to shop second-hand. They were also aware of environmental and ethical issues that were present in the apparel manufacturing industry but admitted that they would have to continue purchasing newly made clothes, especially from fast fashion brands, at least on a yearly basis for intimate items, such as underwear, socks, etc.

All six participants recognized the risks that might be present in second-hand clothing and cited the fear of contamination as the main barrier hindering them from a greater commitment to thrifting. The respondents also expressed some dissatisfaction with the fashionability of second-hand items, as they often had a hard time finding clothes in the right sizes, or modern silhouettes, but to them, this factor was not a make-or-break criterion when deciding whether to purchase an item or not. They are also aware of other negative aspects, such as inflated prices or scamming resellers in online thrifting, etc.

This group has a very practical approach to fashion. They often opted for clothes with a reasonable price range and versatility and were also very adamant about taking good care of the clothes they already owned. They are slightly more willing to experiment with fashion compared to the Non-Thrifters but would likely prioritize practicality over fashionability. This group's members were also knowledgeable about what is considered a high-quality garment:

they paid attention to the materials and tailoring of the fabric, often opted for natural fibers instead of synthetic ones, and were much more likely to purchase an item if they considered the style to be long-lasting or timeless, instead of following trends.

The Novice Thrifters particularly stood out compared to the two other groups because they were very knowledgeable about the environmental and social aspects of fashion consumption. Three out of six participants confirmed that they considered thrifting to be a fun but risky experiment and were actively in search of information before being ready to have any first-hand experience with it. The Novice Thrifters were also the most utilitarian, environmentally, and ethically minded people. This came as a surprise because they still have a low level of involvement and commitment to second-hand fashion as well as other sustainable sources. The second focus group further confirmed the KAP gap in second-hand clothing consumption: a considerable level of knowledge and a positive perception does not always translate into consumption behaviors.

The Novice Thrifters reported a medium frequency of social media usage. They often consumed content on video-sharing platforms like Instagram reels, YouTube, TikTok, etc on a weekly basis. These participants rarely got exposed to fashion-related content on social media. They get information about second-hand fashion from multiple sources, in descending order of importance: word-of-mouth, first-hand experience, and social media. They also considered themselves to possess personal fashion styles that were not easily influenced by social media.

### *Avid Thrifters group*

As predicted, the group with the highest level of commitment to thrifting had a very strong positive perception of second-hand clothing. They believed that shopping second-hand satisfied their fashion-forward nature, and by doing so they were also giving support to an eco-friendly and ethical alternative to the “problematic fast fashion”.

The Avid Thrifters associated thrifting with highly positive vocabulary, which, interestingly, included a lot of specific words pointing to particular subcultures, or individualistic fashion influences. They recognized all the aforementioned (economic, hedonic, sustainability concerns) as motivations to shop second-hand. The participants also made the observation that the second-hand garments that they often came across, most of which were manufactured over a decade ago, had much higher quality compared to newly made clothes nowadays, and they feel like they are getting “more for their buck”. However, it is important to note that all four participants in this group gravitated towards hedonistic agencies, with a heavy emphasis on the



uniqueness of styles and treasure hunting. To them, the economic and personal ideologies factors were more of an additional benefit to the clothes' fashionability and other hedonistic values, which they considered to be an integral and central influence that drove them to commit to shopping second-hand. Furthermore, it could be observed that there was no positive correlation between how cheap an item was and how likely they would purchase it. Some participants stated that they would often go for mid-range priced second-hand garments, believing that cheaper clothes should be reserved for those who financially need them.

To the Avid Thrifters, the perceived benefits are so great that they admitted they often overlooked the concerns, risks, or limitations of shopping second-hand. This group's members were very experimental with fashion, willing to step out of their comfort zones, and much more likely to take risks compared to the other two groups. They were aware of the hygiene concerns, and the fact that they could not mainstream trendy clothes in second-hand stores. They also had a higher tolerance towards items that were not considered to be in prime condition, which otherwise would be passed over if encountered by Novice or Non-Thrifters. Three participants stated that they were even willing to purchase items that might be very oversized on them or might not go with any items in their wardrobe and would try creating experimental outfits from them.

Notably, one participant mentioned that in their culture (in Mongolia), buying used clothes was considered to be a taboo that could bring bad fortunes, and the social norms' pressure had prevented them from purchasing second-hand clothing in the past, even though they had long known about and looked at thrifting favorably, and it had only been a socially acceptable thing to do and a possibility for them since moving to Hungary. This once again confirmed the existence of the KAP gap, but in a reverse manner compared to the one discussed in the Novice Thrifters group.

Unexpectedly, the Avid Thrifters all had a very low frequency of social media usage, with most of the group reporting exclusively using texting applications only to stay connected with friends and family. Three out of four participants did not have a habit of consuming content on social media in the previous 3 months, and the other only came into contact with fashion-related content because of their profession - being a model in the fashion industry. The Avid Thrifters participants cited 90s television series, techno subculture, eccentric Japanese animations, punk rock musicians, etc. as some elements that have had minor influences on their fashion style. However, all four participants considered themselves to have unique individual fashion senses and were able to form their own opinions without any external impacts.

## 9. Discussions

Overall, the findings from the focus group suggest that there exists a correlation between consumers' perception of second-hand clothing and purchase frequency. This is especially clear and observable among participants who were on the two polar ends of the spectrum: People who were highly committed to thrifting held second-hand clothing in much higher regard compared to the other two groups, and Non-Thrifters were more easily subjected to a negative one-sided outlook which often heavily leaned towards the associated risks. The Novice Thrifters generally held positive perceptions, which was what had initially motivated them to experiment with thrifting. However, their opinions were still somewhat laced with skepticism, partly because they were highly practical and utilitarian-driven consumers. It is clear that second-hand clothing is something people often disagree about, since it offers great benefits but also contains certain risks that some cannot accept.

To the Non-Thrifters, none of the perceived motivations can outweigh the barriers. The Novice Thrifters, on the other hand, were particularly focused on economic motivations, while Avid Thrifters were more motivated by hedonic values especially treasure hunting and, uniqueness of clothes. The primary barrier identified among the three groups was fear of contamination. Garments' characteristics were listed as a barrier but were less influential to the more experienced respondents. Because of the generation-specific characteristics in GenZ (see chapter *backdrop for renewed popularity of second-hand clothing*), for all participants, second-hand consumption was not associated with any sense of shame or embarrassment. No one looked down on the practice of thrifting, rather their negative feelings were closer to concerns or fears. Therefore, personal values (see chapter *potential motivations and barriers*) were not considered a pronounced barrier for these participants.

The connection between the level of knowledgeable – perception – consumption practice is more nuanced. The KAP gap (see chapter *backdrop for renewed popularity of second-hand clothing*), was present but manifested in different levels of intensity in three focus groups. In terms of knowledge, all 15 participants possessed more or less some understanding of second-hand fashion and the issues surrounding their consumption habits. To be more specific, the Novice Thrifters were the most knowledgeable about the environmental and ethical impacts of fashion consumption. However, their perception and behaviors do not respond accordingly. In contrast, the experienced Avid Thrifters were less informed but were much more willing to make a purchase. Reports from participants who exclusively buy new clothes were the most

interesting out of the three groups: they were very much aware of the issues connected to how they sourced their clothes but were unwilling to alternate their consumption practices.

The study also identified two other key elements that could potentially be utilized: first-hand experience and word-of-mouth. Some participants reported changing their outlook after visiting thrift stores in person, mainly fueled by hedonic agencies. Many others revealed that they had negative perceptions and were unwilling to purchase second-hand clothing in the past, but had been influenced by friends, families, and other close members in the same community and gradually held thrifting in higher regard and started purchasing frequently.

With the absence of first-hand experience, the media would play a dominant role in spreading information about second-hand clothing. However, there was no solid evidence proving social media can be an element capable of influencing consumers' perceptions and alternating consumption behaviors in the second-hand garment sector. The more experienced participants displayed concrete individualistic preferences and opinions, and social media's influence on them was minimal. The SCC incentives that the participants were exposed to were somewhat effective in spreading information and knowledge but often failed to leave long-lasting impacts on perception and consumption practice.

## **10. Conclusions**

### *Research aims and objectives*

This paper sets out to investigate shopping for second-hand clothing. In particular, this research looked upon the knowledge, perception, and consumption practice and how they might be affected by SCC or be linked to one another.

In particular, the main research questions are formulated as follows:

- (1) Are there any similarities or differences between groups in terms of knowledge, perception/attitude, and consumption practice for second-hand clothing? Why do such differences exist?
- (2) Can social media be recognized as an effective tool for sustainable consumption communication (SCC), capable of bridging the knowledge-attitude-practice (KAP) gap in the second-hand clothing industry?

With this paper, I strived to confirm the current literature as well as expand on it and develop a new framework based on the results. Therefore, I undertook qualitative research by conducting

3 focus groups with GenZ participants who had different levels of involvement with second-hand clothing. However, I first completed an investigation on the already existing theory. The review started with the historical perception of second-hand clothing, and the background conditions for the revived popularity of thrifting, then different motivations and barriers were examined to give a broad picture of the KAP gap and how SCC can potentially be utilized. By summarizing and structuring the given material, I was able to put together a descriptive framework that offered all the relevant details.

Based on my study's results, several fundamental conclusions can be drawn. The Novice Thrifters group had the highest level of knowledge, the Avid Thrifters had the most positive perception, and the highest rate of consumption. The Non-Thrifters had the lowest level of all three elements. There were several similarities among the three groups, however, the differences were stark and existed for a multitude of reasons, including personal fashion style, personal ideologies, cultural background, etc. These concepts were all discussed and examined in detail in chapters *findings* and *discussions*. Social media cannot be recognized as an effective tool for SCC, since there was no concrete proof of its ability to bridge the knowledge-attitude-practice (KAP) gap in the second-hand clothing industry. Even though social media was identified to be the main source of information, indicating its potential to raise the level of awareness and knowledge for CSS incentives, its impacts on the perception and consumption practice of second-hand clothing were still very minimal.

#### *Implications and future research*

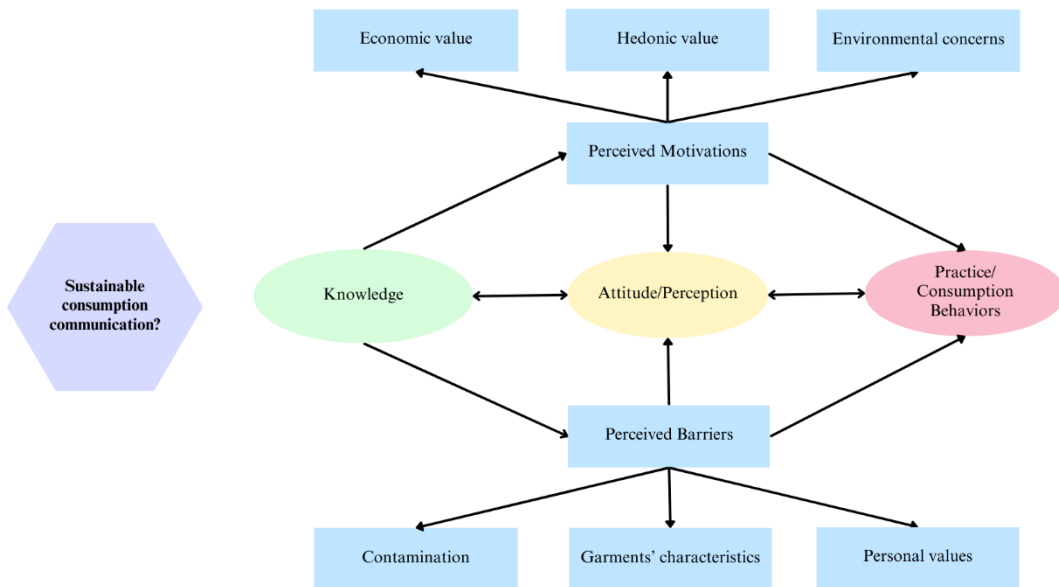
The outcomes of this research can facilitate a better understanding of the differences in perception formation and consumption behaviors present in the industry. As indicated in the previous chapters, how the KAP gap manifests in each individual can be vastly different, meaning SCC cannot be a one-size-fits-all approach. The study suggested that SCC in the field of second-hand clothing is still ineffective, and advocates for second-hand clothing should closely examine how the motivations or barriers had different levels of influence on individuals, in order to construct a communication objective and plan that can cater to various categories of fashion consumers.

Due to some limitations of the focus group method, I suggest that future research can be conducted using more thorough methodologies capable of examining a more representative population. Some participants of the focus group mentioned culturally rooted stigmas, which can be a worthwhile area to investigate, for example, an exploration of how cultural norms

affect people's willingness to buy and wear second-hand items. Domains connected to legal issues surrounding second-hand clothing are also one area that has yet to receive academic attention in my opinion. Some dimensions such as copyright issues, product labeling, consumer protection laws for second-hand shoppers, etc. can be of great value to investigate. These research ideas can provide valuable insights into the complex and evolving world of second-hand clothing perception and consumption.

## 11. Appendices

**Appendix I.** Frameworks summarizing the concepts stemming from the literature, as adapted from Hansson and Morozov (2016)



*Source:* As adapted from Hansson and Morozov (2016), modified by the author

### **Appendix II:** Questionnaires used in focus group Non-Thrifters.

Q1. Form a word cloud: What comes to your mind when “second-hand clothing” is mentioned?

Q2. What is your perception of buying second-hand clothing/thrifting?

Q3. What attributes are important to you when you choose fashion products?

Q4. Which sources do you often get your clothes from?

Q5. What characteristics come to your mind when you think of second-hand clothes?

Q6. What are the factors that motivate you to shop for new clothes?

In your opinion, what positive impacts can second-hand clothing make?

Q7. What are the factors that prevent you from shopping second-hand? In your opinion, what negative consequences can second-hand clothing have?

Q8. Where do you get your information about the second-hand clothing industry?

Q9. What social media platforms do you use? What types of fashion or sustainability-related content are often displayed on them?

Q10. What impacts does social media have on your fashion consumption habits?

Q11. Hold up 1 to 5 fingers depending on how much you disagree or agree with these statements: 1 = totally disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree, 5 = totally agree

- Second-hand clothing cannot be an integral part of my personal style.
- I know about the environmental and social impacts of my fashion consumption.
- I will continue to buy newly made clothing in the future.

### **Appendix III: Questionnaires used in focus groups Novice and Avid Thrifters**

Q1. Form a word cloud: What comes to your mind when “second-hand clothing” is mentioned?

Q2. What is your perception of buying second-hand clothing/thrifted?

Q3. What attributes are important to you when you choose fashion products?

Q4. Which sources do you often get your clothes from?

Q5. What characteristics come to your mind when you think of second-hand clothes?

Q6. What are the factors that might motivate you to shop second-hand? In your opinion, what positive impacts can second-hand clothing make?

Q7. What are the factors that might prevent you from shopping second-hand? In your opinion, what negative consequences can second-hand clothing have?

Q8. Where do you get your information about the second-hand clothing industry?

Q9. What social media platforms do you use? What types of fashion or sustainability-related content are often displayed on them?

Q10. What impacts does social media have on your fashion consumption habits?

Q11. Hold up 1 to 5 fingers depending on how much you disagree or agree with these statements: 1 = totally disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree, 5 = totally agree

- Second-hand clothing is an integral part of my personal style.
- I know about the environmental and social impacts of my fashion consumption.
- I will continue to buy second-hand clothing in the future.

**Appendix IV. Summary of findings**

<b>Non-Thrifters</b>	<b>Novice Thrifters</b>	<b>Avid Thrifters</b>
Very negative perception of second-hand clothing, high level of commitment to purchase new clothes.	Overall positive perception of second-hand clothing, low level of commitment to purchasing.	Strong positive perception of second-hand clothing, very high level of commitment to purchasing secondhand clothing.
Recognized practical and tangible economic benefits of thrifting, did not understand hedonic or sustainability as motivations.	Recognized all discussed values as motivations to shop second-hand. High emphasis on economic motivations.	Recognized all discussed values as motivations to shop second-hand. High emphasis on hedonic motivations.
Believed that the benefits is not worth overlooking the risks.	Identified the barriers as the reasons for low engagement.	Choose to overlook some barriers as a compromise to obtain unique clothes.
Associated second-hand clothing with negative vocabulary, mainly including practical risks and concerns	Associated second-hand clothing with both negative and positive vocabulary (including some related to economic and sustainability values).	Associated second-hand clothing with mainly positive vocabulary, mainly including those emphasizing hedonistic agenda.
Social media as main source of information about second-hand fashion. High frequency of social media usage and usually exposed to mainstream fashion content	Social media and first-hand experience and word of mouth as sources of information. Medium frequency of social media usage usually exposed to both mainstream and second-hand fashion content	First-hand experience and word of mouth as main source of information. Very low frequency of social media usage, and low level of exposure to second-hand clothing content.

*Source:* Results of the author's own research

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## **List of abbreviations**

SSC - sustainable consumption communication

KAP - knowledge-attitude-practice

GenZ – Generation Z

# Food waste management in restaurants: A case study of H.N. Vietnamese restaurant in Budapest

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## ABSTRACT

The global problem of environmental degradation necessitates full assessment across all sectors, encompassing food waste, which involves multifaceted environmental, economic, and social consequences. This study examines the significant issue that concerns food waste management in the restaurant sector, with a case study on H.N. Vietnamese restaurant located in Budapest. It provides insight into the factors that influence food waste generation and handling among employees and the customers, as well as the effectiveness of current food waste control approaches and expose difficulties and challenges during the management process. After a two-week measuring and monitoring period the volume of H.N.'s food waste was calculated, which was roughly 1157 kg, with an average of 82 kg per day including food waste is explicitly classified. The survey answers and collected data of the measurement help the restaurant comprehend the cause and impacts of the food waste production, which stems from awareness, understanding of menus and dishes, eating and ordering habits as well as how customers handle leftovers, while from the staffs, in addition to lack of awareness and proactive in management, practical measures lack feasibility and are hindered by cost, fixed cooking recipes, cultural and technological barriers. Simultaneously, the study revealed positive associations between awareness and concern regarding food waste and both age and education level. The interview also suggested the information about existed methodology and modified the management in the stages of inventory, menu and portion planning, staffs and customer's engagement, and composting with some specific food waste. The recommendations can reduce costs and human resources, increase operational efficiency, and improve the position of the business, bringing a good image to the brand, especially in the context of the environment and sustainability, which are top priorities in every sector.

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**Key words:** food industry, food service, restaurant, food waste, sustainability, consumer, responsible consumption

## **1. Introduction**

Resource conservation and environmental challenges are currently the top concerns for the worldwide society. Rapid growth in industrialization and urbanization lead to increased resource exploitation, environmental destruction, amplification of the greenhouse effect, and detrimental effects on human health. As a result, waste management and treatment are two essential components of environmental preservation that demand more attention in relation to an upsurge in production and consumption.

The most recent available reference year, 2010, generated estimates of 7 to 10 billion tons of solid waste from homes, businesses, industries, and construction. Of this total, half was composed of waste produced in industrialized and high-income countries such as Western Europe, America, Japan, Oceania, and so forth. (GWMO, 2015). The EU as a whole produced 2.3 billion tonnes of garbage in 2018, comprising waste from residences and all forms of industrial activity. In the EU, this equates to roughly 5.2 tons per person (Eurostat, 2018).

There are numerous ways to produce food waste, and because of the interplay of various variables such as consumer behaviours, food production and distribution methods, and national waste management policies, it can be difficult to identify the primary source. However, the food service sector in Europe produces 14% of the total food waste of the whole continent, which can be attributed to left-over packaging policies, client demand variations, and portion limitations in restaurants, hotels, and other food service enterprises (European Environment Agency, 2020).

It is apparent that the service industry, which primarily consists of hotels and restaurants, is one of the major contributors to food waste. This holds especially true in the context of the flourishing growth of the food service, tourism, and other related industries. The hospitality sector in the European Union generated more than 12 million tonnes of food waste in 2010 (Oliveira et al., 2016). Plus, there is a direct correlation between the growth of tourism and the quantity of food waste produced by the hospitality industry (Manomaivibool, 2015). In the instance of Mallorca, a 1% increase in visitor arrivals results in a 1.25% increase in trash creation, of which food waste makes up the majority (Arbulu et al., 2016).

In this case, the region under study is Budapest, the capital of Hungary, a country in Central Europe experiencing an economic transition. Being an intersection of culture and politics, Budapest is also a desirable travel destination with extraordinary resources available for tourists (Vedran Milojica et al., 2022). However, statistics and reports about food waste of the Hungarian hospitality sector are incredibly scarce. The Wasteless Project, run by The National Food Chain Safety Office (Nébih), provides compensation for food consumption, management, and use. With this information, one may somewhat assess how customers generally behave when it comes to food consumption in restaurants and lodging establishments. The results of a 2016 study show that the average Hungarian wastes 68.04 kg of food annually, of which 48.70 percent (or 33.14 kg/capita/year) might have been avoided (Szabó-Bódi et al., 2016). Comparable statistics were also investigated in Finland and Greece, where it was found that each country could cut its annual food waste per capita by 23 kg (Koivupuro et al., 2012) and 25.9 kg (Abeliotis et al., 2019).

Rich and diverse culinary scene is being enhanced by an increasing number of new firms from different areas bringing new ideas to the table. Therefore, H.N. - a Vietnamese restaurant in Budapest is the subject of this study. In contrast to other European restaurants, it features a menu that is designed differently, and the foods it offers have distinct portions and food ratios that may impact how much food is wasted as a result of customers' eating habits.

This study will clarify the problem of food waste at a Vietnamese restaurant in Budapest by analysing the current situation, significant contributing factors, and measures for mitigation. Restaurant operations involve intricate supply networks, complex culinary processes, interactions with customers, and an in-depth understanding of their demands and behaviours. The specific way in which these habits result in food waste is still unclear, which makes developing efficient intervention strategies more challenging.

A thorough evaluation of the wider economic effects is also required, covering the processing, storage, and possible cash gains from food waste management initiatives. Food waste causes financial difficulty for H.N. given that it involves costs for purchasing, storing, processing, and discarding leftovers and misplaced food. Due to differences in meal amount distribution and nutritional value, patrons of Vietnamese restaurants will be influenced by how they are perceived as general Asian restaurants in terms of food waste.

The impact of H.N.'s business model on food waste management initiatives and their efficacy will also be examined in this article from the viewpoint of restaurant employees at all levels. The elements will be examined within the context of Hungary and Europe as a whole. For the purpose of trying to determine the most multifaceted viewpoint and the source of the issue, there will also be a comparison with data on food waste and food waste management in Vietnam. Understanding and eradicating food waste in this context provides benefits not only for H.N.'s operations but also for other food and beverage businesses in Budapest, particularly Asian restaurants. The knowledge gathered from this study will help establish sustainable practices that benefit the industry and are adopted by companies operating in the same sector.

With the goal of developing a multifaceted protocol to better understand the elements that lead to the production of food waste, the primary analytical components that were chosen for the study include the measurement of the amount of food that is wasted, along with the surveying of customers and restaurant employees. In the concluding stages, there is an in-depth interview with the proprietor of the company, during which the company will analyse and assess the efficiency of the management strategies that are now in place, aside from learn about the challenges that the restaurant is currently facing and make recommendations for the future.

## **2. Literature review**

This literature review aims to give a concise overview of the condition of food waste today and the wide range of research that has been done on the subject. Under the research object of an H.N. restaurant, a Vietnamese restaurant in Budapest, Hungary, the literature will examine the environmental, human health, and monetary consequences of food waste, as well as the methods for managing and treating food waste in the hospitality industry. Additionally, this study will look at the deeper impacts on food waste generation, unsolved issues with food waste treatment, their practical applications, and their solutions. This review of the literature will involve three main topics addressed. This is a brief overview of the challenge of sustainable development and the situation of environmental impacts in the food service industry today. The management of food waste in restaurants and Hungarian context are the next discussed. Finally, an examination and study of food waste in restaurants within H.N. case study.

### **2.1. Key definition**

FAO (2014) introduced the definition of food loss as "a decrease in quantity or quality of food," whereas food waste is a component of it. Food waste has unique motivations and solutions that



differ from food losses. Food waste can occur at all stages of the food supply chain, from manufacturing to consumption. Food waste refers to food that passes safety and nutrition requirements but is wasted or alternatively used. The GMA/FMI effort, established by the Grocery Manufacturers Association (GMA) and Food Marketing Institute in 2012, has provided a clear definition of food waste as "Any solid or liquid food substance, whether in its raw or cooked form, that is discarded or intended to be discarded." Food wastes refer to the organic leftovers that are produced during the many stages as in Figure 1, each stages including many specific steps of food processing, handling, storage, sale, preparation, cooking, and serving.

**Figure 1:** *Food supply chain*

*Source:* Environmental Protection Agency

In their 2013 research on the US’s food waste, BSR defined food waste as the quantity of food

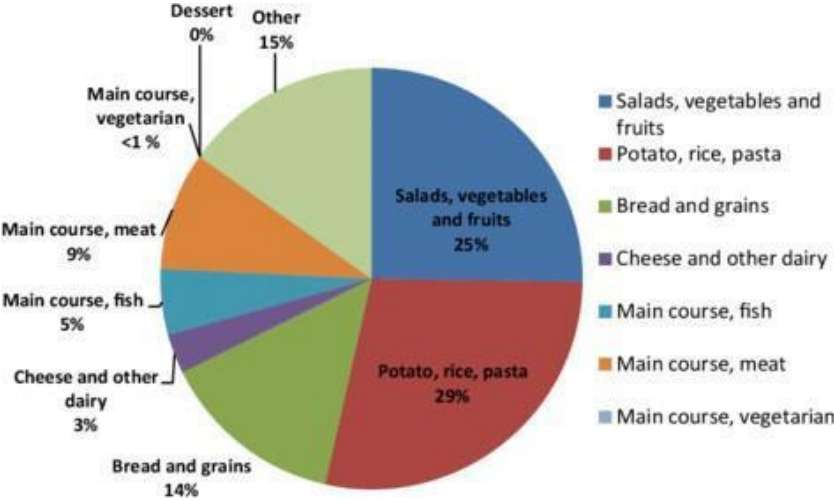


that is "disposed of, whether intentionally or out of necessity," regardless of whether it is in solid or liquid form, or whether it is raw or cooked. Food waste encompasses the organic remnants, such as vegetable roots or peels, that are produced during food production, handling, storage, sale, preparation, etc. Food loss and waste occur throughout the consuming period as a result of the surplus of food purchased by customers, restaurants, and caterers that remains uneaten (Brian Lipinski et al., 2013).

The concept of total food waste represents both preventable and inevitable food waste, also the portion of food waste that is nutritionally deficient and inedible (Peter Lee et al., 2013). Conforming to WRAP, reversible food waste refers to the amount of food that is discarded and continued to be edible before getting tossed away. These waste of food can be diminished by implementing more accurate portioning, effective management, appropriate storage, and meticulous preparation. Edible food items such as crusts and skins from baked potatoes and bread are discarded and end up in the waste bin due to their undesirability (Peter Lee et al., 2013). Food waste often includes inedible components, such as meat bones, egg shells, and used tea bags. An analysis conducted in Finland by Silvennoinen and colleagues in 2015,

illustrated in Figure 2 revealed that the largest portion of unconsumed food items falls under the carbohydrate-rich classification, specifically potatoes, rice, and pasta (29%). Furthermore, salads and vegetables constitute a major share (25%), indicating a trend among diners to leave behind huge amounts of these essential components of a healthy diet.

**Figure 2:** Contribution of the customer plate leftovers in restaurants and diners in the context of Finnish food service sector



Source: Silvennoinen et al., 2015

As stated by the BSR (Grocery Manufacturers Association and Food Marketing, 2013), any food that has been taken out of the main distribution route and may or may not have been processed through product reclamation centres is classified as unsalable. Unmarketable food can be produced throughout the manufacturing and distribution process. For instance, errors made during the manufacturing process can lead to food that is completely safe and fit for consumption, but cannot be marketed due to concerns related to its quality, excessive production, or labelling problems. Donations of raw materials and incomplete goods that are still safe for human use but do not meet retail standards are another good example. In the course of delivery and retail operations, the exterior packaging of food products might get damaged, making them unsellable but perfectly edible. You can still eat food that is not fit for sale because it is either too old, has defects, or is nearing its expiration date (Le Lan Phuong, 2017).

In terms of food leftovers and food waste in general, institutions can be approached to process them through recycling or composting if they are eligible. The Food Bank in Hungary,

established in 2016, has disseminated 340,000 metric tonnes of food, amounting to a total worth of \$67.4 million (equivalent to 20.3 billion HUF). The project has successfully offered aid to over 340,000 individuals through collaborations with 325 non-governmental organisations and municipalities. The organisation distributed 4,800 metric tonnes of donated food in 2016. Food waste reuse or recycling include the procedures of composting, transforming waste into animal feed, and repurposing waste oils for fuel generation. From 2017, Tesco in Hungary contributes to animal shelters with a combined total of 45 supermarkets and 11 smaller outlets. Since 2013, these enterprises have provided animal shelters and wildlife parks with meat, dairy products, eggs, baked goods, and vegetables.

## **2.2. Food waste and environmental management in food service sector**

In 2019, SOFA provided a definition for the concept of food waste as the decrease in the quantity or quality of food resulting from the choices and behaviors of suppliers, food service providers, and consumers. In particular, the amount of food waste can be influenced by consumer culture, waste management strategies, and the economic composition of each region. However, it frequently accounts for a significant portion of garbage generated by both enterprises and households. The processes of producing, manufacturing, distributing, and retailing food all result in greenhouse gas emissions. Greenhouse gas emissions are also produced by food that is disposed of in landfills. The decomposition of the buried food releases methane into the atmosphere, a greenhouse gas 28 times more potent than CO<sub>2</sub> (European Commission)

Food waste is turning into a worldwide issue that affects natural resources, contributes to pollution, complicates climate change, and has major socioeconomic and environmental ramifications (Batool et al.,2024). In 2021, the United Nations Environment Programme (UNEP) identified that a significant amount of food waste is generated by the food service industry (approximately 244 million tons). This waste is largely attributed to the diverse settings in which food is consumed away from home, making it prone to waste (Heikkilä et al., 2016). The scope of food services extends beyond traditional venues like restaurants, hotels, and cafes (Wang et al., 2018), encompassing cruise ships (Li & Wang, 2020), various events (Pirani & Arafat, 2016), and street food vendors (Alfiero et al., 2020). Additionally, food services are provided in educational and workplace environments, where food is served in their canteens and cafeterias, often managed by external contractors (Derqui et al., 2018). Despite ongoing efforts to quantify food waste, comprehensive data collection remains a challenge,

with many areas still underexplored (Dhir et al., 2020). Notably, data on waste from street food vendors is scarce, despite its considerable contribution to the food market in several countries, particularly in Asia and Africa (Filimonau et al., 2023). Following the Covid pandemic, food delivery services have seen robust growth, yet data on food waste within this specific sector remains notably limited. Filimonau and colleagues pointed out that this gap in research hinders the establishment of food waste benchmarks, making the issue increasingly challenging and problematic to address.

Multiple associations are involved in the production and reduction of food waste (Filimonau et al., 2023). To make food waste reduction a reality, these stakeholders may be involved in the stages of food service provision, transportation, or waste treatment that result in the generation of food waste, but their involvement is also intimate and active (Bhattacharya & Fayezi, 2021). The most effective approach for addressing the issue is stakeholder participation (De Visser-Amundson, 2022). To address food waste more successfully and optimally, the previously mentioned cooperation contributes to the professionalization and improvement of the food supply chain's responsiveness and resilience (Filimonau, 2021).

In 2019, approximately 931 million tons of food, which represents 17% of the total food available to consumers, was discarded by households, retailers, restaurants, and other food service providers (UNEP, 2021) while at least 238 million people experience severe food insecurity as a result of food shortages that follow. According to the European Civil Protection and Humanitarian Aid Operations (2023), this number has increased by 10% from 2022. The amount of food produced in Sub-Saharan Africa (230 million tons) is almost equivalent to the amount of food wasted by industrialized regions in North America, Europe, and Asia (222 million tons), based to a concerning UNEP analysis. While other environmental issues are constantly being highlighted, this contrast raises concerns about the deteriorating condition of food waste and has not received much public attention.

Food waste has had significant environmental impacts, both directly and indirectly, such as contributing to the release of greenhouse gases, causing deforestation, soil erosion, and polluting the air and water (Schanes et al., 2018). Food waste not only takes up space in landfills, as is evident, but it additionally emits methane, a greenhouse gas that contributes considerably to global warming (Swinburne and Sandson, 2019). Reducing the quantity of food waste produced while properly applying the concepts of reduce, reuse, recycle, and recover is

key considering good food waste management is a prerequisite for enhancing environmental protection (Ahamed et al., 2016). Food waste recycling, which is most commonly used to reduce environmental impact, primarily through anaerobic digestion and composting of organic waste (Lin et al., 2018), facilitates the development of a complete circular food system and, more scientifically, results in less waste output and fewer inputs into the food production system. Regardless of efforts to implement recycling techniques, the United States' municipal solid waste in 2017 had over 41 million tons of food waste, of which only 6.3% were thought to have been composted (US EPA, 2019). Food waste recycling offers multiple benefits, yet the process may not be practical or safe until waste classification is ensured to occur in an absolutely accurate manner, meaning the input does not consist of hazardous materials or other sorts of material (Thakali et al., 2022). Strict adherence appears to be challenging because environmental contaminants can readily infiltrate the food chain, resulting in food waste during manufacturing, processing, packaging, distribution, and retail, or by consumers during disposal or as a result of inadequate separation from other wastes, consisting of foodservice and packaging items (Thakali and MacRae, 2021).

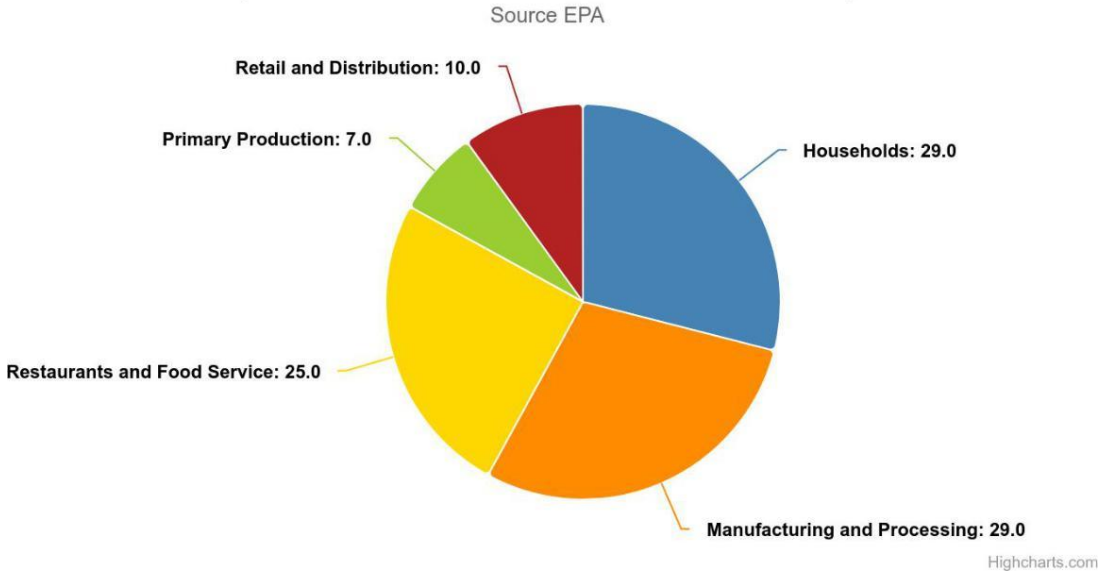
According to World Food Program USA (2021), the quantity of water lost throughout the food manufacturing process is sufficient to fill Lake Geneva thrice. Meanwhile, cereals account for the majority of the water used and produced in the agricultural sector (Mekonnen and Hoekstra, 2011). Results of a worldwide study carried out by FAO in 2011 that investigated the food production and consumption cycle from post-harvest to consumption were released in 2013. 81% of food is estimated to be lost or squandered. This amount of food accounts for 23% of global fertilizer consumption and 250 x 10<sup>9</sup> m<sup>3</sup>/year of water resources (52% of which are used for cereal cultivation) (FAO, 2013). Along with fruit and vegetables, which account for 75% of recorded water loss, grains comprise 57% of overall food waste generated (Kummu et al., 2012).

### **2.3. Hotels and restaurant's food waste and its management**

Food waste has not received as much attention or concern as the other waste categories we have examined and learned about thus far, even though the United Nations Environment Program (UNEP) Food Waste Index Report 2021 states that a billion tons of food are wasted globally each year. The stages of food supply chains that involve consumption in middle-class and high-income countries, production in industrialized countries, and production, storage, and transportation in low-income nations are where a large proportion of food waste happens (Gustavsson et al., 2011). It is astounding to learn that one-third of the food produced worldwide

is wasted or lost. The global challenges of pollution, waste, loss of nature and biodiversity, and climate change must all be addressed by reforming the food system (UNEP, 2022).

**Figure 3:** *Estimated Food Waste Generated in Ireland in 2021 (percentage/food supply chain stage)*



*Source:* Environmental Protection Agency

Figure 3 illustrates the percentage of food waste produced in the food service industry in Ireland in 2021. Restaurants and food services account for 25% of the nation's food waste, which is extremely high, following behind food waste generated by households, highlighting their substantial contribution to food waste metrics. It is known for a fact that the food service industry's internal structure and complexity intensify the seriousness and complexity of the food waste problem (Filimonau et al., 2023). Fine dining, casual dining, and fast service businesses are the restaurant subsector's main contributors of food waste (McAdams, von Massow, Gallant, & Hayhoe, 2019). Filimonau et al.'s 2023 discussion of the variations between the aforementioned business strategies also reveals an effect on the reason beyond food waste. More precisely, food waste occurs primarily at the consumption stage in quick-service restaurants, but it frequently occurs in the kitchen of high-end or hotel restaurants (Charlebois, Creedy, & Massow, 2015). Due to the sensitive specifications of the meals, which only allow for the finest ingredients to be taken, dishes that are exquisitely made and come from upscale hotels or catering services frequently result in waste during the preparation and processing stages. ingredients, but food services in the bottom segment will concentrate on using ingredients to minimize costs. On the contrary, the two groups' diets differ significantly in terms

of quantity, which results in a different amount of food waste being produced during the consumption stage. This is especially true for low-cost restaurants and food services where customers are more likely to leave leftovers because of the larger portion sizes, common ingredients, and flavors.

Moreover, there are notable distinctions in the motivations behind food waste between large, professionally run, chain-linked businesses and small, independently owned or family-run firms (Filimonau et al., 2023). When considered on an equivalent size, the resources, management effectiveness, and utilization of chain branches can vastly surpass those of standalone, non-specialized business models, resulting in distinct food waste production and approaches to the issue (Ritzer, 2018). For the purpose of to get more accurate and thorough data, Betz et al. (2015) divided trash from two businesses (in the business and education sectors) into seven categories and four categories (storage losses, preparation losses, serving losses, and plate waste). food and measured over a duration of five days. The analysis revealed that 7.69% of the volume of all meals served was lost in the process chain in company B (commercial sector) and 10.73% in company A (educational sector). Consequently, waste that might have been avoided is categorized as 91.98% in company A and 78.14% in company B. Serving leftovers, mostly carbohydrates and veggies, results in the highest rate of waste.

The main factor driving wasted food in storage from the kitchen, suppliers, food management organizations, and staff members who produce food is food deterioration (Tomaszewska, Kołożyn-Krajewska, and Bilaska, 2020). From an economic standpoint, food suppliers are incentivized to overorder due to bargaining power and negotiation disparities, particularly for small-scale enterprises and partners of a similar size (Krivcova, Pettit, & Florinau, 2019). When food is kept in excess and not eaten before its expiration date, it deteriorates (Filimonau et al., 2023).

The hotel and restaurant industries have long been important to modern society's socioeconomic structure since they provide the eating needs of those who are out-of-home (Filimonau et al., 2021). Multiple studies have demonstrated that the hospitality industry produces a considerable quantity of environmental pollution and excessive utilisation of natural resources (Chou et al., 2012). The hotel and restaurant industry generates approximately 12 million tons of food waste annually, accounting for almost 12% of the total; residences and the food industry follow in second and third place, respectively (Oliveira et al., 2016).

In the 2019 study, Filimonau and de Coteau identified the main obstacle to the wider adoption of environmental management concepts in hotel operations as the relatively small to medium size of many hotel businesses. The same year, study by Filimonau et al. confirmed that managers are reluctant to actively participate in environmental conservation and doubtful about its necessity due to the hospitality industry's lack of hospitality and limited resources. The flow and exchange of knowledge might be restricted by improperly formed management networks (Shaw & Williams, 2009). Hotel firms operating in the service industry are disadvantaged by their low understanding of environmental management strategies (Legrand et al., 2017). Managers find it challenging to emphasize the areas that need intervention in order to mitigate the increasing environmental effect of hotel enterprises (Filimonau et al., 2019). This makes it more difficult for managers to prioritize and transfer internal resources as efficiently as possible while minimizing negative environmental effects, according to Tzschentke et al. (2008).

According to Heikkilä et al. (2016), there are a variety of internal and external elements that might contribute to food waste and loss during various phases of restaurant operations. These factors include processes and operational procedures that take place prior to, during, and after the kitchen (Filimonau & de Coteau, 2019). There are notable distinctions and impact from national markets. A study of casual dining restaurants in Brazil indicated that reducing food waste worked best when food had been offered by a particular weight (Matzembacher, Brancoli, Maia, & Eriksson, 2020). When applying to a different nation, this cannot be applied entirely. For instance, despite being specialized by big enterprises, hot pot is a common meal custom in Asia that is particularly prone to waste because of its ingredient-rich nature (Filimonau, Zhang, & Wang, 2020). As a result, each market requires a different application and strategy to the problem, and cultural considerations related to cuisine are exceptionally important. Carefully evaluating specificity from a market, economic, and cultural standpoint is necessary for an accurate analysis of food waste (Dhir et al., 2020). As indicated by Papagyropoulou et al. (2016), comparative studies must thus concentrate on a variety of markets in order to identify the most appropriate approaches and define the scope of application. However, the existing shortage of such research and its lack of updates make this process highly ambiguous.

As a result of not adopting comprehensive measures to address sustainability, Robinson et al. (2023) revealed that the hospitality industry has also been accused of greenwashing. Furthermore, a lack of assistance and additional funding has historically made it difficult for



independent restaurants and small and medium-sized businesses (SMEs) to adopt programs that offer comprehensive sustainability value (Chan, 2011; Meager et al., 2021). Although Alcorn's 2014 study demonstrated that applying green practices in restaurants has the potential for positive effects for both employees and consumers., the pressure to increase the sustainable impact contributed by the restaurant industry is remained an unanswered question (Maichum et al., 2016). Basic methods first concentrate on handling food waste, extra ingredients, or rotten food. The government or other parties are then responsible for managing this food waste.

Food waste in the foodservice industry worldwide has long been thought to be substantial, but its precise amount has remained unknown (Parfitt, Barthel, & Macnaughton, 2010). Food service companies neglect to concentrate on tracking the quantity of food that is wasted with diligence (Filimonau, Krivcova, & Pettit, 2019). Food waste is an operational concern that has not received enough attention from management and executives (Principato, Pratesi, & Secondi, 2018). This is also due to the fact that food waste computation techniques are not scientific or provide unreliable results, and quantifying food waste in practice is still difficult (Papargyropoulou et al., 2019). For example, during 'peak' season in a busy restaurant kitchen, quantifying food waste and its major streams can be challenging, if not impossible. Additionally, the layout and design of the restaurant have an impact on how much food waste is calculated. For instance, a buffet or hot pot restaurant's kitchen will be more complex than a traditional restaurant with a simple menu.

Research on consumer attitudes and behavior would have a greater impact, according to other studies, since suppliers can encourage their customers to act in more environmentally friendly ways by offering them financial and ethical incentives (Kallbekken and Sælen, 2013). These studies also suggest that customer plate waste makes up a larger portion of all food waste. Furthermore, several other reasons, including individual tastes (Wang et al., 2018), portion control issues, and overordering (Kallbekken & Sælen, 2013), also contribute significantly to the decision made by customers to cause food waste. Following WRAP (Jayne Cox and Phil Downing, 2006), customers fall into three categories of wasting food: high (30%), middle (27%), and low (43%). After conducting 1,862 interviews, Jayne and Phil identified three key food waste groups: young professionals (16-34), full-time workers (42%), young families (25-44), parents (45%), and social renters (typically those in social class DE) (35%). The report identified four primary conclusions as follows. Firstly, those who exhibit indifference towards food waste may do so due to their minimal disposal of food, their perception that food waste is

not a significant issue, their belief that it is an unavoidable occurrence, or their aversion to the risk of illnesses related to food. Secondly, the group that is troubled by this issue might attribute their concerns to three main factors: the waste of financial resources, the feeling of wasting "quality food," and a general sense of shame. Thirdly, the issue of food wastage cost does not significantly worry the responders. Finally, It is notable that the relationship between environmental concern and behaviour change remains uncertain.

Currently, the most common approaches to mitigate food waste consist of the following: modifying on the quantity and the ratio of ingredient and portion, reusing ingredients in a safe and reasonable form in accordance with food safety regulations, actively recycling or collaborating with other organizations, and apply composting technology in solid food waste treatment. However, the implementation of compost technology necessitates substantial investments in infrastructure, advanced technology, and standardized processes, in addition to physical space and adequate area. According to Papagyropoulou et al. (2016), a cleaning firm or a private rubbish collection service would be examples of the third. Food waste separation from ordinary landfills should therefore be prioritized (Sakaguchi et al., 2018). Focusing on strictly controlling supply and predicting sales volume to serve the import of goods is one of the measures that brings long-term efficiency and is a premise for subsequent operating stages. Besides, the significance of individual actions in positively influencing food waste management is emphasised, as well as their responsibility and value. By highlighting and promoting responsible food consumption and shopping, Filimonau & de Coteau additionally make reference to the instruments of behavioral economics and consumer psychology in addition to the two methods already discussed. Local government support and company readiness are two intimate elements that are challenging to balance to ensure that actions are implemented effectively (Filimonau et al., 2019; Heikkilä et al., 2019; Heikkilä et al., 2016; Tatano et al., 2017).

## **2.4. Hungarian & Vietnamese context**

### **2.4.1. Food waste management in Hungary**

Measuring food waste will necessitate more effort and professionalism from larger, chain-connected food service firms. The explanation for this is the fact that when it comes to environmental protection, they frequently create rigid organizational goals (Filimonau, Todorova, Mzembe, Sauer, & Yankholmes, 2020). Nonetheless, small, independent, or family-run foodservice firms make up the majority of the industry (Camillieri, 2018). These companies'

owners are unlikely to invest in environmental advances like measuring and managing food waste unless they are devoted to environmental conservation (Filimonau, Todorova, et al., 2020). Certain estimates of food waste (FW) in the global foodservice industry are derived from country- and regional-specific reports published by different government agencies and industry associations, such as WRAP (2020) for the UK, Sustainable Restaurant Association SRA (2010), and ReFED (2018) for the US. Regardless, the accuracy of these reports has been undermined due to the fact these analysis often rely on self-reported methods for assessing food waste announced by WRAP in 2015. Estimates of FW produced by "independent companies," such as family-run restaurants and small- to medium-sized dining establishments, are uncommon. This is a significant omission given that these companies dominate the worldwide foodservice industry (Filimonau, Todorova et al., 2020).

The food and beverage industry is a substantial sector of the Hungarian economy, according to EMIS (A Euromoney Institutional Investor, 2015). It ranks third in manufacturing sector production and second in terms of employment size. Its share of the overall industrial output was 10.3% in 2014. From starting point of the pandemic in 2019 until 2022, when it was contained, a total of 4,382 establishments in the food service sector ceased operations. This represents a decrease from the initial count of 51,329 catering units (2019) in the industry to the latest figure of 46,947 (2022).

**Table 1:** *The total amount of catering units in Hungary from 2019 to 2022*

Year	Restaurants and buffets	Confectionaries	Taverns and music club	Public catering units	Workplace, even and mass catering unit	Total catering units
2019	25.325	4013	15.688	45.026	6303	51.329
2020	25.065	4037	14.659	43.761	6429	50.19
2021	23.792	4016	13.385	41.193	6731	47.924
2022	23.181	3949	12.618	39.748	7199	46.947

*Source: KSH - Hungarian Central Statistical Office*

The World Athletics Championship, which was held in Budapest in 2023, attracted more than half of the approximately 230,000 foreign overnight reservations (Hungary Today, 2023). This represents the most remarkable development since the conclusion of the Covid-19 pandemic, and economy, tourism, and service sector repercussions are beginning to gradually improve. This phenomenon yields substantial advantages for the tourism sector as a whole and the restaurant industry specifically, which shows promising future expansion as demand for dining and travel progressively regains popularity.

Likewise to other European nations, Hungary faces a significant difficulty with food waste, which has not been fully addressed despite the FUSION project's establishment to investigate the phenomena of FW in the EU-28. The evidence is that, despite being one of Europe's unique cultural and tourism hubs, Hungary is among the ten EU-28 nations that do not provide any information on food waste. With the tourism industry booming in the wake of the pandemic, the economy is drastically changing. Similarly, a more recent investigation carried out by Bori (2018) revealed that Hungary wastes nearly 2 million tonnes of food each year, although it was unable to accurately quantify the portion attributed to food services.

52% of the companies in Hungary that responded to the study stated that they kept track of food loss measurements; 9.7% of them said they could calculate the losses, and 20% said they could specifically calculate the amount of damages; however, 8.6% of respondents gave a completely negative response, indicating that there is no way to estimate the damages and that it is impossible to determine the data from the records (Kurthy et al., 2021). According to data from the Hungarian National Tax Office in 2016, another study was also carried out with a focus on businesses in the food industry; however, it is thought that this study does not accurately

represent reality, as small and micro enterprises make up a significantly smaller proportion of the business sector than large and medium-sized businesses, which account for a proportion that is quite high (Kurthy et al., 2021). This makes sense because big businesses can more readily communicate their ideas with the public and have greater access to surveys. Larger businesses are also more interested in this topic, seeking knowledge and solutions as well as gaining more expertise in waste management, since they deal with the issue of food loss and its harm more than small and micro businesses do.

In 2021, Filimonau and Sulyok conducted a study in Veszprem, Hungary, and the majority of the participants confirmed that the primary factor causing a significant amount of food waste to be generated is consumer behavior. The relationship between this component and variables like eating habits, portion sizes, and individual preferences (Filimonau, Todorova, et al., 2020). On the other hand preparing more food than needed is the result of errors in demand planning leading to food waste, which was recognized by Pirani & Arafat in 2014. Seasonality should be taken very seriously for this driver, particularly as the two places under discussion - Budapest and Hanoi, are both well-known travel destinations with distinct high and low visitor seasons. Cooking becomes a priority when traveling when you want to save money, nevertheless, as self-sufficient low-cost travel with an emphasis on budget tightness is becoming a global trend and even surpassing package tours (Günter Spreitzhofer, 2010). This implies that dining out will not be the best option for this particular set of travelers. Since eating out is no longer the favored option for tourists—at least not in the recent past—restaurants and food service organizations must modify their food budgets to prevent food waste or excess, even during the busiest travel seasons. Furthermore, most food is left over from dinner service during the low season, especially at restaurants that serve a la carte menus, as contrast to lunch, which has a set menu and clientele. (Sulyok & Florinau, 2021). The À la carte menu format is widely acknowledged to be a contributing factor to food waste, and it makes perfect sense in the Hungarian setting (Filimonau, Fidan, et al., 2019). The same exists for Vietnam, a country well-known for its diverse cuisine that includes a lot of foods that travelers find challenging to eat. With the case study of the H.N. restaurant, the research object possesses all the previously described attributes, including a fixed lunch menu, plus à la carte menu, and Vietnamese foods. The primary target audience for this research is Hungarian, main customer segment that the case study serves.

#### **2.4.2. Food waste management in Vietnam**

In the first quarter of 2018, approximately 25% of the food produced in Vietnam was lost before it could reach processing factories or distribution sites. The total estimated losses amounted to 8.8 million tonnes or US\$ 3.9 billion, which is equivalent to 2% of Vietnam's GDP and 12% of its Agriculture GDP, according to CEL Consulting (2018). It is a frequent occurrence to observe individuals at food and beverage establishments disposing of leftover food into containers that have covers, while wastewater is carelessly poured down the drain or discarded on the roadside, resulting in the degradation of Hanoi's aesthetic appeal. Urban management has led to environmental degradation and public outcry. Hoi An, Vietnam's preeminent tourist destination, documented a total of 1500 kg of waste, with restaurants accounting for 46% and hotels accounting for 22%. Approximately 46.79% of the garbage consists of kitchen waste. Based on an analysis of collected data and surveys, CEL Consulting concluded in 2018 that the fruit and vegetable industry experienced the most significant rate of loss, equivalent to 32% or 7.3 million tonnes annually. Generally, the meat statistics indicate a quantity of 694,000 tonnes per year, which accounts for 14% of the total. Similarly, fish statistics show a quantity of 804,000 tonnes per year, equivalent to 12% of the total.

Another large-scale metropolis in Vietnam is Ho Chi Minh city, which has the per capita food waste rate ranges from 0.9 to 1.38 kg/person/day, with food waste accounting for approximately 50% to 55% (approximately 0.5 to 0.76 kg /person/day) (Thi, 2015), and about 83–88.9% of Ho Chi Minh City's food waste was ended up in landfills. Out of the substantial quantity of food waste, only 10% is utilized for compost manufacturing. Currently, waste classifying in Ho Chi Minh is primarily ignored. The complexity of everyday activities, paired with the frequent occurrence of these activities, along with the inadequate distribution of infrastructure and the absence of proper waste treatment procedures, present challenges in organising waste storage and containment for separating food waste from other types of solid waste (Ngoc Bao Dung Thi et al., 2017).

**Table 2:** *Volume of municipal solid waste, composition, and ratio of food waste generation per capitain selected cities in Southeast Asia*

City	Da Nang	Hanoi	Ho Chi Minh City	Bangkok	Phnom Penh
Year	2018	2015	2018	2016	2015
Population (1000 persons)	1080	4371	8100	9166	1446
Food waste fraction (%)	57.3	57.3	65.7	47.6	51.9
Collected/landfilled municipal solid waste (tons/day)	994	4980	9400	10,130	1121
Food waste generation rate (kg/day.cap)	0.52	0.65	0.76	0.53	0.40

*Source:* Ngoc Bao Pham et al., 2021

When comparing the rate of food waste generation in Da Nang, a famous tourist destination in Vietnam with 7.94 million visitors in 2023 (Ngo Anh Van, 2024), to other big urban areas in Vietnam (Hanoi, Ho Chi Minh City) and other developing country's cities in Southeast Asia (Bangkok, Phnom Penh), it is evident that Da Nang has an immensely high level of food waste generation (Ngoc Bao Pham et al., 2021). In 2016, despite Bangkok having a population nine times larger than Da Nang, both cities had a similar amount of food waste per person. Despite Ho Chi Minh City having a population eight times larger than Da Nang, its per capita food waste generation rate was just 48% higher.

The variation in lifestyle, solid waste management practices (including the handling and disposal of food waste), as well as the attitudes and understanding of the local population in Da Nang, may account for this discrepancy when compared to other cities. Simultaneously, the tourism sector in Da Nang is experiencing rapid growth and faces the potential danger of becoming unmanageable due to an anticipated surge in tourist numbers, projected to reach 8.4 million individuals by 2024 (People's Newspaper, 2024).

The pre-recycling procedure has either not been implemented or has not been implemented comprehensively from the initial phase, leading to inadequate food processing and preparation in restaurant and hotel kitchens. Uyen Vu's 2022 study has demonstrated that it is possible to fully utilise all components of food, including those that are considered unhealthy. However, the majority of individuals choose to opt for discarding such

components. Hotel restaurant operators are sometimes criticised for neglecting to prioritise food optimisation due to the low food prices in Vietnam, despite the fact that the food service industry yields very large profits. Hence, it is comprehensible to discard a withered vegetable, a damaged piece of fruit, and similar items.

The highly competitive nature of the out-of-home food consumption market, especially at the local scale, makes it impossible to control portion sizes, design portions for different subjects, and cook on demand. effective. The example of Veszprem is a testament because of the small city size, most food service operators are located close to each other, the customer base is long-standing and the majority are local regulars (Filimonau & Sulyok, 2021).

Certain enterprises that impose certain conditions, such as IHG Hotels & Resorts, have undertaken initiatives and launched campaigns to provide sustenance to the most impoverished communities in Vietnam. Their charitable network ensures that food from community hotels is not wasted and is instead utilised to sustain a variety of individuals. When businesses in the hospitality industry initiate efforts to address the critical matter of surplus food, educate communities about food security and sustainability, and donate meals to underserved individuals in Vietnam, this is a positive sign, particularly when these initiatives originate from large, influential, and widespread enterprises. Such initiatives set a positive example for other businesses to emulate.

The literature described above discusses a number of comprehensive research on food waste management in the restaurant industry. However, it indicates that there is still a lack of thorough study. Given the unique characteristics of a Vietnamese restaurant in terms of food preparation, cultural significance, and the consumer and staff behaviour, it is necessary to adopt specific food waste minimization measures for this particular case study in Budapest. This literature review emphasises the necessity for a more profound comprehension of these distinct circumstances in order to develop more efficient, considerate, and multifaceted strategies for managing food waste. This study aims to fill the existing knowledge vacuum by conducting a comparative examination of the factors that impact food waste in this varied culinary environment.



### **3. Methodology**

#### **3.1. Goal and scope of the study**

As stated in the literature review, food waste in the food service sector may originate from two sources: consumers and food suppliers, particularly in hotels and restaurants. For this study, the research will examine both the perspectives of customers and the restaurant, including staff and owners.

A study was conducted to analyze the food waste and food waste management practices of H.N. restaurant, with four primary objectives. Initially, the project will clarify the level of food waste at H.N. restaurant by manual monitoring, classification, and measuring techniques. Secondly, the study will investigate the factors and incentives behind the generation of food waste by both customers and restaurants. It will focus on the relationship between customers' consumerism and the amount of leftover they generate and their attitudes toward it. Also, it will explore the connection between work habits, recipes, culinary methods, and employee culture in relation to food waste creation and management. Thirdly, the research will review the efficacy of H.N.'s existing food waste management procedures and identify the challenges encountered by restaurants, along with the constraints limiting their food waste management efforts. Eventually, the research will include the assessment of both customers and restaurant employees, and ultimately suggest practical and most effective approaches for H.N. to mitigate food waste, multidimensionally.

With the intention to achieve the goals listed above, the research will apply qualitative methodologies and quantitative analyses parallelly. This study has been limited to the geographical area of H.N. restaurant. The data in this study were obtained by the administration of questionnaire surveys, personally online interviews with one of two business owners, and manual measurements.

#### **3.2. Data sample and data collection**

##### **3.2.1. Data sample**

The interview with Mr. Vo Hai, the owner of the restaurant, was conducted online and complied with a predetermined set of questions. On March 27, 2024, the interview was conducted out, and a voice recording was made afterward. In compliance with the proprietor's desire, certain

information concerning the restaurant's suppliers, imports and exports, and profits is kept confidential.

Food waste of H.N. was carefully observed and documented from February 12 to February 25, 2024. Food waste was retrieved from the food waste containers in two cooking zones, two dishwashing zones, and two preparation zones. In addition, the number of items with leftovers on the plate is recorded and counted as well as classified as vegetarian and non-vegetarian. The restaurant's ordering system also tracks and approximates the number of clients served each day during the period of measurement.

The targeted sample size of the customer survey was 100, while the actual sample size consisted of 111 responses. The customer survey (called Survey 1) is participated in by customers who have visited the restaurant within 1 week and are between the ages of under 18 and over 65 years old. Significant variations exist in food waste behaviors among different generations. A study conducted by T.E. Quested and colleagues in 2013, titled "Spaghetti Soup: The Complex World of Food Waste Behaviors" revealed that individuals aged 65 and above who suffered food shortages during or after World War II waste approximately 25% less food compared to the rest of the population. As a result of limitations related to language and time, the survey received a limited number of replies from participants aged 65 and older, accounting for only 3.6% (4 responses). Despite its favorable position, H.N. is rarely frequented by visitors. Thus, many poll respondents were local residents and regular guests.

The employee survey (Survey 2) obtained responses from a total of 22 restaurant employees across several departments, including the kitchen area (cooking and preparation), dishwashing area, service area (front of the house), and the managers. The difference in age and awareness between restaurant staffs reveals valuable insights into their work ethics and perspectives on the issue of food waste.

### **3.2.2. Data collection**

Primary data of this study includes two questionnaire surveys, one in-depth interview and food waste measure data.

The survey data was collected and determination followed by data collection analyzed in two distinct steps: preliminary and analysis. The questionnaire has been developed using the author's direct observations as a supervisor of service staff during a position of internship.

This experience involved observing customer behavior regarding leftover food on their plates, as well as monitoring the generation of food waste by staff members and their preferred ways of handling this food waste. The questionnaire is organized into three sections, which include demographic information, awareness and perception of the environment and food waste, and habits related to consuming and handling food waste/leftovers.

The fundamental objective of the initial part of Survey 1 involves identifying key variables associated with the influence of customer behavior, habits, and perceptions on the generation of food waste, particularly in relation to leftovers. Leftovers are recognized as a major contributor to food waste, accounting for a substantial portion, with a significant amount of it being edible. For the identification step of Survey 2, the purpose remained identical. It is important to acknowledge that the creation of food waste during food handling, which includes storage, processing, cooking, and serving, is unavoidable. Although these losses may not be clearly visible as production from customers, they still need to be taken into account. An evaluation will be conducted on the causes of food waste in restaurants, focusing on the employees' level of consciousness and work practices, as well as the cultural elements, rules, and recipes followed by the establishment. The pilot-testing procedure was conducted by distributing the task to ten participants. Once the feedback on the questionnaire, confusing questions, and definitions were gathered, all necessary modifications were implemented.

Firstly, from March 18 to March 24, Survey 1 was conducted using a Google form and distributed to H.N. after they order food using a tablet with the form interface enabled and ready to fill out. The form is specifically created to be completed within a time frame of 5 to 7 minutes, matching with the time frame for waiting for the customer's food. This ensures that time is not wasted and the customer does not experience any discomfort. Additionally, the completion of the form is based on a voluntary spirit. In the meantime, Survey 2 was administered by distributing it to employees through text messages within the internal program Base. Employees who are elderly or have difficulty with language will be provided with a tablet or phone. This device will contain a pre-prepared form that they can easily fill out. Alternatively, an interpreter will be available to explain the questions in the survey form and record their replies.

Secondly, on March 26, 2024, the compilation of interview questions was finalized for the first time and discussed through email correspondence with Mr. Vo Hai. The interview was conducted on March 28, 2024 at 5:30 pm in Budapest via Google Meet, after obtaining consent

for the list of questions. The entire conversation was videotaped. Further discussion was held regarding some additional side questions.

Finally, the data collected on the actual amount of food waste of H.N.. Between February 12 and 25, 2024, monitoring and measurement were used to uncover the quantitative data regarding H.N.'s food waste scenario. The number of customers served each day within 2 weeks of measurement is also monitored and estimated by the restaurant's ordering system. As an intern shift supervisor, the author was granted access to H.N.'s waste management area, specifically the section dedicated to handling food waste. H.N. categorizes and separates food waste into three specific areas: the cooking area, preparation area, and dishwashing area. There are a total of two cooking areas, with two trash bins allocated to each area for the purpose of storing food waste while cooking. Similarly, two trash bins are positioned in each of the two preparation areas. In regards to the dishwashing section, there are two designated locations. Apart from the two standard bins, a smaller bin is utilized specifically for storing leftover vegetarian dishes. In addition, a fixed amount of food waste every day based on the restaurant's recipes and principles is transferred directly to the general trash bin at the end of each day. In a further step, the author records and categorizes the specific amount of items that leftovers existed (excluding packaged ones) using vegetarian and non-vegetarian labels, with the help of two dishwashers. At end of each day during the experiment period, with assistance from fellow staff members, the weight of every garbage bin is measured manually using a 30kg scale. On the other hand, there were a few situations where the amount of waste surpasses the capacity of the scale and cannot be subdivided into smaller portions for weighing (despite the oversight being minor), the measurements obtained are considered relative. The collected food waste components include: two types of vegetarian and non-vegetarian leftovers, food waste generated during the cooking process, food waste generated during the preparation process and fixed food waste including bones and vegetables used to make broth for noodle soup and other dishes. Cooking oil is changed every two days, transferred to another area and handed over to another partner for processing.

### **3.3. Data analysis**

The volume data obtained from the measurement provides insights into the food waste situation in H.N., including the specific volume of each type of food waste. This allows for comparisons to be made, such as identifying which ingredients are most commonly left over and comparing the leftovers of vegetarian and non-vegetarian foods. This outcome enables the computation of

the mean quantity of food waste per day for a single guest (with the number of guests per day recorded by the ordering system). Furthermore, the act of observing and documenting leftovers from both vegetarian and non-vegetarian groups aids in determining the rate at which leftovers are left behind for these two dietary categories. Answers from the interview are typed in writing as well as taken notes during the interview process. Missing or confusing information is updated and discussed via internal software Base (already included in the interview text).

Data from the questionnaire was analyzed using SPSS 26 software. Three stages of data solving were involved: identifying unreliable surveys, coding and processing data, and analyzing the data. The study applied statistical analysis techniques such as frequency analysis, descriptive analysis, mean and standard deviation calculation to achieve its objectives. Aside analysis from sociodemographic information, the causes of food waste also consider customers' eating and ordering habits, as well as the working habits and perception of restaurant staffs. Additionally, attitudes towards and management of leftovers, as well as the frequency and description of food waste, are considered to assess the influence of various factors.

Demographic data of Survey 1 includes age, gender, education level, employment status and income. Demographic data of Survey 2 includes age, gender and work position. Survey 1 includes a section on eating and ordering patterns, which provides details on the frequency of dining at the restaurant, preferred meal times, ordering preferences, frequency of leaving food uneaten, eating preferences, and factors influencing the decision not to consume food that remains. The following section of Survey 2 comprises an evaluation of team members' awareness and working habits, as well as an assessment of the restaurant's food waste situation and its management. Finally, a section asking about potential food waste treatment and reduction methods was included at the end of the form in both surveys, contributing to the evaluation and discussion of the recommendation.

### **3.4. Research questions**

Five research questions will need to be answered by the collected data:

RQ1: What is the magnitude of H.N.'s food waste?

RQ2: What are the primary sources of food waste and specific key drivers?

RQ3: How does H.N. manage their food waste and how effective are the current practices?

RQ4: What challenges and limitations does the restaurant encounter in managing food waste?

RQ5: Which feasible measures can be applied to enhance food waste management in H.N.?

## **4. Results and discussion**

### **4.1. Introduction about the H.N. case study**

The case study revolves around H.N. restaurant, a Vietnamese restaurant situated in District 11. One notable advantage is the restaurant's strategic location in a bustling region that is home to various universities, offices, and the Allee shopping centre. In addition, it is also surrounded by conveniently located traffic crossings leading to the city centre and bustling areas. The restaurant was founded in 2013 and has since been recognised as one of the top Vietnamese restaurants in Budapest, Hungary. It is highly favoured by both locals and visitors and has received high ratings on Trip Advisor (4.5 out of 5 stars) and Google (4.75 out of 5 stars).

The restaurant runs from 10:00 to 21:00, offering a selection of authentic Vietnamese cuisine and meals prepared in the traditional Vietnamese cooking style. During weekdays, specifically from Monday to Friday, between the hours of 11:00 and 15:00, clients are provided with an expanded selection for their office lunch. In addition to the regular a la carte menu, customers can choose from a variety of reasonably priced lunch options. These options include a package of dishes accompanied with soup. The costs for these lunch menus, along with a drink, range from under 4000 HUF per meal.

The capacity of the restaurant is 105, which may be expanded to handle up to 110 seats by adding extra chairs. The restaurant undergoes its highest levels of activity during the time period between 11:00 and 14:00, and between 18:00 and 20:00. The restaurant personnel presently engages a total of 22 people, consisting of 2 co-owners and managers, 9 service team members, and 11 people working in various roles within the kitchen, including preparation, cooking, and dishwashing sections.

The Pho noodle soup, which is the most renowned Vietnamese cuisine, is available in two sizes: medium and big, and remains the top-selling item. Once customers have specific requests, the restaurant consistently attempts to accommodate them. This includes providing smaller portions for children or preparing dishes without certain ingredients that the customer prefers not to have. Nevertheless, there are still several issues with the volume and size of food that H.N. presently offers to customers. The restaurant prioritises cost minimization and optimisation, as well as striving to best utilise materials in the process of cooking and food preparation. Their menu went through multiple revisions and redesigns. However, the business owners

acknowledge the need for more cautious adjustments due to unresolved issues which will be further examined in the following section.

**4.2. Food waste measurement**

**4.2.1. Volume of food waste (FW)**

**Table 3: Types of food waste**

Type of FW	Quantity (kg)	Percentage
Leftover	544.8	47%
FW cooking	50.8	4.4%
FW preparation	81.1	7.0%
Fixed FW	420	36.3%
Cooking oil	60	5.2%
Total	1156.7	100%
Average FW/day	82.6	Total guests in two
Average FW/guest/day	0.22	weeks: 5198 people

*Source:* from findings of the study

The data acquired from the 2-week measuring experiment indicates that the volume of food waste accumulated is 1156.7 kg. The primary category of food waste is leftovers, which amount to 544.8 kg, constituting 47% overall. The cooking procedure generates a total of 50.8 kg of food waste, representing 4.4%. This food waste can be attributed to either overcooked or burnt food, or faults committed during the cooking process. The preparation process leaves 81.1 kg of waste, which accounts for 7% of the overall volume containing the peels, trimmings, inedible or unused parts, and others food that is discarded during the preparation phase. The quantity of garbage generated by cooking oil is 60 kg, corresponding for 5.2% of the overall waste. This is most referring to the disposal of used frying oil or extra grease. Furthermore, a substantial proportion of the trash is categorized as 'Fixed FW', totaling 420 kg, representing 36.3%. This category is referred to unavoidable waste, including bones and vegetables that are boiled to create the broth for Pho soup and other dishes, considered the indispensable part of H.N. and the core of the menu. The restaurant generates an average of 82.6 kg of food waste (FW) per day, providing a quantitative measure and an indication of the daily scale of waste. Considering the total of 5198 guests in two weeks, the waste created by each individual guest is relatively small, 0.2kg per guest. Nevertheless, when combined, these individual contributions result in a substantial amount of food waste. The per guest waste metric is essential for directing waste reduction efforts towards consumers, particularly through initiatives aimed at adjusting portion sizes.

#### 4.2.2. Leftover classification and the ratios

The table in the previous section clearly demonstrates that leftovers constitute the largest share of overall food waste, reaching to 544.8kg. The implementation of separate waste containers in the dishwashing area allows for the collection of more precise data regarding leftovers, categorized according to vegetarian and non-vegetarian labels.

**Table 4:** *Types of leftover*

Type of leftover	Quantity (kg)	Percentage
Vegan leftover	93.9	17.2%
Non-vegan leftover	450.9	82.8%
Total	544.8	100%

*Source:* from findings of the study

The amount of leftover food from two varieties of vegetarian food and non-vegetarian food is 93.9 kg and 450.9 kg, respectively. However, to determine the further details, the total items sold, the total items with leftovers, and the classification of each of those items.

**Table 5:** *Total sold items*

Items	Quantity (kg)	Percentage
Vegan items	1039	8.1%
Non-vegan items	11388	88.4%
Lunch menu items	459	3.6%
Total	12886	100.0%

*Source:* from findings of the study

The restaurant sold 1,039 vegan items, which makes up 8% of the total items. This relatively low percentage might reflect a smaller demand for vegan options. It is comprehensible that just 1% among those questioned in Hungary adhere to vegan dietary guidelines, as indicated by the statistical data released by Nils-Gerrit Wunsch on Statista in 2023. On the other hand, a recent survey conducted by the University of Nyíregyháza in 2022 reveals that between 4% to 6% of Hungary's population currently follows to a vegetarian diet. An additional study published in World Population Review estimated that vegetarianism comprises approximately 5% of Hungary's population, or approximately 450,000 people (2024).

In relation to the lunch menu, a handful of three meal sets is available to accommodate students, office workers, and other laborers in District 11 to provide guests with a diversity of options



and a quick and convenient lunch . Each set contains a starch-based option (such as noodles or rice), a main dish, and an adequate serving of soup. Basic meals averaging between 2,000 and 4,000 HUF, comprising either a single dish and a beverage or a single dish and a main course. Even though the lunch menu is available from 1:00 pm to 3:00 pm, the standard menu is still offered during that time. The lunch menu is accessible Monday through Friday. Each day, there are three alternatives to choose from. One of these options is unique to that day and is only served once a week. The other two options are repeated twice during the week, appearing on another day of the week and this menu is fixed every week. There were 459 items sold from the lunch menu during the 2-week experiment, which is an average of approximately 46 lunch sets sold.

The non-vegan items had the highest sales position, with a total of 11,388 items sold, representing an astounding 88.4% of the total purchases. This indicates a significant customer inclination towards H.N.'s non-vegan cuisine and these are the primary choice for the restaurant's customers. Nonetheless, the ratio of uneaten food among those mentioned food categories provides new insights on the tendency to leave leftover food based on menu choices.

**Table 6:** *Items with leftovers and ratio on creating leftovers*

Items with leftover	Quantity	Ratio of leftovers created by type of food (items with leftover/total items)
Vegan	295	28.40%
Non-vegan (lunch not included)	1512	13.30%
Lunch	112	24.40%
Total	1919	15%

*Source:* from the findings of the study

Due to the given table, it is evident that non-vegan foods at H.N. Vietnamese restaurant contribute to a substantial quantity of leftovers, accounting for 1512 items, which is equivalent to 78.8% of the total items with uneaten food left. Remarkably, the proportion of leftovers for vegan foods has a higher percentage (28.4%) compared to non-vegan items (13.3%). This implies that although non-vegan items constitute the majority of leftovers in terms of amount, vegan items are more prone to being left over relative to their sales frequency. An empirical study was done to emphasize the most commonly neglected components of vegetarian cuisine. It is compared before and after being given to the customer's table. These parts are side dishes consisting of rice and noodles, stir-fried vegetables, and braised tofu. While another type of tofu served which is fried tofu, is not commonly found in post-consumer portions that reach the dishwashing area.

This suggests that the portion size of vegetarian dishes sets barriers either in terms of quantity or taste. One possible explanation could be that Vietnamese-style vegetarian foods contain flavors that are not as familiar to local diners. Also, the portion size may be substantial in relation to the customer's appetite level. The implicit recognition of the diminished starvation among those adhering to a vegetarian diet may contribute to the higher occurrence of leftovers in vegetarian dishes. In 2005, Karen Collins and R.D reported that vegetarians generally have a lower body weight compared to meat-eaters. Furthermore, the calorie intake of these individuals decreased by approximately 200 calories per day upon adopting a vegetarian diet.

Recently, there has been an increasing trend towards vegetarianism and the consumption of plant-based goods. This shift is driven by a heightened awareness of the need to protect the environment and ecosystem, as well as a recognition of the potential health benefits for humans (A.Saari et al., 2021). Yet, ultimately, not everyone chooses to adopt a vegan lifestyle. Non-

vegan diners may occasionally order vegan foods out of curiosity, but they may not always find them as enjoyable as their usual selections.

The lunch items exhibit a significant leftover ratio of 24.4%, despite the sale of only 459 meals. This implies that, on average, 11 lunch items remain unconsumed completely per workday. A study conducted by Le Lan Phuong in 2017 revealed that customers have a propensity to discard between 10% and 20% of their meals when they are presented with a set menu. The menu varies between different days of the week and avoids repeating meals, however it remains consistent on a weekly basis. The fixed menu may become repetitive for customers who visit frequently during lunchtime, resulting in a decline in their motivation to complete their meals. The lunch consumer base primarily consists of office workers, university students, and a certain number of manual workers, resulting in potential variations in their appetite. Due to limited time, customers frequently desire a meal that is convenient, compact, and time-saving. The lunch menu is a good choice for this reason. However, the portion sizes provided are considered generous by H.N. for lunch can be perceived to be excessively large.

### **4.3. Results from the surveys**

#### **4.3.1. Sociodemographic characteristics**

Two Google forms were administered, resulting in 111 responses for Survey 1 (Customer Survey) and 22 responses for Survey 2 (Employees Survey). All the answers are acceptable and none of the responses needed to be excluded.

Regarding the nationality component of Survey 1, it was stated in the introduction that a majority of responses would be from frequent customers and local individuals. However, due to the diverse and multi-ethnic composition of the citizens, the collected answers are varied and distinct. Particularly, 69.3% of the participants hold Hungarian nationality, while the remaining 30.7% are from various European, Asian, and African nations.

**Table 7: Socio-Demographic data of Survey 1 (Customer Survey)**

Age	Frequency	Percent	Cumulative Percent
Under 18	7	6.3%	6.3%
18-24	35	31.5%	37.8%
25-34	29	26.1%	64.0%
35-44	16	14.4%	78.4%
45-54	12	10.8%	89.2%
55-64	8	7.2%	96.4%
Above 65	4	3.6%	100.0%
<b>Gender</b>			
Female	60	54.1%	54.1%
Male	46	41.4%	95.5%
Prefer not to say	5	4.5%	100.0%
<b>Nationality</b>			
Hungary	77	69.4%	69.4%
Other Europeans countries	7	6.3%	75.7%
Asian countries	25	22.5%	98.2%
African countries	2	1.8%	100.0%
<b>Employment Status</b>			
Full-time	60	54.1%	54.1%
Part-time	9	8.1%	62.2%
Self-employed	17	15.3%	77.5%
Unemployed	2	1.8%	79.3%
Student	20	18.0%	97.3%
Retired	3	2.7%	100.0%
<b>Monthly Income</b>			
Below average	22	19.8%	19.8%
Average	36	32.4%	52.3%
Above average	53	47.7%	100.0%
<b>Level of education</b>			
Highschool	40	36.0%	36.0%
College or Vocational Training	12	10.8%	46.8%
Bachelor's Degree	51	45.9%	92.8%
Higher Education	8	7.2%	100.0%
<b>Frequency of dining</b>			
Multiple times a week	39	35.1%	35.1%
Once a week	35	31.5%	66.7%
A few times a month	23	20.7%	87.4%
Once a month	2	1.8%	89.2%
Less than once a month	4	3.6%	92.8%
This is my first time	8	7.2%	100.0%

*Source: from findings of the study*

In relation to Survey 2, there is a significant disparity in the nationalities of the restaurant's staff, with 77.3% being Vietnamese and only 22.7% having Hungarian nationality. Hence, cultural and identity issues might influence the outcomes of a survey, leading to discrepancies in responses when individuals are asked about the same matter.

**Table 8: Socio-Demographic data of Survey 2 (Employee Survey)**

Age	Frequency	Percentage	Cumulative Percent
18-24	9	40.9%	40.9%
25-34	7	31.8%	72.7%
35-44	3	13.6%	86.4%
45-55	2	9.1%	95.5%
Above 55	1	4.5%	100.0%
<b>Nationality</b>			
Vietnamese	17	77.3%	77.3%
Hungarian	5	22.7%	100.0%
<b>Work Position</b>			
Manager	2	9.1%	9.1%
Kitchen area	6	27.3%	36.4%
Service area	9	40.9%	77.3%
Preparation area	3	13.6%	90.9%
Dishwashing area	2	9.1%	100.0%

*Source: from findings of the study*

#### **4.3.2. Impacts of customers on food waste generation**

All responses obtained from Survey 1 will be analyzed in this section including data tables designed to facilitate the discussion.

- *Frequency of the food waste generation by customers*

In an attempt to obtain comparative data and establish correlations, the primary focus of analysis will be on the frequency of leftover food when dining at H.N. This will allow us to draw implications and identify the factors that influence customers' food waste production. This data will be juxtaposed with other influential elements listed in the findings section throughout this results and discussion section.

**Table 9:** African: Frequency of leaving food uneaten at H.N.

Frequency of leaving food uneaten	Frequency	Percent	Cumulative Percent
Always	21	18.9%	18.9%
Often	49	44.1%	63.1%
Rarely	30	27.0%	90.1%
Never	11	9.9%	100.0%
Total	111	100.0%	
Mean value	2.721		

*Source:* from findings of the study

The mean score of 2.72 on a scale ranging from 1 (indicating 'Never' leaving food uneaten) to 4 (indicating 'Always' leaving food uneaten), meaning 4 is the maximum value, implies that the guests tend to occasionally leave food uneaten. The value is closer to 3 ('Often') rather than 2 ('Rarely'), suggesting that a substantial proportion of customers consistently fail to complete their meals.

- *Comparison between demographic information and food waste generation*

The acquired demographic information is used to make comparisons of food waste generation among consumers based on age, gender, nationality, income, education level, and labour status for a preliminary assessment.

**Table 10:** Comparison on age and frequency of leaving food uneaten

Age	Frequency of leaving food uneaten				Total	Mean value
	1	2	3	4		
	Never	Rarely	Often	Always		
Under 18	0	1	2	4	7	3.43
18-24	1	12	20	2	35	2.66
25-34	3	8	10	8	29	2.79
35-44	3	5	6	2	16	3.17
45-54	0	2	6	4	12	2.38
55-64	2	2	3	1	8	2.00
Above 65	2	0	2	0	4	2.69
Total	11	30	49	21	111	2.72

*Source:* from findings of the study

The data suggests that younger customers, particularly those under 18, are more likely to leave food uneaten, as evidenced by the highest average value of 3.43. In contrast, the 18-24 and 25-34 age group demonstrates a higher level of awareness regarding food waste, as indicated by the lower average score of 2.66. Diners in the middle age range, specifically for the people aged

45 and over, exhibit a more diverse range of reactions, with a higher level of awareness and consideration towards waste, even though there are some fluctuations, but the gaps are not significant. Interestingly, those between the ages of 35-44 exhibit a greater inclination to leave food uneaten, with an average value of 3.17, which is somewhat lower than the youngest age group, under 18, who had the highest average of 3.43.

**Table 11:** Comparison on gender and frequency of leaving food uneaten

Gender	Frequency of leaving food uneaten				Total	Mean value
	1	2	3	4		
	Never	Rarely	Often	Always		
Female	2	19	24	15	60	2.87
Male	8	9	23	6	46	2.59
Prefer not to say	1	2	2	0	5	2.20
Total	11	30	49	21	111	2.72

*Source:* from findings of the study

The data illustrates that there are variations by gender in the frequency of leaving uneaten food, with women exhibiting a higher tendency to leave more food compared to males, as well as people who choose not to disclose their gender in the restaurant. It is potential that the portion amounts are more appropriate for male participants or those who chose not to disclose their gender than women.

**Table 12:** Comparison on nationality and frequency of leaving food uneaten

Nationality	Frequency of leaving food uneaten				Total	Mean value
	Never	Rarely	Often	Always		
Hungary	7	24	32	14	77	2.69
Other European countries	0	2	5	0	7	2.71
Asian countries	3	4	11	7	25	2.88
African countries	1	0	1	0	2	2.00
Total	11	30	49	21	111	2.72

*Source:* from findings of the study

There are slight variations in food wastage behaviours among different nationalities. Asian customers tend to leave more uneaten food than others, while African customers leave the least amount of food uneaten, with the small sample size. Hungarian and other European citizens have wastage levels that are close to the overall average (2.72), with mean values of 2.69 and 2.71, respectively. These insights could be used to measure culturally appropriate modifications to portion sizes, flavor adjustment and menu choices.



**Table 13:** Comparison on employment status and frequency of leaving food uneaten

Employment Status	Frequency of leaving food uneaten				Total	Mean value
	1	2	3	4		
	Never	Rarely	Often	Always		
Full-time	4	19	25	12	60	2.75
Part-time	2	3	4	0	9	2.22
Self-employed	3	3	8	3	17	2.65
Unemployed	0	0	2	0	2	3.00
Student	1	5	8	6	20	2.95
Retired	1	0	2	0	3	2.33
Total	11	30	49	21	111	2.72

*Source:* from findings of the study

The mean values for students and the unemployed who leave a significant amount of food uneaten are 2.95 and 3.00, respectively. In contrast, part-time workers have the lowest mean value of 2.22 for food uneaten, followed by retirees at 2.33.

**Table 14:** Comparison on monthly income and frequency of leaving food uneaten

Monthly Income	Frequency of leaving food uneaten				Total	Mean value
	1	2	3	4		
	Never	Rarely	Often	Always		
Below average	3	5	9	5	22	2.73
Average	2	8	21	5	36	2.81
Above average	6	17	19	11	53	2.66
Total	11	30	49	21	111	2.72

*Source:* from findings of the study

In brief, people earning higher monthly incomes appear to be marginally less likely to leave food uneaten, whereas those earning lower incomes are slightly more likely not to finish their meals. Nevertheless, the differences are negligible, indicating that income does not significantly distinguish this conduct.

**Table 15:** Comparison on educational level and frequency of leaving food uneaten

Level of education	Frequency of leaving food uneaten				Total	Mean value
	1	2	3	4		
	Never	Rarely	Often	Always		
Highschool	3	8	18	11	40	2.93
College or Vocational Training	2	5	3	2	12	2.42
Bachelor's Degree	3	14	26	8	51	2.76
Higher Education	3	3	2	0	8	1.88
Total	11	30	49	21	111	2.72

*Source:* from findings of the study

Those with an education in high school exhibit the highest frequency of consistently leaving food uneaten, with a mean value of 2.93. This finding implies a lower degree of involvement in addressing concerns related to food waste among individuals at this educational level. Individuals who have received college or vocational training have a lower mean score of 2.42, which suggests that they leave uneaten food less frequently. Individuals with a Bachelor's degree exhibit a mean value of 2.76, indicating a modest tendency to leave meals uneaten. Participants with higher education exhibit a lower frequency of leaving food uneaten, as indicated by a mean value of 1.88. This suggests that this group possesses a greater awareness or employs more effective food management strategies. Compared to the average value of 2.72, it can be deduced that educational attainment influences food waste behaviour, with greater levels of education being associated with less frequent food waste.

- *Food waste perception and awareness*

The level of awareness and comprehension of the food waste issue among H.N.'s customers is assessed through the administration of a series of fundamental inquiries.

**Table 16:** Findings on customer's food waste perception

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total	Mean value
	1	2	3	4	5		
Level of agreement of the FW is needed more attentions	0	5	22	46	38	111	4.05
Level of concern on FW (From Not concerned at all to Extremely concerned)	4	8	21	51	27	111	3.80
Level of agreement on complying future measures	1	4	20	34	52	111	4.19

*Source:* from findings of the study

Customers strongly agree or generally agree with the opinion that food waste requires additional research and attention, as indicated by the mean value of 4.05. A mean score of 3.80 shows a significant degree of concern with food waste, although slightly less prominent than the first group. The statement reveals a responsible group of customers who are probably knowledgeable about the broader consequences of food waste, this might include its environmental and economic effects. The question on agreement to comply with future sustainability measures has the highest mean value of 4.19. This suggests a significant willingness among customers to support and adhere to such measures implemented by the restaurant in the future. The considerable degree of support confirms that the restaurant possesses a strong foundation upon which they can develop and execute food waste-reducing and managing methods.

Nevertheless, there may be a discrepancy between worry and perception and the real action. The initial cross-comparison table examined the relationship between the survey respondents' level of concern regarding food waste and their frequency of leaving uneaten food at H.N.

**Table 17:** Comparison on level of concern and frequency of leaving food uneaten

Level of concern		Frequency of leaving food uneaten				Total	Mean value
		1	2	3	4		
		Never	Rarely	Often	Always		
Not concerned at all	1	0	0	2	2	4	3.50
Slightly concerned	2	1	2	1	4	8	3.00
Moderately concerned	3	2	6	9	4	21	2.71
Very concerned	4	4	15	25	7	51	2.69
Extremely concerned	5	4	7	12	4	27	2.59

Source: from findings of the study

The numbers ranging from 1 to 5 is referred from Not concerned at all to Extremely concerned. The inverse relationship between mean values and the amount of concern implies those who express higher levels of precaution regarding food waste are less inclined to leave food on their plates, though the gap is not significant between each level. The group that responded "not at all concerned" about food waste leaves food uneaten "often" and "always," reflected by their mean value of 3.50. This aligns with their low level of concern regarding food waste. Conversely, the customer who responded "extremely concerned" about food waste leaves food uneaten "rarely," as stated by their mean value of 2.59. On the other hand, customers who claim to have a high level of concern (level 4) still leave behind more food than expected, even more so than those with lower levels of awareness. This inconsistency between their perception and their actual behaviour suggests that they might be influenced by external factors when it comes to leaving food uneaten.

**Table 18:** Awareness of the food waste issue categorized by the respondent's countries

Nationality	Level of concern on food waste					Total	Mean value
	1	2	3	4	5		
	Not concerned at all	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned		
Hungary	4	7	17	36	13	77	3.61
Other European countries	0	0	0	5	2	7	4.29
Asian countries	1	1	4	9	10	25	4.04
African countries	0	0	0	0	2	2	5.00

Source: from findings of the study

In comparison to the overall mean of 3.80, Hungarians exhibit a slightly below-average level of concern regarding food waste, as evidenced by their mean value of 3.61. The '4' rating for concern by the majority of Hungarians indicates that they are concerned but not the most so, and the issue may not be considered urgent in Hungary. With mean values of 4.29 and 4.04, respectively, other European and Asian customers at the restaurant demonstrate a heightened awareness of the issue of food waste. Notably, the group representing European countries provides the highest value, which implies that these demographics might be especially receptive to initiatives aimed at reducing food waste.

- *Ordering and eating habits*

This section aims to gather data on eating and ordering habits to gain insights into consumer behaviour patterns that may impact the amount and variety of food that is wasted. By recognising these characteristics, H.N. can analyse and address these issues thoroughly, leading to improved techniques, better assistance to consumers, more informed decisions, decreased the amount of avoidable food waste, and increased customer satisfaction.

The initial characteristic identified is the frequency with which the client visits the H.N. the author has categorised the responses into six distinct answers, each with its own frequency, in order to distinguish between frequent and infrequent consumers, as well as to determine the regularity at which consumers return.

**Table 19:** Comparison on guest's frequency of dining in H.N.

		Frequency of leaving food uneaten				Total	Mean value	
		1	2	3	4			
		Never	Rarely	Often	Always			
Frequency of dining	Multiple times a week	4	15	15	5	39	2.54	
		3.60%	13.50%	13.50%	4.50%	35.10%		
	Once a week	4	9	15	7	35	2.71	
		3.60%	8.10%	13.50%	6.30%	31.50%		
	A few times a month	3	4	13	3	23	2.30	
		2.70%	3.60%	11.70%	2.70%	20.70%		
	Once a month	0	0	1	1	2	3.50	
		0.00%	0.00%	0.90%	0.90%	1.80%		
	Less than once a month	0	1	2	1	4	3.00	
		0.00%	0.90%	1.80%	0.90%	3.60%		
	This is my first time	0	1	3	4	8	3.38	
		0.00%	0.90%	2.70%	3.60%	7.20%		
	Total		11	30	49	21	111	2.72

*Source:* from findings of the study

The largest segment, at 35.1%, represents customers who dine multiple times a week and 31.5% represents customers who visit once a week, indicating a strong regular customer base with cumulative percent of these two groups are 66.6%. The next significant segment, those visiting a few times a month account for 20.7% of visits, suggesting moderate regularity. The smaller categories show 5.4% of customers dine once or less than once a month, which is a smaller number compared to first-time visitors, who account for 7.2%.

Customers who visit the restaurant consistently consume a reduced quantity of food, as evidenced by the score of 2.54, which is below the calculated midpoint of the scale. Conversely, people who come infrequently (customers who come once a month, less than once a month and new guests), including those who are visiting for the first time, exhibit a higher propensity to depart with their food, as indicated by their scores getting closer to the maximal value of 4. It

shows that customers who are acquainted with H.N. exhibit a positive correlation with reduced food waste. This can be attributed to their familiarity with the menu and accurate prediction of their consumption, characteristics that might not be available to less frequent customers or new visitors. Despite small sample of those who visit once a month and less than once a month, it is still possible to observe that out of the six people who responded in these two groups, the majority indicated that they frequently leave food behind, with only one respondent indicating rare occurrences.

**Table 20: Comparison on order styles**

Order style	Frequency of leaving food uneaten				Total	Mean value
	1	2	3	4		
	Never	Rarely	Often	Always		
Order from basic courses in a meal (Starter, Main course, Dessert)	2	5	28	16	51	3.14
Only soup or main dish	4	3	4	0	11	2.00
Soup/main dish and dessert	1	7	2	0	10	2.10
Soup and main dish	0	4	2	0	6	2.33
Starter and soup/main dish	3	10	10	4	27	2.56
Others (all are more than two courses)	1	1	3	1	6	2.67
Total	11	30	49	21	111	2.72

*Source:* from findings of the study

The research suggests a positive correlation among the number of courses ordered and the likelihood of food being left uneaten. Based on the comparison table, it is visible that customers who primarily order main dishes and soups (which are considered main dishes) tend to waste less food. This is particularly true for customers who exclusively choose only soup or main dishes for their meal, as their average waste value is only 2.0, which is significantly lower than the overall average waste value of 2.72. Beyond that, consumers that purchase a substantial number of courses in a single meal, notably three or more courses, have a significantly high average value. Customers who opted for all three standard courses of appetisers, main dishes,

and desserts were the most prone to leaving food uneaten, with an average value of 3.14 out of 4. Responses categorised as "Other" and all involving the selection of more than two courses in a meal likewise exhibit a mean value of 2.67. This indicates that consumers in this group frequently abandon uneaten food. Certain customers may be unfamiliar with Pho soup, which happens to be the top-selling and most renowned dish in H.N. Besides, they may have a limited understanding of the portion size, leading to a propensity for ordering excessive amounts. Pho, a type of soup, is commonly served as a main dish. However, cultural and culinary influences can affect the way customers perceive it, as some may not consider soup to be the main dish in a meal. This is particularly apparent when 27% of individuals explicitly stated that they do not regard Pho as a primary course, as indicated by the study's findings.

**Table 21:** Comparison on time of dining

Time of dining		Frequency of leaving food uneaten				Total	Mean value
		Never	Rarely	Often	Always		
		1	2	3	4		
Weekday (from Monday to Friday)	Lunch time (from 11am to 3am)	3	8	16	10	37	2.89
	Dinner time (from 6pm to 9pm)	6	11	10	3	30	2.33
	Between lunch and dinner time (from 3pm to 6pm)	0	2	4	2	8	3
Weekend (Saturday and Sunday)	Lunch time (from 11am to 3am)	1	5	9	2	17	2.71
	Dinner time (from 6pm to 9pm)	1	4	10	3	18	2.83
	Between lunch and dinner time (from 3pm to 6pm)	0	0	0	1	1	4
Total		11	30	49	21	111	2.72

*Source:* from findings of the study

Customers have a higher tendency to leave a greater amount of uneaten food during lunchtime on weekdays, but they prefer to leave a lesser amount after dinner on weekdays. This might be affected by the lunch menus offered during lunch time can lead to the greater inclination to



create food waste, correlated with the high ratio of food waste generated by type on the previous section. The intervals between meals over weekends display a significantly greater inclination towards wastage. However, the validity of this outcome may be compromised by the limited size of the sample. This also suggests that the timing of meals may affect how people behave in terms of wasting food, and that there may be a connection between specific consumer segments and their frequent visits during certain time periods. This information might be valuable for H.N. when they are planning the portion sizes for their menu.

**Table 22:** Popular food that being left on plate post-consumption

Type of food	N	Mean	Std. Deviation	Minimum	Maximum
Vegetable	111	3.23	0.904	1	5
Side dishes (Rice/Noodle)	111	4.03	0.919	1	5
Garnishes	111	4.44	0.86	1	5
Special flavor ingredients	111	3.04	0.673	1	5

Source: from findings of the study

The author categorises the most frequently found leftovers on customers' plates into six groups: vegetables, side dishes (rice and noodles), garnishes, starters, desserts, and meat, food items with distinct flavours or ingredients, and inedible parts such as bones, fatty portions, and animal skin. However, ongoing research is focused exclusively on vegetables, side dishes, garnishes, and food that contains unique flavours or ingredients. Other types of food are consistently found to be either never or rarely left behind, and inedible food items are similarly discarded which is obvious. Garnishes and side dishes are the most commonly left out, according to the data, which has exceptionally high mean values of 4.44 and 4.03, correspondingly, with the highest value being 5 (always leave leftovers). This suggests that the quantity of food offered by restaurants in these two categories exceeds the the amount required to satisfy consumers. Subsequently, vegetables receive an average score of 3.23, while foods containing special ingredients or flavours receive an average score of 3.04, considerably marginalised. While the standard deviation indices are comparable, they continue to indicate fluctuations in the number of consumers who leave food behind.

**Table 23:** Factors that influence on guest's leaving leftovers

	Level of agreement		
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Influence on wasting food	1	2	3	4	5	Total	Mean	Std. Deviation
	Strongly disagree	Disagre e	Neutral	Agree	Strongly agree			
Large portion size	1	16	10	61	23	111	3.80	0.961
Personal taste	0	3	11	72	25	111	4.07	0.657
Overorder	8	26	28	38	11	111	3.16	1.116

*Source:* from findings of the study

In the same method as the preceding section, three of the six reasons investigated regarding the reasons that impact on discarding leftovers were eliminated by the author: social norms (mean value of 1.42), dietary restrictions and allergies (mean value of 1.86), and food quality (mean value of 2.92), which, while near the midpoint of the scale, was not a strong or dominant factor. Three influencing factors remain, as shown in the table above. In general, personal taste is identified as the primary factor resulting in the greatest number of participants leaving food uneaten (mean value: 4.07). This is entirely rational and the most challenging aspect to regulate due to the inherent variability in flavours. Le Lan Phuong's (2017) research on food waste revealed that the tasting experience of food exerts the most significant impact on consumers discarding their food, with an exceptionally high mean value of 4.46. The subsequent factor is the large portion size factor, which has a mean value of 3.8 and a standard deviation of 0.961. Despite some variability, this value is sufficient to demonstrate that large portions are a significant factor. Although overordering is of lesser concern, it exhibits the greatest degree of variability in the responses, as shown by the mean score of 3.16 and standard deviation of 1.116, which is the lowest mean score but carries highest variability. It is apparent that this factor does contribute, yet not significantly; it is more likely to occur with a small number of customers who are unfamiliar with the menu and serving sizes offered by H.N. or who are visiting less frequently or visiting for the first time.

**Table 24:** Agreement on type of food is served in excessively large quantities by customers

		Rice	Noodle	Vegetable	Meat/Poultry/Seafood	Garnishes
N	Valid	111	111	111	111	111
	Missing	0	0	0	0	0
Mean		2.76	3.34	3.04	2.58	3.77
Median		3.00	3.00	3.00	3.00	3.00
Mode		3	3	3	3	3
Std. Deviation		0.43	0.86	0.49	0.51	0.99

*Source:* from findings of the study

To reinforce the findings of H.N.'s issue with portion size, customers were also surveyed regarding their views on specific food portions that they believed were excessively large and not appropriate for their personal appetite. This survey utilised a 5-level scale ranging from Strongly Disagree to Strongly Agree. Based on the median and mode values of 3, the majority of customers believe that the portion sizes for all items, except meat, are significantly larger than their preference. Meat, poultry and seafood are considered closer to the ideal portion size. Rice has a mean value of 2.76, indicating it is slightly larger than preferred but still acceptable, while vegetables have a little higher mean value of 3.04. Noodles and garnishes are currently agreed to have the largest serving size and exceed customers' consumption needs with mean scores of 3.34 and 3.77, respectively, along with the two highest standard deviations of 0.858 and 0.99.

- *Customers' handling and attitudes toward leftovers*

In relation to the matter of remaining food, survey participants were also inquired about their decision to either package or not package the leftover food. Among the 111 respondents, 82 people indicated their intention to pack leftover food for takeaway, whereas the remaining 29 people expressed their refusal to do so, irrespective of the quantity of leftover food. Consequently, the author persists in evaluating 82 responses featuring the provision to take home leftover food, in an effort to determine the actual consumption of these wrapped leftovers.

**Table 25:** *Likelihood of leftover consumption of customers choosing to package leftover home*

Customers choose to package leftover home	Likelihood of consuming leftover after packing home					Total	Mean value
	Very unlikely	Unlikely	Neutral	Likely	Very likely		
	1	2	3	4	5		
	0	16	11	29	26		
	0.0%	19.5%	13.4%	35.4%	31.7%	100%	3.79

*Source:* from findings of the study

On average, customers have a higher probability of consuming their leftovers with the mean value at 3.79 out of 5, which is a positive result. This demonstrates a favourable disposition towards avoiding the unnecessary disposal of leftover food brought home. While 19.5% of respondents reported to unlikely continuing to consume wrapped leftovers, and 13.4% replied neutrally, it remains uncertain whether there was a clear intention to continue consuming it or not.

H.N. offers a range of, tools, and plastic containers of different sizes to cater to both take-away clients and those who buy meals through the delivery app. This makes it highly handy for consumers who wish to wrap their food home in the case that customers do not consume all of it. The food cleanliness, safety, and quality of H.N. are ensured and monitored by Nébih (Nemzeti Élelmiszerlánc-biztonsági Hivatal – National Food Chain Safety Office), making it perfectly safe to pack leftover food from a health perspective. Therefore, the survey continues to study how customers handle their leftovers, specifically packaging to take home from a cultural and social perspective. Hence, the survey aims to explore the manner in which customers manage their remaining food, particularly bringing unfinished food home, from both a cultural and social standpoint. It also seeks to understand how customer’s cultural background and societal norms influence their decision to bring home leftovers or not, at the moment when they need to make this decision.

**Table 26:** *Level of agreement that taking leftover home are influenced by cultural background and social norms*

	Level of agreement					Total	Mean value
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
	1	2	3	4	5		
Impact of cultural background	1	7	19	57	27	111	3.92
Impact of social norms	11	29	30	28	13	111	3.03

*Source:* from findings of the study

It is widely recognized that both elements have an impact, but the average value of 3.92 clearly shows that cultural background is a more influential component than social norms. The mean score for social norms is significantly lower, close to the midpoint of 3.03 with the spread across different levels of agreement is broader suggesting a more varied perception of the impact.

#### **4.3.3. Impacts of the employees on the food waste generation**

- *Food waste perception and awareness*

The personnel’s collective consciousness of and dedication to environmental values in general and to food waste problem in particular play a crucial role in determining the extent to which the restaurant adheres to sustainable practices. The employees’ perspectives on food waste provide valuable insights into their awareness and willingness to initiate and support change. This, in turn, plays a crucial role in reducing, effectively managing food waste, and developing suitable methods. The following analysis seeks to extract the core of these views, outlining a range of consciousness that impacts each food item offered and every morsel discarded.

**Table 27:** Perception of H.N.'s employees on environmental problem and food waste

	Not concerned at all	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned	Total	Mean value
	1	2	3	4	5		
Level of concern about environment and sustainability	3	10	2	3	4	22	2.77
Level of concern about food waste	2	3	5	5	7	22	3.55

Source: from findings of the study

According to the table, employees display a greater level of concern for food waste issues that are directly linked to their job with the high mean value at 3.55, as opposed to more general environmental concerns when the calculated mean value was 2.77, under the mid-point of the scale. This suggests a divergence between personal values and actual execution of those beliefs in the workplace. Additionally, employees may perceive that their individual actions have less influence on more expansive environmental concerns. Employees are more aware of and connected to issues that they can immediately see and affect in their immediate work environment. The impact of food waste is more noticeable and real in this context, making it a more urgent concern.

**Table 28:** Self-evaluation of employees on the severity of food waste

Evaluation on H.N.'s food waste severity by their employees	Not serious at all	Slightly serious	Moderately serious	Very serious	Extremely serious	Total	Mean value
	1	2	3	4	5		
	1	7	5	8	1		

Source: from the findings of the study

The average result of 3.05 indicates an elementary level of concern generally, suggesting that although employees are aware of the problem of food waste, there may not be a connected feeling of urgency to address it. This perception can be juxtaposed with the concrete statistics gathered on the restaurant's factual food waste, totaling 1156.7 kg over a span of two weeks. The average daily waste of 82.62 kg is quite considerable and highlights a major possibility for improvement. The inconsistency between the mild perception of the problem's severity and the

actual food waste statistics suggests a possible gap in employees' understanding of the extent of waste produced, or a difference in how waste levels are communicated and handled internally.

However, when surveyed about the ability to accept improvements and new methods, the results were considered relatively positive.

**Table 29:** *Agreement on the need of training about environmental problems and food waste and agreement on complying with the management*

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total	Mean value
	1	2	3	4	5		
Agreement on receiving more training about environment and food waste	1	2	2	8	9	22	4.00
Agreement on complying future measures	1	1	6	9	5	22	3.73

*Source:* from findings of the study

The first component is shown by a high mean score of 4.00 out of 5, which shows a solid consensus among employees regarding the necessity for additional training on environmental issues and food waste. This indicates that the staffs are receptive and acknowledge that acquiring more knowledge and skills could be beneficial in tackling the issue of food waste. It is in line with the previously data moderate concern over food waste, suggesting that employees are not only aware of the problem but also prepared to participate in finding solutions. The second factor has a lower mean score of 3.73, compared to a mean of 4 out of 5 for the first factor, but still indicates a positive index . This difference suggests that employees acknowledge the significance of additional training on environmental and food waste issues. However, they may have slightly less dedication or confidence in implementing these measures. It is also possible that they already feel well-informed.

- *Internal factors*

In this section, factors that considered internal and examined include the influence of food processing and recipes on dishes, the amount prescribed by the restaurant, and an assessment of current food waste management methods.

**Table 30:** *Agreement on the impact of recipes and process that cause food waste*

Level of agreement on H.N.'s food processing and recipes causing food waste	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total	Mean value
	1	2	3	4	5		
	0	3	4	8	7	22	3.86

*Source:* from findings of the study

According to the data collected from employees' opinions, there is moderate agreement that food processing and recipes are a considerable factor in food waste, with an average rating of 3.86 out of 5. A significant percentage of employees appear to concur or strongly concur with this assertion, which could be indicative of their observations regarding the generation of food waste during the preparation of specific dishes, particularly Pho soup – the restaurant's top-selling item, with a total of 2070 units sold over a two-week observation period covering both medium and large sizes. Pho broth necessitates a substantial quantity of bones, resulting in a significant amount of fixed food waste (30kg a day). Although bones are crucial for enhancing the broth's taste, they are not meant to be ingested, even after long hours boiling. Similarly, the inclusion of vegetables in vegan broths also adds to the amount of waste generated. The high mean score indicates their awareness of the waste produced by these processes and highlights potential opportunities for enhancing waste reduction strategies. This could involve optimizing recipe proportions or finding alternative uses for typically discarded remains. However, it should be noted that addressing waste reduction in recipes and adhering to cooking rules can be challenging, especially to the dishes that require us to follow certain recipes.

**Table 31:** *Agreement on type of food is served in excessively large quantities by employees*

		Noodles	Vegetable	Meat/Poultry/Sea food	Garnishes
N	Valid	22	22	22	22
	Missing	0	0	0	0
Mean		3.32	3.05	2.36	3.45
Median		3.50	3.00	2.00	4.00
Mode		4	3	2	4
Std. Deviation		0.995	0.722	0.902	1.011

*Source:* from findings of the study



According to the employee responses, garnishes have the highest mean score of 3.45, which aligns with customer perceptions. This indicates a widespread consensus that garnish portions are more than necessary. The higher standard deviation in the garnishes option, as observed in both the customer (0.99) and employee (1.011) responses, suggests that there is greater variability in how respondents perceive the size of garnishes. This implies that both customers and employees hold diverse viewpoints regarding what qualifies as an excessive serving of garnish. Opinions may vary regarding the abundance of garnishes, with some individuals perceiving them as excessive and potentially resulting in wastage, while others may consider the quantities appropriate or insufficient, depending on personal preferences or cultural norms regarding meal aesthetics. Noodle is also regarded as somewhat extravagant, with an average rating of 3.32, slightly lower than customers' perception of noodles (3.34), along with the diversity in opinion which illustrated by a high standard deviation value 0.995. Vegetables have a mean score of 3.05, with a median of 3 and a mode of 3, implying a consensus that vegetables are often served in excess, but to a lesser extent than noodles, as shown by the lower mean score and the smaller standard deviation of 0.722. The employees share a similar viewpoint to customers, perceiving meat, poultry, and seafood to be the least excessive. This is indicated by the lowest mean score of 2.36, which reflects their agreement that these items are served in an ideal amount.

**Table 32:** *H.N.'s employees rate the effectiveness of current FW management*

Evaluation on current FW management by employees	Not effective at all	Slightly effective	Moderately effective	Very effective	Extremely effective	Total	Mean value
	1	2	3	4	5		
	4	10	4	4	0		

*Source:* from findings of the study

The employees' assessment of the food waste management techniques at H.N., with an average score of 2.36, indicates that the existing strategies are considered inadequate. The absence of any answer rating the management as 'Extremely effective' and only four employees perceiving it as 'Very effective' highlights the urgent requirement for reevaluation and improvement of existing practices to reduce food wastage. This indicates an undeniable gap between awareness and action among both employees and owners.

- *Self-assessment and conscious efforts*

The employees' acknowledgment and active measures to minimize and decrease food waste throughout their work are of utmost significance. It measures the extent to which employees are involved in sustainable practices and their willingness to actively contribute to lowering the environmental footprint of the company. When questioned about this topic, precisely 50% of the employees surveyed, 11 out of 22, acknowledge being aware of and actively attempting to minimize and decrease food waste throughout their duties, while the remaining 50% do not verify this, still may suggest an uncertain commitment to environmental conservation among the restaurants' staff. This equitable division emphasizes a potential opportunity for the employer to enhance education or offer supplementary resources, implement incentive programs, promote shared collaboration among staff members, and establish particular goals to create more effective sustainable practices.

**Table 33:** *Employees' self evaluation on their contribution in reducing FW*

Evaluate on the contribution in reducing FW	Not helpful at all	Slightly helpful	Moderately helpful	Very helpful	Extremely helpful	Total	Mean value
	1	2	3	4	5		
	5	5	4	5	3	22	2.82

*Source:* from the findings of the study

The average score of the employees' self-evaluation of their effort in food waste practices is 2.82, suggesting a moderate opinion of their contributions. The average result is 2.82, suggesting that although employees are conscious and moderately engaged in decreasing food waste, they may not feel completely empowered or equipped to make a significant difference. The range of responses, ranging from employees perceiving their contribution as 'not helpful at all' to others perceiving it as 'extremely helpful', underscores the diversity in perceptions and experiences. Similarly, the analysis of their concern regarding the problem reveals that 7 participants expressed a high level of concern ('Very concerned' and 'Extremely concerned'), while 13 people displayed indifference by selecting "Not concerned at all" and "Slightly concerned". It implies that certain people may possess the appropriate knowledge and access to resources to efficiently minimize food waste, while others may not, which may stem from differences in age and uneven educational levels of employees.

#### **4.4. Result from the interview**

When identifying the success of H.N. restaurant's present procedures in managing food waste, it is crucial to take into account the viewpoints of the owner and also the general manager, who is responsible for setting and implementing the establishment's policies and operations. The managerial interview offers a thorough comprehension of the internal mechanisms implemented to tackle food waste, the effectiveness of these measures, and the obstacles the restaurant faces in reducing waste. This assessment not only demonstrates the restaurant's dedication to sustainability but also highlights the intricate challenges that the food service industry faces in its efforts to combat waste. The data obtained in this part will serve as the primary information for answering RQ3 and RQ4.

Mr. Vo Hai is the person in charge of monitoring and executing all activities occurring in H.N. The interview with him focused on the restaurant's current food waste control procedures, evaluating its operations and addressing the problems and obstacles they are encountering.

H.N. argues that sustainable growth is essential for the restaurant industry and for the restaurant itself, as it involves satisfying current demands without jeopardizing the well-being of future generations. Hai also acknowledged the enduring benefits that sustainable development delivers to enterprises, like increased operational efficiency and cost optimization for restaurants by leveraging human resources effectively although the restaurant is currently in the process of attempting to shift its company towards a more sustainable route. Concerning the matter of food waste, the restaurant acknowledges that it is a serious issue, both in terms of its environmental impact and its cost consequences. However, achieving zero-waste goal is currently a challenging objective. “We think it is challenging to match the balance of the quantity of the food and try to minimize it by meeting the need of offered services considering the cost and the profit. We assure you that we have never engaged in wasteful practices. However, due to the structure of our cuisine and recipes, there is a certain amount of waste that is unavoidable. We recognize the need of managing this waste effectively and make efforts to do so.” (Vo Hai, 2024)

After evaluating the food waste situation in H.N., management acknowledges that it is not yet at an alarming stage compared to other restaurants of similar size. However, they do recognize that the situation is still quite serious and there is a potential for it to escalate to a very serious level. Due to inherent constraints and complexities in measurement and computation, as well

as the intricate and interdependent nature of H.N.'s operating processes, making it impossible to quantify the financial impact for each individual step, therefore, providing an exact figure for the total quantity and monetary value of food waste is exceedingly challenging. Nevertheless, it is widely acknowledged to be of considerable magnitude, albeit with some progress observed since the latest estimate in 2017, which was approximately 100kg per day food waste in general. The restaurant also modifies its prices in accordance with the inflation rate and economic climate, in comparison to the cost of sale. Nevertheless, both expenses—converting costs from the quantity of food waste and the quantity of surplus food that the restaurant receives—are on the rise, and Hai accepts the possibility that the resulting costs are likely to surpass the restaurant's initial projections.

The main contributors to food waste are categorized into two primary sources: leftover food abandoned by customers and food waste generated within the restaurant. The latter includes food waste resulting from activities such as importing, storing, preparing, processing, and cooking food, as well as the consistent amount of food waste produced daily due to specific standards and regulations outlined in the restaurant's recipes. The restaurant recorded the data collected by the author while measuring food waste over a two-week span and verified its relative accuracy and also expressed concern about this issue. In terms of the quantity of food waste, both the author and the restaurant side concur that, excluding fixed food waste, leftovers constitute the bulk of the overall food waste. Therefore, consumers play a crucial part in generating this amount of food waste. The information regarding the issue of excessive food waste from customers is also received and in response, and the restaurant conducted inquiries and observations with selected certain consumers to understand why they did not finish their meals. It recorded that the majority of customers cited personal taste preferences, larger portion sizes than expected, and over-ordering, when some customers order too many dishes compared to their appetite and are not familiar with the flavors of Vietnamese dishes and the restaurant's menu. Additionally, Hai acknowledged that the restaurant's concentration on food waste is still inadequate and that the staff lacks sufficient attention and awareness regarding this issue. Restaurant employees are generally not aware of limiting and reducing waste and food waste and most of them only work as instructed by management.

When questioned about portion sizes, despite substantial evidence indicating that the quantity of food provided by H.N. for certain dishes surpasses the optimal level in comparison to the consumption patterns of survey participants, the restaurant maintains that there are no issues

with their portions. However, when questioned about Pho soup, the most popular dish, Hai acknowledged that customers had expressed dissatisfaction with the amount of pho noodles served per portion. As a result, the restaurant adjusted in 2021, reducing the quantity from 220g per large portion and 180g per medium portion to 190g and 150g respectively. The restaurant is confident that this modification has been successful. Hai said that "We check if the amount of food is too much or not, probably I would rate it like 40% of the guests say it is still too much and the rest 60% say the ratio is just right enough for them, we are trying to find the balance point in the menu planning but we think this result is not too negative". Hai also emphasized that the garnishes is crucial to include in every single dish. The portion sizes are considered generous, yet not overly excessive. While some customers greatly enjoy it, others may not, but it remains an essential component of the dish. Regarding the personal preference, H.N. believes that they have made appropriate modifications to the flavors of their dishes in order to satisfy customers from all continents with diverse cuisines. Additionally, customers have the option to personalize their orders and have the seasoning served according to their tastes. For customers who are new or unfamiliar with the store, H.N. always encourages servers and all front of the house staff to provide clear introductions and explanations of dishes. They also advise staff to offer reasonable recommendations to ensure a quick and suitable ordering process that matches the customers' appetite and consuming ability. Additionally, if a customer is unable to finish their meal, H.N. offers full support in packaging the remaining food items for take-home, if desired.

In response to the remaining issues, several practices have been implemented to address them. Classifying food waste to monitor and control the final treatment process by the collection partner is taken place in the first stage, certain distinct categories of food waste are categorized and subsequently acquired by a third party. For instance, cooking oil utilized in frying is relinquished to Biofilter, the company responsible for both collecting food waste for H.N. and managing its disposal. In addition, the restaurant emphasis on managing supplies and optimizing the sourcing of raw materials. These measures aim to make the most efficient use of available resources, excluding any elements that are completely inedible. Furthermore, the restaurant has demonstrated a keen interest in exploring and applying management techniques that prioritize biological recycling, particularly composting and to learn about new means and technology that facilitate composting which might be an ideal solution to deal with the fixed food waste including bones and vegetable generated by the broth making process. Hai declared that the restaurant takes great pride and has full confidence in efficiently managing supplies and imports through a rigorous and systematic approach. The POS system is used to accurately

forecast the required amount of food and ensure regular operations for imports to maintain the highest quality of food. Additionally, they strive to minimize food loss during import and storage, aiming for the lowest possible rate. “Overall, our proactive and systematic efforts have been moderately effective up to this point. On a scale of 5, I would rate it as 3.5. Nevertheless, we totally understand that there are certain aspects in which we do not meet expectations, and we are continuously attempting to discover methods to enhance and introduce new ideas to decrease food waste, especially aiding customers to reduce leaving and wasting leftover food.” Hai shared. Thus, it is visible that the effectiveness of current food waste management measures is considered by restaurants to be at a reasonable level and certain positive effects are recorded.

Undoubtedly, when implementing food waste approaches, there will inevitably be certain obstacles, and the long-term aspect of food waste management acts as a significant challenge, as it complicates the task of ensuring sustained effectiveness in managing and maintaining it. Initially, it is important to mention that the restaurant aims to explore and adopt the composting technique. Nevertheless, it suffers from a shortage of adequate physical space and the necessary technology and procedures to put it into practice. Furthermore, the insufficient awareness and knowledge among restaurant staffs impedes the smooth operation and optimal efficiency of food waste management. If employees have no proactivity and self-awareness regarding the significance and purpose of these tasks, and do not willingly engage in them, management's effectiveness is compromised. Their staffs receive training and are encouraged to focus on efficient utilization of resources and avoiding wastage to reduce costs. However, they have little familiarity with environmental concerns and sustainable development. Conversely, the work cycle consists of multiple stages, each comprising many different steps. If employees are conscious and proactive in reducing and minimizing food waste starting from the smallest steps, it will facilitate more efficient and tight management. The restaurant has informed us that they are currently in the process of finalizing procedures and sorting perishable food waste in order to collaborate with the Food Bank project. Yet, at present, the food waste from H.N. does not meet the necessary requirements to be included in this program.

The inevitability of generating a significant quantity of food waste daily is supported by the unalterable nature of Vietnamese recipes, where this waste is utilized for the preparation of bone and vegetable stew for Pho soup and other dishes, making it a crucial and indispensable ingredient. However, the restaurant firmly believes that the substantial quantity of bones and vegetables, estimated at 30kg per day, has been efficiently utilized and cannot be repurposed,

but entirely organic. As previously stated, the restaurant has a strong emphasis on conserving and optimizing the utilization of all ingredients, which has been a consistent part of the restaurant's culture. In addition to the previously justified fixed waste section, Hai believes that they are effectively managing costs and materials. Thus, apart from the fixed food waste in making broth, the quantity of food waste generated during other stages, while still being addressed, is inherently negligible.

In the future, H.N. will strive to implement a compost testing plan for planning and implementation purposes. Despite the time and cost involved, this method, by far, is the most effective solution for managing organic food waste. While it may not be suitable for leftovers, the restaurant think it is highly beneficial for solid food waste, particularly fixed food waste which including long-cooked bones and vegetables, although other processing steps still need to be modified afterwards. The restaurant also continues to work on adjusting the size and quantity of food to create the most ideal portions and aims to limit leftover as much as possible, while encouraging customers to wrap their food home in case there is leftovers to avoid wasting food while it can still be consumed, thus prevent the avoidable food waste. Simultaneously, the restaurant additionally encourages the promotion of employee awareness regarding the significance of effectively managing food waste, as well as other sustainable environmental principles. Hai commits to improving the staff's knowledge to be able to ensure the comprehensive implementation of management measures. With the forthcoming backing or sanctions from the government or local committee, the restaurant anticipates significant financial, operational, and moral advantages in its efforts to minimize and handle food waste in the region, as well as support small and medium-sized eateries and food enterprises like H.N. Nevertheless, Hai stated that thus far they have not encountered any legislation or regulations of such kind, or they were unaware of these sanctions previously, or these regulations have had barely any effect on the restaurant.

#### **4.5. Feasible improvement options**

The subsequent step in enhancing food waste management at H.N. involves examining viable options for improvement. Creating strong food waste reduction frameworks is essential for identifying and incorporating more efficient and inventive strategies. This section explores potential modifications and approaches that the restaurant could implement to further minimize waste, optimize resource efficiency, and strengthen its dedication to environmental stewardship. Valuable insights have been obtained from both customers and employees by asking specific questions about the most efficient strategies they propose for minimizing food

waste. This section assesses the proposed improvements put forward by the main stakeholders, in addition to the opinions provided by the restaurant manager during a recent interview. The goal is to combine these different perspectives to identify the most practical and creative methods that can be implemented to improve resource efficiency and maintain the restaurant's dedication to proper food waste management.

Based on the literature review and an understanding of H.N.'s situation, the survey included five improvement options for customers and employees to evaluate their agreement on the conformity and feasibility of these options, on the scale from 1 to 5 (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly agree)

**Table 34:** *Customers evaluate the improvement options*

	The evaluation of improvement options by customers				
	Adjust dish ratio and size	Interpret specific dish information on menu	Encourage customer to take leftover home	Reuse in case safe and reasonable	Composting
N	111	111	111	111	111
Mean	4.22	4.33	4.04	3.03	3.04
Std. Dev	0.68	0.68	0.86	1.10	0.93
Minimum	2	2	1	1	1
Maximum	5	5	5	5	5

*Source:* from findings of the study

From Table 34, the average score of 4.33 indicates that customers place a high importance on having precise information about dishes on menus. Additionally, they have a strong tendency to the option of adjusting the portion sizes, as evidenced by their average rating of 4.22. In addition, they strongly support the practice of taking leftover food home, giving it a rating of 4.04. However, their inclination to reuse items when it is both safe and reasonable, as well as their interest in composting, is relatively low, with average scores of 3.03 and 3.04, respectively. The customers at H.N. restaurant display a notable tendency towards receiving comprehensive information for the dishes on the menu, as evidenced by the exceptionally high average score of 4.33. This preference may stem from the fact that such detailed information aids in developing a thorough comprehension of the menu and dishes, enabling customers to make well-informed choices that can potentially minimize food wastage. Furthermore, they exhibited a pronounced inclination towards modifying portion sizes and ingredient quantities in dishes, particularly when it related to noodles and garnishes that were perceived to be excessively



provided through the findings above. The average scores for this preference were 4.22, indicating a desire to order food that aligns with their consumption capacity which has huge potential for reducing food waste. The practice of bringing home uneaten food was also highly valued, receiving a score of 4.04. This indicates a proactive and responsible approach to finishing the meals that were ordered, thus reducing the amount of unnecessary leftover food for customers. Conversely, the comparatively lower scores for reuse (3.03) and composting (3.04) show that while customers are receptive to these approaches, they might not consider them as immediately or practically beneficial as the other available options. It is understandable that customers have concerns about the safety and quality when discussing reusing. Also, composting is a concept that is not widely known to customers, and they often lack confidence in its effectiveness and the outcomes it produces, or simply view it as unpopular.

**Table 35:** *Employees evaluate the improvement options*

	The evaluation of improvement options by employees				
	Adjust dish ratio and size	Interpret specific dish information on menu	Encourage customer to take leftover home	Reuse in case safe and reasonable	Recycle and compost
N	22	22	22	22	22
Mean	3.68	4.18	4.23	2.5	2.95
Std. Dev	0.72	0.66	0.43	0.96	0.95
Minimum	2	3	4	1	2
Maximum	5	5	5	4	5

*Source:* from findings of the study

Meanwhile, as indicated in Table 35, the employees' strong endorsement for customers to take leftovers home as the most effective measure to reduce food waste is reflected in the highest mean score of 4.23. The employees' level of support for details on menus is quantified by a mean score of 4.18 reflects a recognition of the positive impact it can bring on customer understanding of the menu. The adjustment of dish portions receives a lower yet high level of support, as indicated by an average rating of 3.68. Composting is assigned the lower priority, with a rating of 2.95, which is less favorable compared to all other options. The lowest rate belongs to the option of reusing food and ingredient. The restaurant regards promoting customers to take home leftovers as the most effective measure to minimize food waste, rating it 4.23. This shows their belief in individual accountability for reducing food waste and the immediate impact of this approach, without requiring significant changes or extra effort from the restaurant. Additionally, they recognize the importance of repurposing food in a cautious

and logical manner, demonstrating a proactive stance towards minimizing waste. The staff considered the amount of support for the details interpretation menu options, scoring it at 4.18, still a high index yet slightly less immediate solution compared to the ratings given by customers. It is widely acknowledged that can enhance the efficiency of the ordering process and improve customer satisfaction by providing clear menu descriptions. This, in turn, reduces the likelihood of incorrect orders and customer dissatisfaction, ultimately minimizing food waste resulting from unmet expectations food, despite the complexity and time-consuming nature of changing the menu design. Employees moderately supported the idea of adjusting food portions, with a score of 3.68. This suggests that they viewed it as a practical measure. However, implementing this change may require significant operational adjustments and testing time, which could hinder its quick effectiveness. Composting was calculated to have the fairly low mean value at 2.95. This discrepancy may be attributed to concerns about the feasibility, additional workload, or effectiveness of implementing composting programs in a restaurant setting, which only the restaurant staff fully understand. Lastly, reusing is not considered as an appropriate approach (mean value 2.5) despite its convenience and simplicity, prioritising food cleanliness and safety, as well as following health regulations, remains a top concern. In addition, there are still parts of food that can be reused, but the quantity is very small, leading to insignificant effectiveness. The disparity in viewpoints regarding the influence of information and customization in waste management is underscored by this comparison between employees and customers.

In general, customers, restaurant staff members, and management concur that the most efficient strategies presently involve enhancing the comprehension of menu in details, encouraging customers to bring home uneaten food, and adjusting the quantity and size of food portions. Although composting demonstrates promising utility, it remains currently unattainable.

## **5. Conclusion and recommendations**

### **5.1. Conclusion**

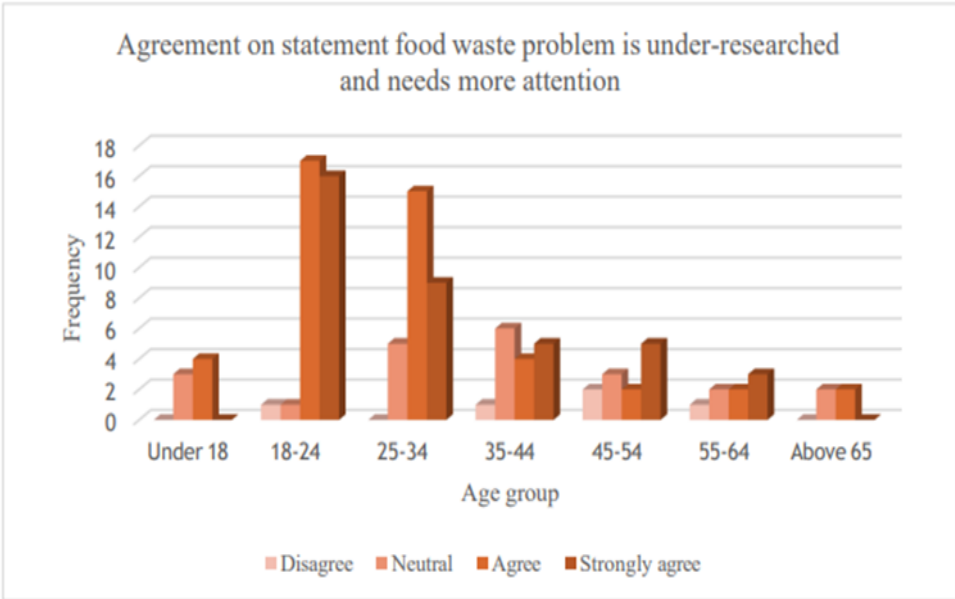
#### **5.1.1. Correlations between customer's socio-demographic data & food waste awareness**

By conducting a dependency test on the demographic information and food waste awareness and perception responses of 111 customers, multiple links were identified.

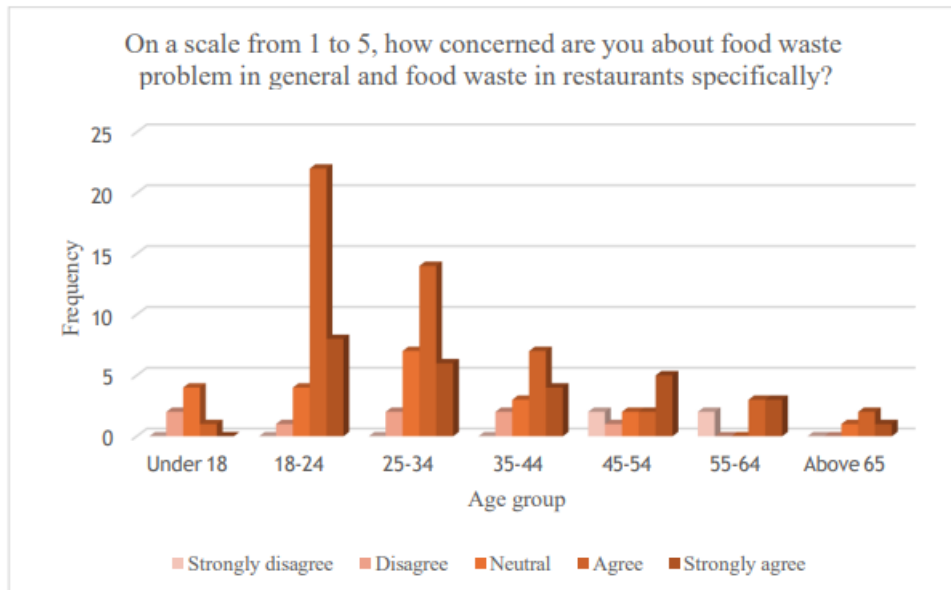
After coding 5 level of agreement (there was no response for “Strongly disagree”) and calculate the dependency, an association was discovered between the age of customers and their level of awareness regarding food waste issues. The results indicate that the question regarding the under-researched nature of the food waste problem and the need for more attention has a p value of 0.044. Additionally, the question regarding the level of concern about food waste has a p value of 0.007. These findings suggest that younger individuals, particularly those aged 18 to 34, are more likely to possess greater awareness and interest in the issue.

**Figure 4:** Crosstabulation between the statement “Food waste is under-researched and needs more attention” and age group

Source: from findings of the study



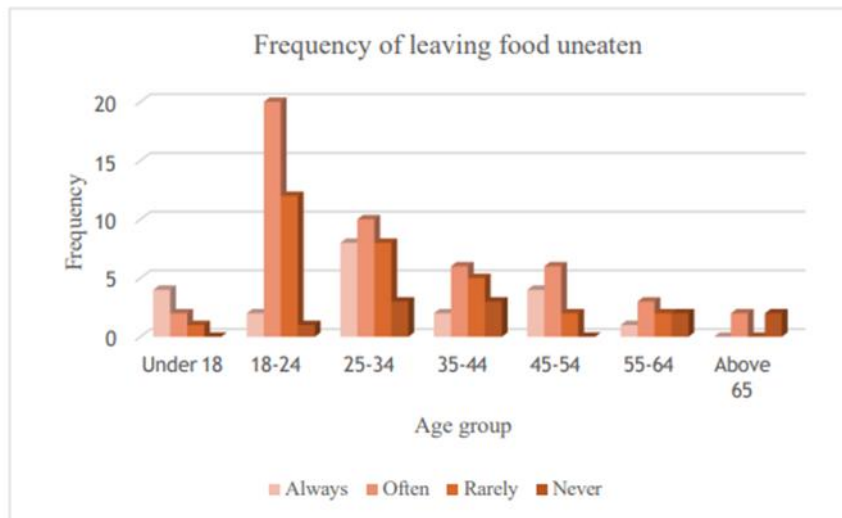
**Figure 5:** Crosstabulation between the level of concern and the age group



*Source:* from findings of the study

Nevertheless, when examining the relationship between participants' age and frequency of leaving leftovers, a statistical test for independence yielded a p value of 0.028, indicating a significant correlation between these two variables (the four sections 1, 2, 3, 4 are similar to the 4 levels of leaving leftovers: Always, Often, Rarely and Never respectively; and values from 1 to 7 correspond to age groups as mentioned above).

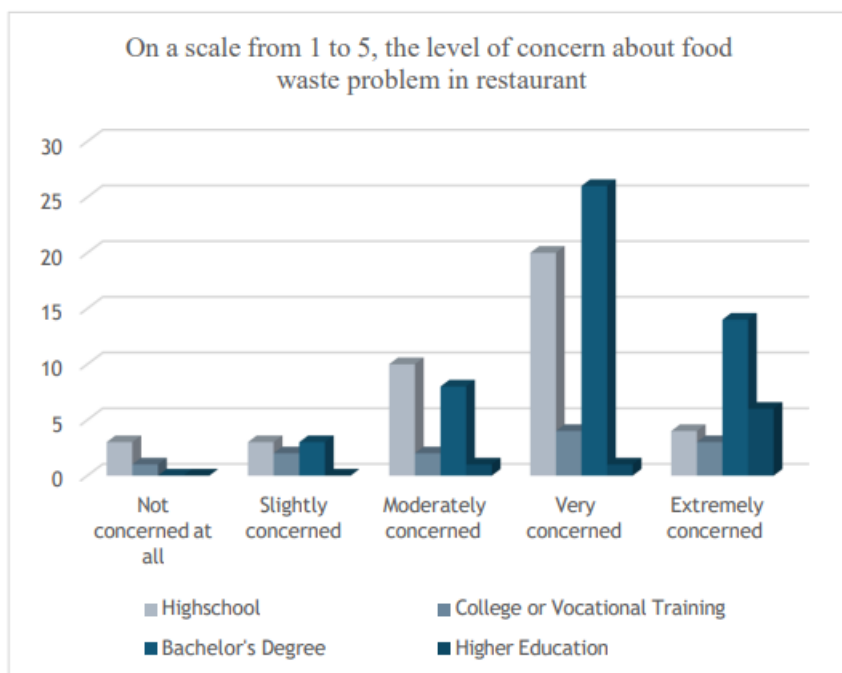
**Figure 6:** Crosstabulation between the frequency of leaving food uneaten and age group



*Source:* from findings of the study

Despite showing greater awareness and concern about the issue, this age group is also the most likely to leave food behind (Figure 6), with frequency decreasing towards older age groups (the four sections 1, 2, 3, 4 are similar to the 4 levels of leaving leftovers: Always, Often, Rarely and Never respectively; and values from 1 to 7 correspond to age groups as mentioned above). There is a possibility that the environmental consciousness of young people, particularly with regard to food waste, is expanding. However, a lack of comprehension regarding personal responsibility or the impact of individual liberalism may account for this awareness. Consequently, younger consumers are more likely than older consumers to abandon uneaten food, whereas the latter are more cognizant of personal accountability and the value of food.

**Figure 7:** Crosstabulation between customer's level of education and level of concern



*Source:* from findings of the study

An additional correlation was discovered between participants' level of education and their awareness and perception of food waste. According to Figure 7, there is a positive correlation between education level and awareness and concern regarding the issue at hand. This correlation can aid restaurants in providing customised approaches for each customer based on their educational attainment, and utilising education to involve customers in their food waste management efforts to achieve favourable outcomes, particularly considering that 53.1% of restaurant patrons possess a bachelor's degree or higher (as indicated in the study's findings, Table 7).

### 5.1.2. Summary

In conclusion, the study achieved the four primary objectives and provided answers to five research inquiries. First, the author had access to specific estimates of the level of food waste in H.N. Initially, the author had access to precise estimates regarding the extent of food waste in H.N. The total amount of food waste is estimated approximately 1156.7kg over two weeks with daily outflow of food waste averages 82.6kg. In this section, the leftovers have been categorised according to the original food type. Leftovers from vegetarian dinners make up 17.2% of the total, while the remaining 82.8% consists of non-vegetarian foods.

Furthermore, by monitoring the sales of items categorised as vegan, non-vegan, and lunch menu, as well as tracking the amount of leftover food for each item, we can determine the rate at which food waste is generated for each label. While vegetarian food comprises only 8.1% of the total items sold, it has the greatest proportion of leftovers at 28.4%, indicates that the rate of food waste generation is also higher than the other two classifications. Lunch menu offers follow with a leftovers percentage of 24.4%, despite accounting for only 3.6% of the total lunch offers sold. The food waste generation rate for the leftover food is 13.3%, and the total number of sold goods accounts for 88.4%. By comprehending the rate at which food waste is generated, restaurants can gain a more comprehensive understanding of the consumption and eating patterns of different customer groups. This knowledge enables them to enhance portion sizes and make necessary modifications to flavours and ingredients in order to cater to customers' dietary requirements.

Second, the two primary causes of food waste were found to be leftover and fixed food waste from cooking, accounting for 47% and 36.3% respectively. The residual quantity of food waste is present in various stages of restaurant operations, such as preparation, processing, and cooking oil is redirected to Biofilter for treatment. The author's evaluation of the causes of food waste includes customers and restaurant staffs, based on the quantity and types of food waste observed. The perspective and influence of the two mentioned subjects on food waste production have been elucidated through two surveys. Customers' decisions are influenced by their awareness, familiarity with the restaurant, understanding of menus and dishes, quantity of the food, personal preference, eating and ordering habits, as well as their cultural background and social norms (although the latter is not highly significant). Simultaneously, demographic factors also impact the generation of food waste. Specifically, individuals who are younger and possess higher levels of education tend to exhibit greater awareness and concern regarding the discussed problem. On the other hand, restaurant employees demonstrate a noticeable impact on the generation of food waste due to their limited awareness and proactive management, the shortage of practical measures, hindered by cost, cultural, and technological barriers, further exacerbates the issue. Additionally, employees exhibit a lack of personal responsibility and initiative in contributing to waste management. Plus, it is imperative to acknowledge that recipes, which necessitate strict adherence and prohibit alterations, have played a substantial role in generating a predetermined quantity of food waste, thereby complicating the management of food waste.

Third, by amalgamating the evaluations of both restaurant staff and managers, it can be deduced that the food waste management in H.N. exhibited a moderately satisfactory level of effectiveness, yet there were several areas that were constrained and necessitated enhancement. Restaurants presently prioritise the categorization of food waste to oversee and regulate the ultimate disposal procedure. They also aim to prompt customers to order according to their level of consumption when placing orders and to consult the food base on customer's ability to consume their entire meal. The restaurant is currently highly confident in effectively managing supplies and optimising the sourcing of raw materials through the use of a POS system to forecast sales. In addition, it is important to make suitable adjustments to the taste of the dishes to meet customers' individual preferences and to encourage them to take home any uneaten portions if they are unable to finish their ordered meals. Ultimately, the restaurant is conducting ongoing research to enhance the accuracy of food quantification in order to determine the optimal portion size, yet not effective. The main obstacle are encountering is the lack of awareness and knowledge among restaurant staff, which impairs the effective implementation of food waste management. Meanwhile, barriers such as cost, time, cultural differences, and cognitive limitations limit the ability to involve customers in activities aimed at reducing food waste and leftovers. Additionally, there are uncontrollable factors, such as customer personal preferences, that contribute to the likelihood of generating leftovers. The restaurant has expressed its intention to evaluate and implement the composting technique, highlighting its efficacy in managing fixed food waste. However, due to constraints such as insufficient physical space, lack of necessary technology, and absence of proper procedures, the implementation of composting is currently not feasible.

Lastly, after collecting and calculating data about the responses, there are three options that both customers, restaurant staff and management agree are the most feasible and predicted to bring high efficiency. The three most immediate measures are to improve the interpretation of menu details, encourage customers to take leftovers home, and adjust the quantity and portion size of food. Composting shows potential usefulness, it is not yet possible.

## **5.2. Recommendations**

Based on the study findings, a number of approaches have been proposed. However, currently, three methods are considered the most practical for reducing food waste generation:



Enhancing menu details helps customers have a more in-depth view of the dishes, size and flavor information helps improve the efficiency of the ordering process and improve customer satisfaction, reduces the likelihood of incorrect orders and ultimately minimizes food waste

Encouraging customers to pack leftovers is a measure that does not require substantial alterations or additional exertion from the restaurant customers while are equipped with appropriate amenities, such as reusable plastic containers and utensils, to pack their leftovers. This method is also recorded to bring positive signals when customers have a higher probability of consuming their leftovers (from findings of the study, Table 25)

Considering the research findings, it is necessary to modify the portion size and quantity of ingredients. The restaurant has acknowledged that they are currently working on designing optimal portion sizes, although their previous attempts have not been particularly successful. If implemented correctly, this method has the potential to align with the customer's consumption level, enhance customer satisfaction in terms of appetite, and reduce food waste. However, it will require time for testing and significant operational resources, which may impede its immediate effectiveness.

While the remaining two proposed methods are not completely ineffective, their overall effectiveness and feasibility are relatively low. Due to concerns regarding food safety and health regulations, as well as the restaurant's existing emphasis on efficiently using raw ingredients from the start, there is limited room for implementation and the resulting effectiveness is not significant. Furthermore, the foods utilised by H.N. are characterised by their freshness, perishability, and limited shelf life, making reuse challenging. Composting is a viable approach for managing solid food waste, which constitutes a substantial portion of the overall waste produced. Nevertheless, the current unavailability of adequate physical space, appropriate treatment technologies, and sufficient testing time pose financial obstacles that hinder the implementation of this method. H.N. also expressed their desire to promptly integrate this method into existing management and eagerly anticipate its promising outcomes.

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## **Appendix**

### **I. Questionnaires survey for customers (Survey 1)**

Dear Participants,

I am conducting a Bachelor thesis to examine the Food Waste Management in Restaurants, the case study will be H.N. restaurant - a Vietnamese restaurant with Vietnamese cuisine in Budapest, Hungary. The aim of this survey is to get an in-depth knowledge of the viewpoints, needs, and practices of the customers in relation to the production and management of food waste. This information will help improve and refine waste management strategies, which will ultimately result in less food waste and better food waste management. These enhancements will increase client satisfaction while also optimizing resource utilization.

The survey should take about 5 - 7 minutes to complete, and all responses will remain anonymous. I sincerely appreciate your time and effort in filling this research. Your responses are invaluable and will contribute to a deeper understanding of food waste issues from the viewpoint of customers.

Thank you and best regards,

Tran Thu Phuong

- *Demographic section*

1. Your age group:

- Under 18
- 18-24
- 25-34
- 34-44

- 45-54
- 55-64
- Above 65

2. Your gender:

- Female
- Male
- Prefer not to say

3. Your country of citizenship

4. Your employment status

- Full-time
- Part-time
- Self-employed o Unemployed
- Student
- Retired

5. Your monthly income range (The average range is based on Hungary's average income level of about 200,000 HUF - 400,000 HUF  $\approx$  550 USD - 1100 USD)

- Below average
- Average
- Above average

6. Your level of education

- Highschool
- College or Vocational Training
- Bachelor's Degree
- Higher Education

• *Perception and Awareness About Food Waste*

1. Do you think the food waste problem is under-researched and needs more attention (than other environmental issues)? ( 1 - Strongly disagree, 2 - Disagree, 3 - Neutral, 4 - Agree 5 - Strongly agree)

2. On a scale from 1 to 5, how concerned are you about food waste problem in general and food waste in restaurants specifically? (1 – Not concerned at all, 2 – Slightly concerned, 3 – Moderately concerned, 4 – Very concerned, 5 – Extremely concerned)
  
  3. Would you agree and be willing to comply if the restaurant takes measures to reduce food waste? ( 1 - Strongly disagree, 2 - Disagree, 3 - Neutral, 4 - Agree 5 - Strongly agree)
- *Specific survey questions*
    1. Your frequency of dining in H.N.
      - Multiple times a week
      - Once a week
      - A few times a month
      - Less than once a month
      - This is my first time
  
    2. If this is your first time, have you known about Vietnamese food and Pho soup before?
      - Yes
      - No
  
    3. What time of day do you usually come to H.N. to eat?
      - Lunch time (from 11am to 3pm)
      - Dinner time (from 6pm to 9pm)
      - Between lunch and dinner time (from 3pm to 6pm)
  
    4. What time of the week do you usually come to H.N. to eat?
      - Weekday (from Monday to Friday)
      - Weeken (Saturday and Sunday)
  
    5. In what order do you usually order food?
      - Order from basic course in a meal (Starter, Main course/Soup, Dessert)
      - Only soup or main dish

- Soup/main dish and dessert
- Soup and main dish
- Starter and soup/main dish
- Other

6. Do you consider a Pho soup as a main dish?

- Yes
- No
- Maybe

7. How often do you leave food uneaten?

- Always
- Often
- Rarely
- Never

8. In case you leave leftovers when eating out, what parts of food are usually left behind?
- Vegetable
  - Side dish (rice/noodle)
  - Garnishes (item or substance used as a decoration or embellishment such as pickles, sauce, herbs, etc.)
  - Starter
  - Dessert
  - Meat
  - Inedible parts (skins, bones, fatty parts, etc.)
  - Food that are flavored or contain special ingredients
9. What influences your decision to leave food uneaten at restaurant?
- Large portion size
  - Quality of food
  - Dietary restrictions or allergies
  - Personal taste (The dishes are not my preference or contain ingredients that are not in my preference)
  - Over-order
  - Social norms
10. In case you have leftover, do you pack it home?
- Yes
  - No
11. On a scale of 1 to 5, rate your likelihood of consuming leftover food after packing it to take home (1- Very unlikely, 2 - Unlikely, 3 - Neutral, 4 - Likely, 5 - Very likely)
12. On a scale of 1 to 5, how do you evaluate the opinion that leaving leftovers and wrapping leftovers to take home is influenced by cultural background factors? (1 - Strongly disagree, 2 - Disagree, 3 - Neutral, 4 - Agree 5 - Strongly agree)

13. On a scale of 1 to 5, how do you evaluate the opinion that leaving leftovers and wrapping leftovers to take home is influenced by social norms? (1 - Strongly disagree, 2 - Disagree, 3 - Neutral, 4 - Agree 5 - Strongly agree)
14. Do you think that a certain amount of food in a dish is being served too much compared to other ingredients of the dish? (1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree)
- Rice
  - Noodle
  - Vegetable
  - Meat/Poultry/Seafood
  - Garnish
15. On a scale of 1 to 5, would it be easier for you if the sizes and portions were clearly illustrated and explained on the menu? (1 - Strongly disagree, 2 - Disagree, 3 - Neutral, 4 - Agree 5 - Strongly agree)
16. Of the methods below, evaluate relevance and applicability to reduce food waste in the restaurant?
- Adjust quantity and ratio of ingredients and dishes
  - Reuse in case safe and reasonable
  - Encourage customer to bring left-over home
  - Enhance menu details interpretation
  - Compost
17. On a scale of 1 to 5, would it be easier for you if the sizes and portions were clearly illustrated and explained on the menu? (1 - Strongly disagree, 2 - Disagree, 3 - Neutral, 4 - Agree 5 - Strongly agree)
18. Do you have any suggestion for the restaurant to reduce food waste?

## II. Questionnaires survey for employees (Survey 2)

The purpose of this survey was to gain in-depth knowledge of the attitudes, behaviors and perceptions of restaurant staff regarding the production and management of food waste. This information will help improve and refine food waste management strategies, which will ultimately lead to less food waste and better food waste management. The survey will take approximately 5 minutes to complete and all responses will be anonymous. I sincerely appreciate your time and effort in answering these survey questions honestly.

Thank you and best regards!

Tran Thu Phuong

- *Demographic section*

1. Your age group

- 18-24
- 25-34
- 35-44
- 45-55
- Above 55

2. Your nationality

3. Your work position

- Service area
- Kitchen area
- Dishwashing area
- Preparation area
- Manager

- *Food waste perception and awareness & specific questions*

1. Are you aware and concerned about protecting sustainable values, the environment and the ecosystem? (1 - Not concerned at all, 2 - Slightly concerned, 3 - Moderately concerned, 4 - Concerned, 5 - Very concerned)

2. Do you think that food waste awareness and food waste reduction is a necessary and obligation for restaurant employees? (1 - Not necessary at all, 2 - Slightly necessary, 3 - Moderately necessary, 4 - Necessary, 5 - Very necessary)
3. How do you assess the severity of the food waste problem in H.N.? (1 - Not serious at all, 2 - Slightly serious, 3 - Moderately serious, 4 - Serious, 5 - Very serious)
4. Do you think that a certain amount of food in a dish is being served too much compared to other ingredients of the dish?
  - Noodle
  - Vegetable
  - Meat/Poultry/Seafood
  - Garnish
5. Do you think the food processing and recipes in H.N. causing food waste? ( 1 - Strongly disagree, 2 - Disagree, 3 - Neutral, 4 - Agree 5 - Strongly agree)
6. How effective do you feel are the current food waste management measures in H.N.? (1 - Not effective at all, 2 - Slightly effective, 3 - Moderately effective, 4 - Effective, 5 - Very effective)
7. Are you conscious and trying to limit the creation and reduce food waste during work?
  - Yes
  - No
8. Do you find your contributions very helpful in reducing restaurant food waste? (1 - Not helpful at all, 2 - Slightly helpful, 3 - Moderately helpful, 4 - Helpful, 5 - Very helpful)
9. How do you feel it is necessary to receive more training or information about food waste management? (1 - Not necessary at all, 2 - Slightly necessary, 3 - Moderately necessary, 4 - Necessary, 5 - Very necessary)



10. How willing are you to participate in food waste reduction programs or initiatives at H.N? (1 - Very unwilling, 2 - Slightly willing, 3 - Moderately willing, 4 - Willing, 5 - Very willing)
11. Of the methods below, evaluate relevance and applicability to reduce food waste in the restaurant?
- Adjust quantity and ratio of ingredients and dishes
  - Reuse in case safe and reasonable
  - Encourage customer to bring left-over home
  - Enhance menu details interpretation
  - Compost

### **III. Questions for the interview**

1. What is the significance and relevance of sustainable development for the restaurant sector as a whole and specifically for your business?
2. Regarding the issue of food waste in particular, do you think this is a prominent issue in your business?
3. What is your evaluation of the present food waste situation in your restaurant? Can you estimate a number that represents the damage and costs of food waste generated by the restaurant?
4. From your perspective, what do you believe are the primary sources of the restaurant's food waste?
5. What measures are restaurants currently taking to reduce and manage food waste? Can you further evaluate its effectiveness?
6. Based on observations and tracking, the quantity of unconsumed food left by guests is substantial. What are your opinions regarding this issue, and have you ever discovered the reason behind guests leaving uneaten food?

7. Are there any challenges and limitations that restaurants face when it comes to managing food waste?
8. Does the restaurant cooperate with any partners to support food waste treatment?
9. Does the fact that a restaurant specializes in Vietnamese cuisine, with its specialized recipes and cooking methods, address a challenge in terms of minimizing food waste?
10. How does the cultural background of restaurant employees and the culture of the business in general affect the restaurant's food waste management?
11. Based on survey responses and customer opinions, there is currently an inconsistency in the portion size and ingredient ratio of the dish, specifically the Pho soup - the restaurant's best-selling dish. Specifically, there have been complaints about excessive servings of pho noodles. Do you believe this is an issue that should be addressed?
12. Does your business prioritize the education and involvement of employees in subjects connected to environmental responsibility and sustainability? If yes, how did you reach that goal and keep that commitment between the circle of the restaurant?
13. Do you believe it is necessary for restaurant staff to receive education regarding awareness and the significance of food waste management, along with other environmental principles?
14. Do regulations influence your approach to controlling food waste at H.N.? How valuable do you consider the government's efforts in decreasing and managing food waste in the restaurant industry?
15. What are your future plans or goals for enhancing food waste management in your restaurant?

# **Pollution of the aviation industry and its effect near airports “Global challenges – local solutions”**

Zsombor Polgár<sup>1</sup>

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## **ABSTRACT**

In this essay the reader will find more details and descriptions of the following:

The aviation industry's reliance on fossil fuels leads to emissions of CO<sub>2</sub> and other pollutants, contributing to climate change and poor air quality. Budapest Airport serves as a focal point for air and noise pollution due to emissions from aircraft engines, ground vehicles, and infrastructure. Noise pollution from aircraft operations affects nearby residents, leading to long term health effects and disturbances during day and night.

Recommendations for solving the problem include collaborating with airlines to reduce emissions by promoting cleaner aircraft models and operational practices, investing in electric or hybrid vehicles for airport operations and ground support equipment, implementing infrastructure for electric vehicle charging and exploring renewable energy sources.

For Noise Mitigation Measures, promote quieter engine technology and incentivize the use of quieter aircraft models. Optimize flight paths to minimize noise exposure for communities. Adopt noise reduction practices during take-off and landing, such as reduced engine thrust and continuous descent approaches.

For Community Engagement and Support, expand support for community initiatives like window insulation programs to mitigate noise impacts on residents. Collaborate with local authorities to improve air quality through joint initiatives like tree planting and pollution control measures. Implement transparent reporting mechanisms to keep the public informed about air quality and noise pollution levels.

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## **1. Introduction**

Air pollution occurs when gases, dust particles and smoke are released into the atmosphere, making it harmful to humans, infrastructure, and the environment. (European court of auditors, 2018)

Noise pollution is unwanted or excessive sound that can have deleterious effects on human health, wildlife, and environmental quality. (Britannica, 2024)

The World Health Organization identifies air pollution as the foremost environmental risk to health in Europe. In the EU, air pollution causes over 1,000 premature deaths daily, surpassing the toll of road accidents by more than tenfold. Some EU Member States experience lost years of healthy life comparable to countries like China and India, known for poor air quality. In 2013, the EU Commission estimated the annual health-related external costs of air pollution to range between €330 and €940 billion. (European court of auditors, 2018)

The aviation industry is singled out as a major culprit for pollution in tourism. (Harrison, Masiol, & Vardoulakis, 2015)

The aviation industry generates 87.7 million jobs globally, both directly in airlines and airports and indirectly through its economic influence. Aviation is an economic giant, contributing over \$3.5 trillion to global GDP, which is on par with the combined economies of Indonesia and the Netherlands. This impact goes beyond airlines and airports, encompassing jobs in manufacturing, tourism, and the broader supply chain. By 2038, the aviation industry is predicted to soar, supporting 143 million jobs, and injecting a whopping \$6.3 trillion into the global economy. (Air Transport Action Group)

I choose this topic because I recently started working for an airline in the field of digital marketing, however I was always interested and was driven by sustainability, as well as biology and chemistry, which from I took my upper-level graduation exams. I hope that this essay will enlighten the readers about the seriousness of air pollution by the aviation in Hungary.

In this essay I will give more detail of the global air- and noise pollution of aviation in the skies and near airports, the health effects of the latter, and the local impact with focus on Budapest Airport.

## 2. Evaluation and statements

### 2.1 Pollution itself

The air transport industry, pivotal in global socioeconomic development, has historically overlooked its environmental impact. However, addressing and managing its environmental costs has become increasingly relevant. Despite technological advancements, the industry remains heavily reliant on fossil fuels, leading to a significant rise in CO<sub>2</sub> emissions. While aviation's contribution to climate change is relatively small compared to other sectors, its fast expansion poses a substantial challenge, with CO<sub>2</sub> emissions projected to increase by 300-700% by 2050. This growth contrasts with emissions reductions in other sectors, prompting calls for more robust environmental measures. International air transport, vital for social and economic development, is a significant CO<sub>2</sub> emitter, with emissions forecasted to rise by 70% by 2020, even with a 2% annual improvement in fuel efficiency. (European commission, 2016)

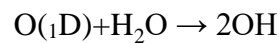
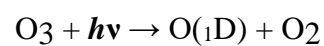
„Aircraft emissions consist mainly of water vapour (H<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>). They further contain oxides of nitrogen (NO), carbon monoxide (CO), oxides of sulphur (SO<sub>x</sub>), unburned hydrocarbons (HC), and particulate matter (PM).” (M.O. Köhler, 2015, p.2.)

Aircraft emissions are released mostly at high altitudes (9-13 km) where the upper troposphere and lower stratosphere meet. This is important because these atmospheric layers have different chemical properties and how they affect emissions is different. Some emissions, estimated at 20-60%, end up in the stratosphere, which is further complicated by the ever-changing border between the two layers. (M.O. Köhler, 2015)

Based on Köhler's (2015) publication, I'll try to explain how these emissions contribute to air pollution. Imagine the lower atmosphere (troposphere) as a giant outdoor chemistry lab. Sunlight is the main source of energy for most reactions in this lab. But before sunlight reaches the troposphere, it gets filtered by a layer of ozone gas up high (stratosphere). This filtering acts like a giant UV shield, only letting through the weaker kinds of sunlight (longer wavelengths). Certain molecules in the troposphere, like ozone (O<sub>3</sub>) and nitrogen dioxide (NO<sub>2</sub>), are sensitive to this weaker sunlight. When they absorb this sunlight, they break apart, like triggered dominoes. This breaking apart is the first step in a series of reactions, kind of like a chemical chain reaction. One important chain reaction involves a super reactive molecule called a hydroxyl radical (OH). There aren't many OH radicals floating around, but they're good at grabbing onto and breaking down things like pollution (organic substances) and carbon monoxide (CO). This process is like a slow-burning fire at low temperature, cleaning up the air. At night, with no sunlight, another molecule called the nitrate radical (NO<sub>3</sub>) takes over a similar

role, but it's not quite as good at cleaning things up. The passage goes into more detail about how these cleaning reactions work during the day, using examples like CO and methane (CH<sub>4</sub>). It also talks about how some of these reactions can affect the amount of ozone in the atmosphere. (M.O. Köhler, 2015)

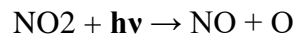
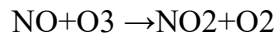
„At wavelengths  $\lambda$  of less than 310 nm the photolysis of O<sub>3</sub> can produce an excited-state oxygen atom, O(<sup>1</sup>D). This high-energy oxygen atom can overcome the stability of the H<sub>2</sub>O molecule and, upon reaction with water vapour, result in the formation of OH.” (M.O. Köhler, 2015)



$$(\lambda < 310 \text{ nm})$$

*Formulas from publication by M.O. Köhler, 2005*

The compounds nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>), when available in sufficiently large concentrations, have the ability to interfere in the above described reaction process. During day time atmospheric NO rapidly inter-converts with NO<sub>2</sub> in the presence of ozone such that both species usually are in chemical steady state and are together referred to as the NO<sub>x</sub> chemical family (nitrogen oxides). (M.O. Köhler, 2015)



$$(\lambda < 400 \text{ nm})$$

*Formulas from publication by M.O. Köhler, 2005*

*The catalytic-like agent "M" in the reaction  $\text{O} + \text{O}_2 + \text{M} \rightarrow \text{O}_3 + \text{M}$  is typically a third body, which can be any molecule (often nitrogen or oxygen in the atmosphere) that absorbs excess energy from the forming ozone molecule, stabilizing it and allowing the reaction to proceed.*

The main purpose for including these formulas is to show the elimination of  $h\nu$ . The term " $h\nu$ " in the context of atmospheric chemistry refers to a photon of light energy, specifically ultraviolet (UV) radiation. UV radiation itself is not inherently harmful; in fact, it is essential for life on Earth as it drives photosynthesis in plants and helps produce vitamin D in humans. However, excessive exposure to UV radiation, particularly UV-B and UV-C, can be harmful to living organisms. (WorldWideScience)

The combustion of kerosene or fossil fuels emits water vapor and carbon dioxide, both potent greenhouse gases affecting Earth's radiative balance. Water vapor emissions in the troposphere have minimal impact due to high natural concentrations and control by physical processes. However, in the stratosphere, water vapor emissions contribute to ozone destruction. While current subsonic aircraft have negligible impact, potential future supersonic aircraft could significantly affect ozone loss. Carbon dioxide emissions from aviation accumulate globally, interacting with the biosphere and hydrosphere, persisting for over 100 years. (M.O. Köhler, 2015)

Nitrogen oxides (NO<sub>x</sub>) from aviation influence tropospheric and stratospheric chemistry, affecting ozone and methane levels. NO<sub>x</sub> emitted at cruise altitudes interacts with other compounds, potentially leading to ozone loss. The impact of aviation NO<sub>x</sub> on ozone varies regionally, with models indicating both increases and decreases in ozone levels, along with enhanced methane destruction. (M.O. Köhler, 2015)

Sulphur oxide emissions from aircraft, primarily SO<sub>2</sub>, affect sulphate aerosol formation, leading to heterogeneous chemical processes. This can result in the loss of reactive nitrogen, reducing ozone increases caused by NO<sub>x</sub> emissions. Additionally, reduced reactive nitrogen levels may impact halogen nitrate compounds, affecting ozone depletion via catalytic cycles. Model studies suggest that at high latitudes, aerosol effects can decrease stratospheric ozone levels, partially offsetting ozone increases caused by NO<sub>x</sub> emissions. (M.O. Köhler, 2015)

As for the airports, the International Civil Aviation Organization (ICAO) acknowledges air pollution as a concern, particularly near urban airports. Various pollutants are emitted, including Carbon Monoxide (CO), Oxides of Nitrogen (NO<sub>x</sub>), Hydrocarbons (HC), Particulate Matter (PM), Sulphur Oxides (SO<sub>x</sub>), Ozone (O<sub>3</sub>), Lead (Pb), Hazardous Air Pollutants (HAPs)

The primary culprit is aircraft engine emissions. However, other airport activities contribute including ground vehicles (cars, trucks), ground support equipment, fuel storage and handling, construction, heating and cooling systems, aircraft engine emissions. (ICAO)

Most countries regulate air quality to protect public health. Airports must comply with these regulations, which establish thresholds for various pollutants. Permits may be required for specific operations, and new construction often undergoes air quality impact modelling. Regulations may categorize emissions by type, such as hazardous air pollutants (HAPs), volatile organic compounds (VOCs), greenhouse gases (GHGs). (ICAO)

Aviation is not only polluting the air with harmful gases, but also with noise. Aircraft noise, generally unwanted, comes from engines (especially during take-off) and airframe turbulence. Engine noise mainly originates from the fan, compressor, turbine, and exhaust, while airframe noise comes from turbulent airflow around various parts. Pinpointing the exact source during flight is difficult due to the merging of these noises. (I.B. Zimmer, 2001)

Day-night sound level (**DNL**) accounts for night-time noise impact by adding 10 dBA between 10 p.m. and 7 a.m. It's useful when sleep disturbance is a concern and is commonly used for community noise assessment, including near schools. It's straightforward to understand, compares noise control methods, and is backed by scientific data on human reaction to noise. However, its accuracy depends on data quality, and factors like aircraft operations and human subjective response can affect its reliability. A study near Heathrow Airport found a strong linear relationship between the percentage of annoyed residents and the DNL (day-night sound level). (I.B. Zimmer, 2001)



To demonstrate the calculation of DNL, I would add the formula for it from source I.B. Zimmer, 2001:

$$DNL = 10 \cdot \log \left( \sum_{i=1}^N 10^{\frac{E_i}{10}} \right) - 49.4 \quad (1)$$

*Formulas from publication of I. B. Zimmer, 2001.*

Where  $E_i$  is

$$E_i = SEL_i + 10 \cdot \log(d + 10 \cdot n) \quad (2)$$

*Formulas from publication of I. B. Zimmer, 2001.*

**SEL** represents the Sound Exposure Level for the specific event type. "d" denotes the count of events occurring between 7 a.m. and 10 p.m. within a typical 24-hour period, while "n" signifies the count of events between 10 p.m. and 7 a.m. within the same timeframe. (I.B. Zimmer, 2001)

By including these formulas, I wanted to show the possibility of a fair and relatively simple calculation of noise pollution, which then could further contribute to noise reduction focusing on residents, given the linear relationship result of the Heathrow Airport experiment.

## **2.2 Impact on Hungary**

From the previous chapter, we can see that the air pollution is relevant to Hungary based on these data, therefore the air is being polluted by the same processes that were mentioned before (please refer to chapter *Pollution itself*) by the airplanes passing through, above the country.

Airports are a focal point for air quality concerns due to the various stakeholders' activities, including aircraft operations. While aircraft engine emissions are a major source of pollution, this passage focuses on how airports can collaborate with stakeholders to manage other emission sources. Airports are at the centre of aviation's environmental impact, and air quality is a key concern. Diverse activities at airports generate various pollutants affecting air quality.

Airports can partner with airlines, air traffic control, and others to reduce emissions. Regulations and resources exist to guide airports in managing air quality. (ICAO)

The Budapest Ferenc Liszt International Airport, situated just 16 kilometres from the centre of Budapest, holds a license for a capacity of 6 million passengers per year. In 2023, Budapest Airport handled 14.7 million passengers. This was already twice the original capacity. (Morina, 2024)

With plans for expansion, the goal is to increase passenger turnover to 21 million, more than twice the population of Hungary. This expansion will impact approximately 1 million people, including families residing in houses constructed decades before the airport's growth began. Unfortunately, the quality of life for local inhabitants has been declining in proportion to the rise in air traffic. (A. Roggenbuck & T. Dönsz-Kovács, 2021)

The European Investment Bank loaned Budapest Airport €200 million to expand its capacity by 50%. This €463 million project includes a new pier, terminal, cargo city, and baggage system upgrades. However, the project avoided a full environmental review by splitting it into smaller sections, raising concerns about increased pollution from the higher passenger volume. The airport also plans a new cargo facility, rail connection, and general service improvements. (A. Roggenbuck & T. Dönsz-Kovács, 2021)

As the Budapest Airport had 340 operations per day during its peak operation, take-off and landing during this period must have resulted in the emission of at least 700 tons of CO<sub>2</sub> and microdust particles per day. (A. Roggenbuck & T. Dönsz-Kovács, 2021)

Also, I wanted to gather some research for other effects of the pollution of the aviation industry in Hungary.

Specifically, studies have observed increased concentrations of UFPs (Ultrafine Particles - These are microscopic particles suspended in the air, less than 100 nanometres in diameter. They are so small they can easily penetrate the lungs and enter the bloodstream, potentially causing health problems), PM<sub>2.5</sub> (Particulate Matter 2.5 - These are fine inhalable particles, with a diameter of 2.5 micrometres or less. They are a major component of air pollution and can also cause respiratory problems), PM<sub>10</sub> (Particulate Matter 10 - This refers to coarse inhalable particles, with a diameter of 10 micrometres or less. While not quite as concerning as PM<sub>2.5</sub>, they can still irritate the respiratory system), BC (Black Carbon - This is a component of PM<sub>2.5</sub> that comes from the incomplete burning of fossil fuels and biomass. It is a major concern because it can absorb sunlight and contribute to warming the planet), and gaseous criteria pollutants (Gaseous criteria pollutants are specific air pollutants regulated by authorities

based on their health and environmental impacts) such as carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), and sulphur dioxide (SO<sub>2</sub>) near airports, with some studies indicating contributions extending up to 12 kilometres from the airport. The presence of hazardous air pollutants (HAPs), particularly polycyclic aromatic hydrocarbons (PAHs), has also been documented, although fewer studies have specifically addressed these pollutants. (K. Riley et al., 2021)

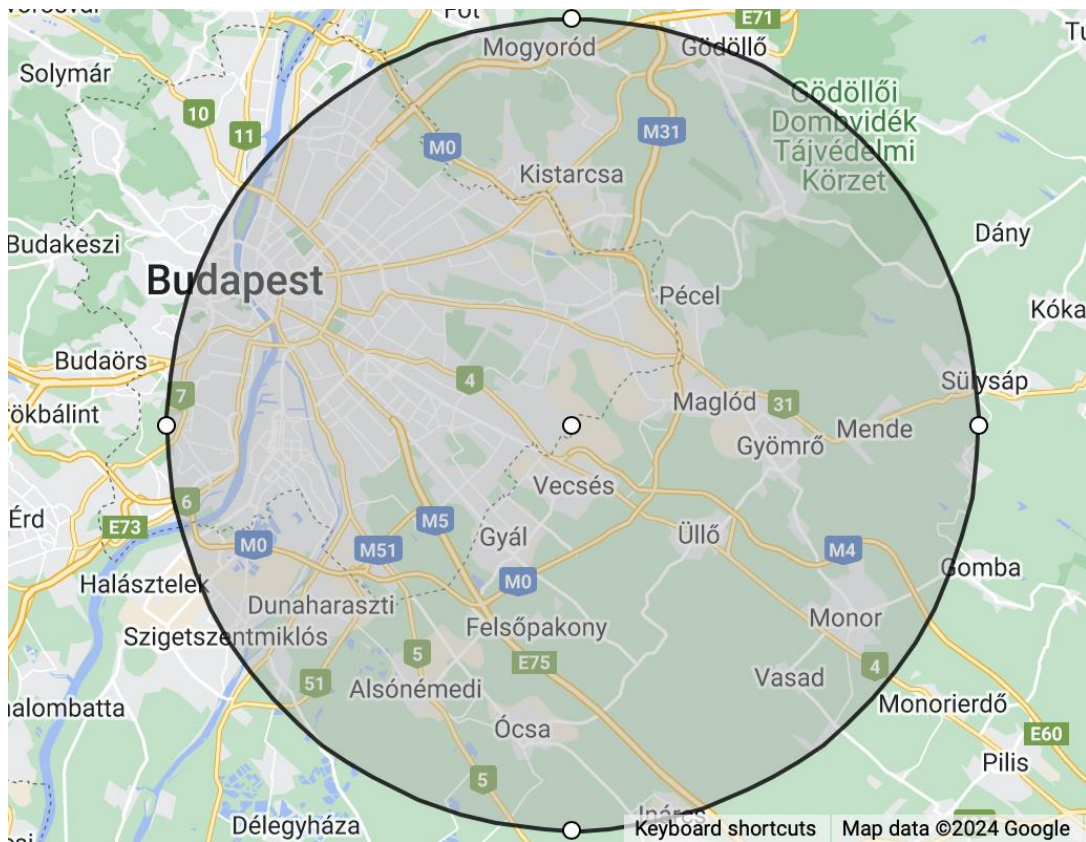


*12 kilometre radius from Budapest Airport. Own editing, based on Google Maps data. 2024*

I would like to add here, that some buildings and faculties of Budapest Business University (for which I'm currently writing this essay to), therefore it's students and teachers are with high chance impacted by the followingly described effects and pollutions-

A 2015 study by Yim et al. estimated: 16,000 premature deaths globally each year due to civil aviation emissions. 87% of these deaths attributable to PM<sub>2.5</sub> exposure. Around a third of these deaths attributable to PM<sub>2.5</sub> exposure within 20 kilometres of an airport. Studies since 2015 haven't quantified health impacts but found elevated UFP concentrations downwind of commercial airports and increased particle number concentrations in residences near airports. (K. Riley et al., 2021)

Please see the 20 kilometre radius from Budapest Airport.



*20 kilometre radius from Budapest Airport. Own editing, based on Google Maps data. 2024*

A 2013 study by Rissman et al. found a positive correlation between: Minority population percentages and aircraft-derived particulate matter concentrations. (K. Riley et al., 2021)

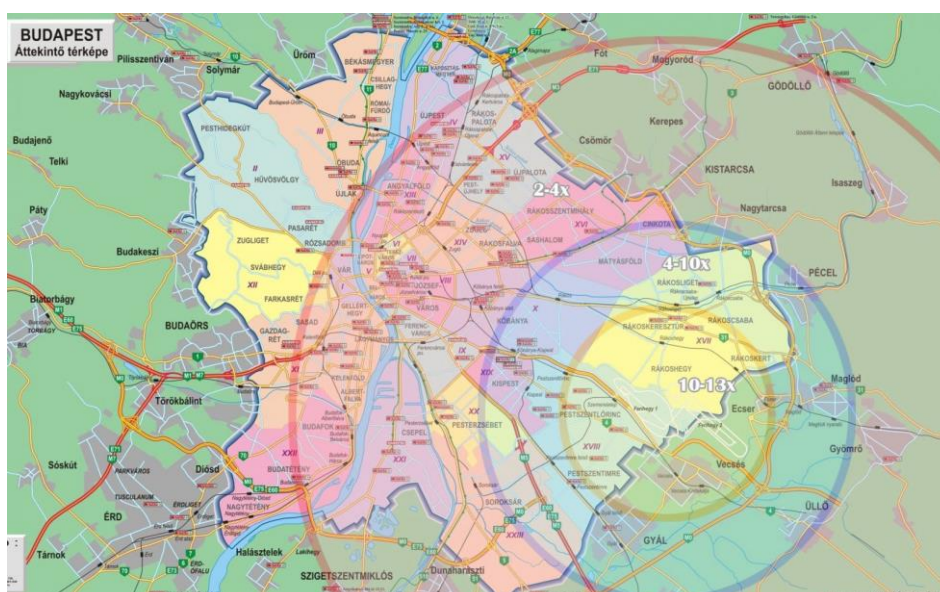
The health effects of aviation air pollution have been extensively studied over the past two decades, with numerous investigations focusing on various pollutants and their impacts on human health. Studies conducted primarily in the United States but also internationally have consistently shown elevated concentrations of ultrafine particles (UFPs), PM<sub>2.5</sub>, PM<sub>10</sub>, black carbon (BC), and gaseous criteria pollutants in the vicinity of airports. These pollutants are often found to be significantly higher under landing approach paths and extend several kilometres downwind from airports. While some variability exists in the findings, particularly regarding PM<sub>2.5</sub> levels, overall, the evidence suggests a notable impact of aviation activities on local air quality. (K. Riley et al., 2021)

The health effects associated with exposure to aviation air pollution include respiratory and cardiopulmonary outcomes, such as decreased lung function and increased risk of pre-term birth. Additionally, exposure to jet engine emissions has been linked to adverse biological responses, including cytotoxicity, oxidative stress, and inflammatory mediator release in human bronchial epithelial cells. Studies have also shown genotoxic and oxidative effects in airport personnel exposed to PAHs (Polycyclic Aromatic Hydrocarbon), suggesting potential long-term health risks associated with chronic exposure to aviation-related pollutants. (K. Riley et al., 2021)

Ultrafine particles (UFPs) are much smaller than larger particle pollutants and can be absorbed directly into the lungs and bloodstream, posing health risks. High-performance air purifiers with special filtration technology can be used to remove UFPs from the air. (IQAir, 2016)

Air pollution in Hungary is a major health concern, with the **second highest death rate globally** (after China). This translates to roughly 10,000 premature deaths annually due to pollution-related illnesses. (Euronews, 2019)

In Budapest, harmful substances in the air often exceed official limits, but ultrafine particulate matter (UFPs) pose a major, overlooked threat. UFPs, smaller than 100 nanometres, are hard to measure due to their tiny mass. Recent technology reveals UFP concentrations in busy areas are 10-20 times higher than in cleaner zones, reaching peaks of 470,000 particles per cubic centimetre. Despite their abundance, their minimal mass means they don't breach air quality limits. This highlights the need to address UFP pollution for public health. (Levegő Munkacsoport, 2019)



*Estimated micro-dust concentrations around Budapest Airport. Based on data measured at Schiphol Airport in the Netherlands and applied to Budapest Airport based on 2018 and 2019 traffic data. Source: Association for Civil Aviation (KLKE / CATA) and Magyar Természetvédők Szövetsége*

The above map shows the micro-dust concentrations around Budapest Airport. The latter are also called as Particulate Matter.

While the literature on health effects associated with aviation air pollution remains limited, recent systematic reviews have highlighted the similarities between jet engine emissions and diesel exhaust particles in terms of physicochemical properties and adverse health effects. Overall, these findings underscore the importance of further research into the health impacts of aviation air pollution and the implementation of measures to mitigate its effects on both airport personnel and nearby communities. (K. Riley et al., 2021)

As for the noise pollution, contours for Budapest Airport from 2012 to 2019, available on the airport's website, show a notable increase in noise exposure over both day and night periods, as depicted by the expanding coverage of the noise contours. With the airport being the city's sole airport, the situation may worsen due to increasing air traffic and potentially growing population of the impacted areas. (T. Elliff et. al, 2020)

### **2.3 Economic decisions to solve air pollution**

Various strategies can be employed to mitigate adverse aircraft emissions, encompassing economic mechanisms, regulatory measures, research initiatives, and shifts in fuel usage and transportation habits. (N. Cottis & P. Morell, 2001)

Economic mechanisms, while theoretically viable, face challenges due to the complexity of emissions' adverse effects and equity concerns regarding revenue distribution. Proposed community objectives for the International Civil Aviation Organization (ICAO) include taxes on fuel and emissions trading, aiming for revenue neutrality to address distribution issues. Regulatory mechanisms ensure compliance with emissions standards, including stricter certification for new engines and interim rules for non-compliant engines. Research sponsorship, exemplified by programs, targets reducing uncertainties in environmental impacts and operational efficiency improvements. Biofuels offer a potential solution with no net CO<sub>2</sub> emissions, but face challenges in scalability due to land requirements. Non-carbon fuels like hydrogen present opportunities, but infrastructure changes are needed, and emissions of nitrogen oxides and water vapor persist. Inter-modal transport promotion could reduce air travel demand for shorter distances, though significant investment is required. Teleworking and improved communication technologies may reduce business travel but might also encourage it, making significant reduction unlikely. (N. Cottis & P. Morell, 2001)

Unlike the Kyoto Protocol, the Paris Agreement applies to all countries and their entire economies, including aviation, even though not explicitly mentioned. Countries are expected to include aviation emissions in their national climate pledges (NDCs) to encourage action at national and international levels. (Transport & Environment)

The International Civil Aviation Organization (ICAO) is working on global measures like long-term emission reduction goals and offsetting schemes, but their effectiveness might be limited.

The EU includes outbound aviation emissions in its 2030 target (though not yet implemented in legislation), and some countries like the UK are taking the lead in accounting for aviation emissions in their carbon budgets. (Transport & Environment)

Beyond CO<sub>2</sub>, aviation significantly impacts air pollution through contrails (condensation trails) and cirrus cloud formation. These high-altitude clouds trap heat more effectively than CO<sub>2</sub>, potentially doubling the total warming effect of aviation. There are currently no global measures to address these non-CO<sub>2</sub> effects. (Transport & Environment)

E-fuels, particularly e-kerosene, hold promise for reducing carbon emissions but require substantial renewable energy and raise concerns about the source of CO<sub>2</sub> used in their production. Zero-emission aircraft using hydrogen or electricity are a future possibility for shorter routes but require significant funding for development. One of the major disadvantages of e-fuels is the lack of viable industrial-scale technology for their production. Currently, the production of e-fuels is not yet feasible on a large scale, making it a less practical solution compared to other alternatives. (Transport & Environment)

Based on the information I found, there are at least 3 airfields within 100km of Budapest: Hármashatárhegy airfield, Budaörs Airport, Budapest Ferenc Liszt International Airport, and the average distance from the city centre of these, compared to other European countries capital cities are one of the lowest in the list. (Eurocontrol, 2007)

Among other sectors, the forecasting of demand for passenger air transport is difficult because historical passenger-km data are not available in the statistics, only airports provide passenger number data. We therefore accepted the estimates of the PRIMES model, which, similarly to the current trend, forecasts significant growth; demand for air transport (passenger-km) will triple by 2050 over the year 2015. (Hungarian Ministry of Innovation and Technology)

## **2.4 Actions of Budapest Airport**

Based on Budapest Airport's website, the airport monitors air quality around the facility to track various pollutants and their sources. These sources include on-airport sources: aircraft engines, boilers, vehicles on airport roads. Off-airport sources related to airport operations: vehicles used by staff, suppliers, and passengers. Unrelated sources: nearby traffic, industrial facilities, and Budapest itself (due to wind patterns).

The airport takes steps to reduce emissions through practices like taxiing aircraft at lower engine power, using external power for grounded planes instead of auxiliary engines, providing air conditioning and electricity via external units at gates, encouraging the use of cleaner aircraft and vehicles on the airport grounds, operating an internal bus system for employee transport.

As for the noise pollution, Budapest Airport employs several strategies to reduce noise pollution and mitigate its impact on nearby residents. This includes noise monitoring system, which operates for continuous noise measurement and flight tracking, correlating flight data with noise levels to ensure compliance with legal thresholds. Also, a public flight tracking system, that provides residents with a user-friendly application to monitor arriving and departing flights and



environmental noise impacts in real-time. Noise Protection Zones designates noise protection around the airport to assess and manage aircraft noise emissions' impact on residents. Night Curfew imposes restrictions on night-time flights to minimize disturbances during sleep, with limited commercial flights allowed during the night, subject to prior authorization. A window insulation program offers a passive acoustic protection program for residential properties within noise protection zones, providing window insulation options either free of charge or through cost-sharing. Air Traffic-Related Regulations adhere to stringent aviation regulations governing noise protection, with comprehensive provisions outlined in legal decrees and manuals. Engine Test Stand operates an engine test stand with noise protection measures to conduct aircraft engine tests without causing excessive ground noise. Protection for Rákoshegy implements environmental restrictions on runway use to minimize noise burdens on residents, with transparent information provided on air traffic movements over the area. Settlement of Roof Damage Cases addresses damage to residential roofs caused by aircraft vortexes through appropriate measures and compensation where necessary. (Budapest Airport)

## **2.5. Proposals**

As for the air pollution I used mainly ICAOs *Air Quality Management at Airports* publication as well as all the previous literature to make some proposals.

Budapest Airport could work with airlines to reduce aircraft emissions, encourage airlines to use cleaner, newer aircraft models that meet the latest ICAO emission standards. Also, support operational practices that reduce fuel burn during taxiing and landing, such as using low-power taxiing techniques and continuous descent approaches.

Reduce ground vehicle emissions by investing in electric or hybrid vehicles for airport operations, including ground support equipment and buses used to transport passengers and employees. Encourage airlines and ground handling companies to transition to cleaner vehicles. Implement infrastructure to support electric vehicle charging at the airport. Optimize energy use by investing in energy-efficient heating and cooling systems for airport terminals. Explore the use of renewable energy sources like solar or wind power to meet the airport's energy needs.

Minimize other sources of pollution by implement stricter measures to control dust and emissions from construction activities. Explore ways to reduce emissions from fuel storage and

handling. Partner with local authorities to improve air quality in surrounding areas, potentially through joint initiatives like planting trees.

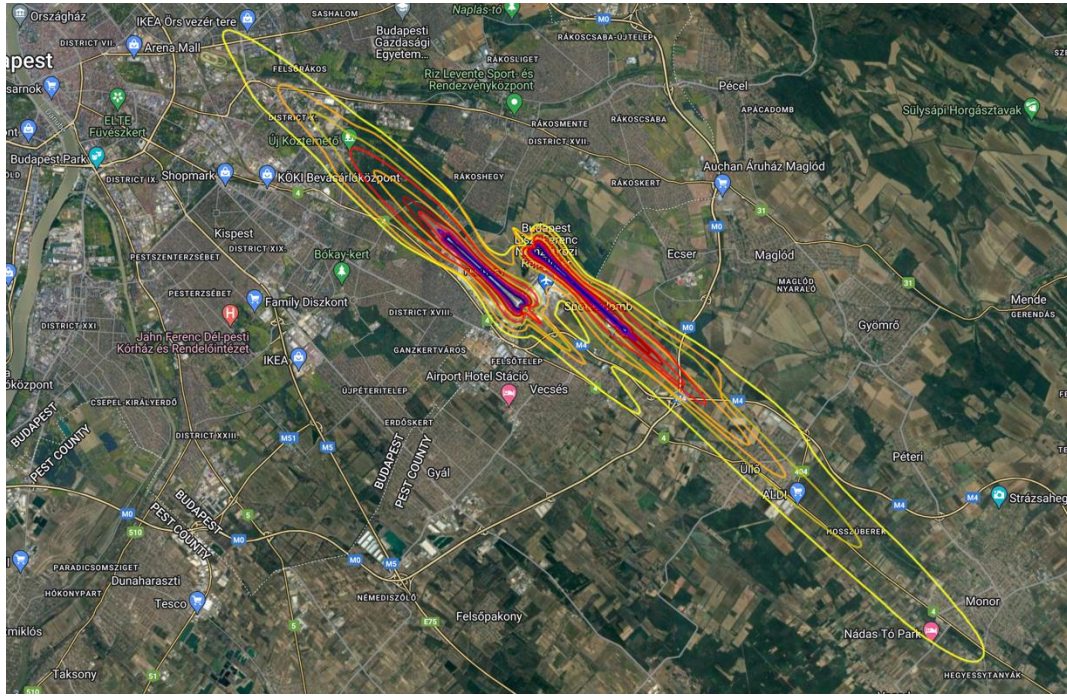
Monitor and report on air quality by maintaining a robust air quality monitoring program to track pollution levels and identify areas for improvement. Regularly report air quality data to the public and relevant authorities. By taking these steps, Budapest Airport can demonstrate its commitment to environmental responsibility and contribute to cleaner air for the surrounding communities.

As for the noise pollution, with the help to global solution ideas by Aviation Benefits Beyond Borders I gathered some proposals.

Quieter engine technology could mean newer aircrafts are quieter by design, meeting stricter noise reduction standards set by ICAO (International Civil Aviation Organization). Research focuses on minimizing noise from engine components like fan blades and air intake. Budapest Airport could encourage the use of these new aircraft by for example a fee for the louder planes. This fee could be taken to further support the noise reduction support for the residents in the area.

Air traffic management could be optimizing flight paths to avoid populated areas during take-off and landing, which could significantly reduce noise exposure for communities. Also, pilots landing and taking off from Budapest could familiarize themselves with the populated area locations and sizes near the airport. Newer navigation systems allow for precise flight tracks, but this can concentrate noise over fewer areas. Collaboration between airlines, air traffic control and communities is crucial.

Operational procedures would mean that airlines and pilots can adopt noise reduction practices during take-off and landing. This includes using less engine thrust, starting take-offs from further down the runway (displaced landing thresholds), and maintaining a continuous descent for landing to minimize loud engine noise.



*Noise map of Budapest Airport, 2021 day and night. Source and edit: Budapest Airport*

The mapping of the noise related to the airport could help in the previously described proposals. Also, the support for the window insulation program could be widened to every resident in the impacted areas (from IKEA to Monor, as shown).

In conclusion, while these proposals offer a comprehensive approach to addressing air and noise pollution at Budapest Airport, it's important to note that I do not have information of the actual implementation status of these measures. Without access to direct, specific information regarding the airport's initiatives, it's challenging to ascertain whether any of these proposals have been put into practice in the past or are currently being implemented. Therefore, further research or direct inquiry with Budapest Airport authorities would be necessary to determine the extent to which these proposals have been adopted. Nevertheless, these suggestions serve as a proactive framework for potential future actions that Budapest Airport could consider to enhance its environmental sustainability efforts and mitigate the impact of air and noise pollution on surrounding communities.

### **3. Conclusions and recommendations**

Air pollution from aviation is a significant environmental concern globally, with adverse effects on human health and the environment. Budapest Airport, like many others, faces challenges related to air and noise pollution due to its operations and expansion plans. Various pollutants emitted by aircraft and airport operations contribute to air and noise pollution, affecting local communities' health and well-being.

The aviation industry's reliance on fossil fuels leads to significant emissions of CO<sub>2</sub> and other pollutants, contributing to climate change and poor air quality. Airports, including Budapest Airport, serve as focal points for air pollution due to various activities and emissions from aircraft engines, ground vehicles, and infrastructure. Noise pollution from aircraft operations impacts nearby residents, affecting their quality of life and health.

The global challenge of air pollution from aviation manifests locally at airports like Budapest Airport due to emissions from aircraft engines and airport activities. Factors certifying this problem at the local level include the expansion plans of Budapest Airport, increased air traffic, and the resulting emissions affecting nearby communities.

Proposals for Budapest Airport include collaborating with airlines to reduce emissions, investing in cleaner vehicles and infrastructure, optimizing energy use, and implementing stricter measures to control pollution. Strategies to reduce noise pollution involve promoting quieter engine technology, optimizing flight paths, adopting noise reduction practices during take-off and landing, and supporting community initiatives like window insulation programs.

It's acknowledged that there's uncertainty about the actual implementation status of the proposed measures at Budapest Airport. Further research or direct inquiry with airport authorities is necessary to determine the extent to which these proposals have been adopted.

The suggestions provided serve as a proactive framework for potential future actions, demonstrating a commitment to enhancing environmental sustainability efforts and mitigating the impact of pollution on surrounding communities.

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*Gathering the relevant data and insights from these authors and publications I used Google's Gemini (AI) to fact-check all the data and correct grammar where applicable.*

# **Bridging the Gender Gap: Mitigating the Impacts of Climate Change on Women in MENA with a Focus on the Agriculture Sector**

NAOUM Rawia Fuad<sup>1</sup>

DOI: 10.29180/978-615-6886-04-0\_17

## **ABSTRACT:**

This study explores the disproportionate impact of climate change on women and girls in the MENA region's agricultural sector. This exploration includes women's key challenges regarding health, education, access to resources, and work environment. The research also seeks to identify strategies to bridge gender equality gaps that may amplify due to climate change, through synthesising and analysing scholarly articles and reports from governmental and non-governmental organisations (NGOs) working in the MENA region and worldwide. This research offers a comprehensive analysis of the gendered impacts of climate change on MENA agriculture, a topic that has received limited attention in MENA region. Moreover, it suggests improvements for existing strategies to improve women's situation in the agricultural sector and to increase resilience for women and their families in the face of climate change.

**Keywords:** Climate change, Gender equality, MENA region Agriculture sector , Women's challenges, Key Stakeholders, Adaptation strategies.

## **1. Introduction**

The Middle East and North Africa (MENA) region is home to extensively varied natures and cultures; however, the MENA region is one of the world's most vulnerable and highly effected to the impacts of climate change. Climate change impacts the environment as well as other aspects such as economic, political, health, and social aspects (Nong, et al., 2020). Green (2020, p. 152) stated, "Climate change is not about science, but politics. It requires elaborating a new theory of the political economy that puts the climate crisis front and centre." Other scholars, such as Mearns & Norton (2010), stated that the social aspects of climate change must be

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elaborated on more and given a more thorough focus in the research field. According to Gupta (2015), Climate change risk is often perceived to impact women more severely than men, making them more vulnerable.

In the context of the MENA region, according to IMO (2024), women make up the majority of the agricultural workforce in the MENA region, with Jordan, Libya, and Syria having over 60% of their agricultural workforce comprised of females. Therefore, climate change's effect on the agriculture sector mainly is enormous, more specifically with the increasing of women's participation in the agricultural workforce in the MENA region, possibly due to men and male youth leaving the sector to chase other sources of income, migrants and refugees' movement, disasters and wars. As stated by Baruah & Najjar (2022, p.6) "Although all farmers had been negatively affected by the effects of climate change, women often experienced additional challenges due to gender norms and cultural practices".

This paper explores climate change's impact on women and girls in the MENA region, specifically on Health, Education, Access and control over resources, and work environment aspects. Moreover, it explores strategies implemented to bridge the gender inequality gaps in the MENA region.

### **Overview of Climate change crisis in the MENA region**

The Middle East and North Africa (MENA) region is home to extensively varied cultures, a population of about 500 million (Kyungmee & Garcia, 2024), with approximately 40% of them children (UNICEF, 2022a), and geographical diversity that spans mountain varieties and river valleys to wide arid landscapes (Miller, et al., 2022). However, the MENA region is one of the world's most exposed and highly unprotected to the impacts of climate change (Kyungmee & Garcia, 2024; The World Bank, 2023a). Enduring ever-higher temperatures, rising seas, droughts, floods, intense water scarcity and polluted air (Kyungmee & Garcia, 2024), agricultural activities face challenges due to the scarcity of freshwater resources and limited arable land. Additionally, the increasing urban population leads to higher consumption of energy, water, and food (Miller, et al., 2022). Moreover, challenges are being imposed on energy systems already straining to meet economic growth demands, energy security and

social welfare (Lim, et al., 2023). Table (1) provides an overview of the most affected regions in the MENA countries.

**Table 1:** *Some of the countries in the MENA region are affected by climate change.*

<i>Country</i>	<i>Main characteristics of the affected region</i>
<b>Jordan</b>	- High temperatures cause high evaporation rates and droughts (Ministry of Environment, 2021), specifically in Jordan Valley (Haddad, 2023). - Globally, Jordan is ranked as the second most water-stressed country. (USAID, 2022 ; UNICEF, 2022a)
<b>Lebanon</b>	- Coastline cities: climate-related sea level rise and saltwater intrusion into coastal aquifers (Ministry of Foreign Affairs, 2018). - Water Scarcity: Despite Lebanon's relatively abundant natural water resources (The World Bank, 2024), over 70% of the Lebanese population currently faces critical water shortages (Ferrando, 2022). Lebanon has a notable water shortage as a cause of different factors, for example; population growth, quick urban development, extreme weather conditions, and the displacement of Syrian refugees to Lebanon . (The World Bank, 2024).
<b>Syria</b>	- Low and inconsistent rainfall during the winter season of 2021, coupled with increasing temperatures (IFRC, 2022), caused droughts in Northern and NorthEast Syria (The World Bank, 2022), in addition to significant losses in crop and livestock in other areas in Syria(IFRC, 2022).
<b>Iraq</b>	- The rate of desertification and temperature rise is seven times higher than the average global increase (Schaer, 2023), affecting 39% of Iraq's area. Iraq faces very high temperatures, which are causing drought. In addition, dust storms are becoming more intense (ICRC, 2022). - The rate of desertification and temperature rise is seven times higher than the average global increase (Schaer, 2023), affecting 39% of Iraq's area. Iraq faces very high temperatures, which are causing drought. In addition, dust storms are becoming more intense (ICRC, 2022).
<b>West Bank / State of Palestine</b>	- The West Bank is facing a severe water scarcity issue, with the Palestinian communities in Bethlehem and Hebron governorates being the most affected. (Oxfam and MA'AN development centre, 2021). This is due to the restrictions imposed in Area C, which limited Palestinian control over water resources (Oxfam and MA'AN development centre, 2021). In addition to the temperature increase (Al-Haq , 2019; Hallaq & Daas, 2024).



<b>Yemen</b>	- Yemen is currently experiencing a one of the worst in the world humanitarian crisis. As a result of long-lasting conflict, economic crises, and frequent climate hazards. These hazards include increasing temperatures, increasing sea levels, and inconsistency in rainfall patterns, which lead to floods, droughts, soil degradation, and reduced water sources . (SIPRI, 2023; Tamdeen Youth Foundation and Oxfam, 2022).
<b>Egypt</b>	- Egypt's Nile Delta and its coastal front on the Mediterranean: heatwaves, increased soil salinisation, rainfall retention, and desertification (Eelnahry & Doluschitz, 2009; The World Bank, 2021) - Egypt's agricultural lands are facing irrigation issues due to the tremendously low rainfall and high evaporation rates (Kotb et al., 2000).
<b>Algeria</b>	- Algeria is second in water scarcity of all countries in Africa (Mohammed & AlAmin, 2018), rainfall in Algeria has decreased by 40% in the west, 30% in the centre, and 20% in the east, in addition to temperature increasing (Bensmaine, 2022), where the highest warming is observed at the Southern stations (Bouregaa, 2022).
<b>Morocco</b>	- Morocco's vulnerability to climate change is highlighted by the more frequent occurrence of drought, particularly in the central and southern regions. ( IEA, 2023; IMF, 2023).
<b>Tunisia</b>	- Water scarcity, coastal erosion, temperature increasing, and more frequent floods one of the most pressing climate change issues in Tunisia's (EIB, 2022) as low and variable rainfall (The World Bank, 2023b)

Source: *Own work*

Based on the above table, the paper investigates (i) water scarcity, (ii) rising sea level (SLR), and (iii) temperature heat trends.

1.1 Water Scarcity

The MENA region faces the most water and food scarcity (Abou Zaki et al., 2022) and, even more, is the most water-scarce region in the world (UNICEF, 2021). Of the 17 most water-stressed countries worldwide, 11 are in the MENA region: Bahrain, Iran, Jordan, Kuwait, Lebanon, Libya, Oman, Israel/The State of Palestine, Qatar, Saudi Arabia, and the United Arab Emirates (UNICEF, 2021). Approximately 70 per cent of the lands in these countries are considered as arid or semi-arid, receiving less than 250 millimetres of annual rainfall. The

remaining areas receive a moderated volume of rainfall ranging from 300 to 600 millimetres (Dogar & Sato, 2018). Moreover, as a result of the increase in population in the MENA region and the growth of economic activities, the current water supply is not enough. Where, It is expected that the annual water supply per person in the Middle East will decrease from 1000 to 600 cubic meters by 2025(Qin, et al., 2019) . With the pollution and salinity challenges, building dams and extracting groundwater, the water resources are becoming scarcer (Ouda, et al., 2021 With the exception of Iraq, Oman, Syria, and Lebanon, the MENA region countries have renewable water resources that are available at a rate of less than 1000 m<sup>3</sup> per capita per year. In Kuwait, the availability of renewable water resources is as low as 50 m<sup>3</sup> per capita. (Selvaraju, 2013; Sowers, et al., 2011).

### 1.2 Rising Level Sea (SLR)

Due to climate change, MENA countries are also predominantly vulnerable to sea level raising (SLR) (Borghesi & Ticci, 2019). The MENA region, which generally comprises more temperate and littoral countries (Chibani, 2022), has a high concentration of human population as well as agricultural, industrial, and other economic activities in the coastal zones (Waha, et al., 2017), A significant percentage of the population, approximately seven per cent, live in regions where the altitude is less than five meters above sea level. These areas are considered to be highly vulnerable to floods; they also affect the economic activities of the residents (Borghesi & Ticci, 2019). The effect of sea level rise may also be destructive to economic activities, such as tourism, agriculture and fishing, especially in the Mediterranean and Red Sea sub-regions (Borghesi & Ticci, 2019). Apart from the floods, the rise in sea levels is also anticipated to cause significant effects such as the infiltration of saltwater, salinity of groundwater increase, rising water table levels, and hindered soil drainage (Hunt & Watkiss, 2011; Werner & Simmons, 2009).

### 1.3 Temperature Heat Trends

A growing body of literature on the changes of temperature patterns predicts that global warming is expected to last until the end of this century (Collins et al., 2013; Feng et al., 2014; Raftery et al., 2017). With a focus on the MENA region, most MENA countries are facing recurrent extreme temperature waves above 35°C and severe drought in summer (Fragaszy, et al., 2020; Tanarhte, et al., 2015), these episodes of extreme temperatures expect to increase further (Bucchignani, et al., 2018; Coumou & Rahmstorf, 2012; Lelieveld, et al., 2016; Ozturk,

et al., 2018), leading to large dry regions that may increase the risk of scarcity and scarce-related mortality (Varela, et al., 2020). According to (Varela et al., 2020) study, several cities such as Accra (Ghana), Lome (Togo), Mogadishu (Somalia), and Riyadh (Saudi Arabia) will experience heatwave conditions for almost the entire warm season. This study also suggests that the mean intensity of heat waves will increase between 2°C and 4°C, depending on the location. The cities in the Middle East, Eastern Africa, and the Mediterranean area will be the most affected, while those in the Gulf of Guinea will be the least affected. Moreover, cities such as Alexandria, Giza, and Istanbul will experience maximum heat wave intensity exceeding the threshold value by more than 12°C (Varela et al., 2020).

## **2. The Gendered Impact of Climate Change in the MENA region**

As mentioned previously, the Middle East and North Africa (MENA) region is highly vulnerable to the impacts of climate change and also ranks by (World Economic Forum, 2023) as one of the regions with the greatest gender inequality worldwide. For instance, according to the Global Gap Report by (World Economic Forum, 2023), the current parity score of the MENA region stands at 62.6%, indicating that it is the farthest away from achieving equality, suggesting that it would take approximately 152 years to attain full parity. According to IOM (2024), the agriculture sector in the MENA region is the largest in terms of employment for women, and it also offers significant job opportunities for refugees, especially for women in countries such as Lebanon, Iraq, Somalia, Sudan, and Yemen. (UNDP, 2021). As a result of existing gender disparities in the region, women face disproportionate risks from climate change (Moneer, 2024). For instance, there are 48.7 million adolescent girls across the MENA region in drought-impacted communities (UNICEF, 2022b). The impact of climate change can be seen in different dimensions: Health, Education, Access and control over resources and Work environment.

**Health:** The impact of heatwaves, drought and water scarcity on agriculture and livelihoods affects mostly women in MENA communities as the largest percentage of the workforce in the agriculture sector are female workforce (UNICEF, 2022b). One example can be drawn here from rural areas in Morocco where dreadful climatic conditions effect women's access to health services more specifically as Morocco face frequent floods in areas such as Figuig, Ten Drara, and Bou Arfa (Kamal & Malle, 2023). Another example is from Jordan, where Joran is one of the top five most water-stressed countries in the world (UNFPA, 2022); women face more health risks from sanitation issues, more specifically in the rural areas (Kamal & Malle, 2023).

These issues are increasing due to women's growing care responsibilities, as due to gender roles, women and girls are responsible for care activities. According to (Oxfam & Includovate, 2023) women in the MENA region spend up to ten times more than men on unpaid care activities, including caring for others' health. When disasters happen, such as in Syria, Iraq, Sudan and Yemen, the care responsibilities increase for women. According to (UNODC, 2021), women face higher health risks and need for healthcare on the migration journey as they may be responsible for tasks like childcare or breastfeeding and higher exposure to sexual violence. This hinders their mobility to seek shelter or assistance and increases their face of health risks such as fatality and injuries (Oxfam & Includovate, 2023). Moreover, the scarcity of clean water also makes adolescent girls' menstrual and hygiene arrangements more problematic, which implies their sexual and reproductive health (SRH), affects their well-being and decreases their educational opportunities (UNICEF, 2022c). All of this can add to the negative ripple effects on women and girls' mental health (Kamal & Malle, 2023).

**Education:** Women in the MENA region already face high responsibilities for unpaid care and domestic responsibilities due to the social norms, but climate change increases these responsibilities on women, which leads to limits their opportunities for education and employment (Moneer, 2024). For instance, women in MENA regions, more specifically, rural and agricultural areas often are responsible for collecting water for their families and for their work in the agriculture sector, which is considered to be time-consuming and physically demanding (Grossman, 2023). According to (World Bank, 2009) the MENA region, women and girls spend up to six hours per day collecting water, this may lead to less participation in education, employment and economic activities. For example, in Yemen, due to droughts and aggravated water scarcity, some girls have to drop out of school to tackle the burden of their care and water responsibilities (CIVIC, 2022). Another aspect that leads to school absenteeism or dropouts is the lack of sanitation and hygiene services in educational institutes in MENA region more specifically in the rural region due to concerns surrounding security and hygiene (Oxfam & Includovate, 2023).

**Access and Control over Resources:** In the MENA region, the agriculture sector has a relatively high percentage of women participating in it compared to other sectors (World Economic Forum, 2023). Women in the region not only face significant barriers to accessing water due to limited infrastructure and resources (Grossman, 2023), but they may also lack

access to land management. For example, according to (ICARDA, 2020), women own less than 5 per cent of the agricultural land in the region, and they often do not have a say in decisions related to land management. Baruah & Najjar (2022, p.5) stated that “women’s contribution to the sector remains largely undervalued, if not invisible”. According to certain estimates by Kabeer, et al., (2019), around half of the women who work in agriculture are either not included in the national surveys or identified as economically inactive. Moreover, social Norms, discriminatory laws, and limited access to and control of financial services in the MENA region encumber women's access to resources such as credit, water, cash, and land, and this limits women's abilities to participate fully and considered to be seen in the agriculture sector economically and earn an income and limit their ability to contribute to food and water security (Grossman, 2023) and face the climate change challenges. Moreover, there is extensive evidence of gender inequity and wage bias in agricultural labour. Researchers such as Baruah & Najjar (2022); de Pryck & Termine (2014); Najjar et al., (2018) disclose that due to stereotypes that tend to underestimate women's work in the agriculture sector, women steadily perform tasks that require less skill and are typically compensated at a lower rate, with risky work environment, inconsistent and seasonal, while men perform more permanent, technologically advanced, and higher-paying jobs.

**Gender-Based Violence and Sexual Harassment:** Women in the MENA region, more specifically in the agriculture sector, may also face challenges related to Work Environment and Sexual Harassment (WSH) (Baruah & Najjar, 2022) . More specifically, women who are immigrants, younger, and refugees due to climate change crises (Moneer, 2024) or political crises or come from indigenous communities are particularly vulnerable to WSH (Reyes Rocha & Sexsmith, 2024). For instance, according to the United Nations High Commissioner for Refugees (UNHCR, 2020) , due to the extensive floods that occurred in Yemen in the summer of 2020, about 300,000 individuals lost their homes, crops, and livestock and were subsequently internally displaced. As stated by (Moneer, 2024) “In addition, the displacement process puts women and girls at high risk of gender-based violence, human trafficking, injury, and death”. A study by ILO 2018 indicates that non-standard forms of work, including temporary work and informal work, are critical factors in creating such behaviours (Henry & Adams, 2018) . Factors contributing to this issue include power differentials between supervisors and workers, the cultural norm of silence and tolerating such behaviours, and structural environments that distance perpetrators from accountability; limited labour law coverage and application and poor

labour inspection services further increase agricultural workers' vulnerability to sexual harassment (Henry & Adams, 2018)

### **Discussion: Strategies to mitigate gender inequalities caused by climate change**

Climate change has a snowball effect in all aspects, specifically in the social aspect. The effects of climate change tend to exacerbate the vulnerabilities associated with long-standing inequality patterns (Schipper et al., 2022). Rao et al. (2019, p.19) stated, “Migration emerges as an important adaptive strategy in the face of climate and other livelihood risks and uncertainties.” Therefore, climate change signifies migration and displacement, where it is expected to displace over 250 million between 2007 and 2050, as stated by (Dimitrov, 2019). Therefore, decision-makers and critical actors must be aware of the importance of planning climate-resilient development solutions, as well as addressing the long-term impact of socio-economic inequities (Schipper, et al., 2022) . To address the risks of climate change and implement effective measures, the main actors need to be active and involved to work together and coordinate their efforts towards sustainable adaptation, which can lead to more sustainable results. Effective, sustainable adaptation entails the proper active participation of key stakeholders in order to identify the best and most appropriate adaptation methods and strategies (Leal Filho et al., 2018; Nicholson, 2018).

#### *Stakeholders Engagement*

According to (Lewis, 2004, p. 202) the term stakeholder refers to “any person or group that can claim an organisation’s attention, resources or output or who may be affected by the organisation”. Moreover, different individuals or groups have varying levels of power (Krüger, 1974), legitimacy (Suchman, 1995), and urgency (Mitchell, et al., 1997) make them the key stakeholders. According to (Conde et al., 2005, p.50 ), “The term “stakeholder” in climate change studies refers to policymakers, scientists, administrators, communities, and managers in the most at- risk economic sectors. In this context, stakeholders from both public and private enterprises can be brought together to develop a joint understanding of the issues and to create adaptations”. Based on that, the stakeholders are two types: (i) people who have the power and control over resources and (ii) those whose lives are affected by the circumstances and the interventions (Mkonda, 2022).

Therefore, stakeholder engagement is very crucial to guarantee that there is no missing perspective from a certain group and has its influence on the outcomes. Stakeholders' engagement is defined by (Brown, et al., 2001) as is a set of actions that an individual, group, or organisation can take to effectively communicate with, involve, or seek feedback from their current stakeholders. In the climate change context, these stakeholders include, but are not limited to, the government, international organisations and development agencies, women farmers and producer groups, non-governmental organisations (NGOs) and civil society organisations (CSOs), and private sector and affected groups, including marginalised groups and women.

For instance, the government has a crucial role in addressing policies related to climate change (Marty, et al., 2023). However, previous studies have indicated that some gender and climate change policies have not adequately addressed structural issues, equality dynamics, and intersectionality (Krizsan & Lombardo, 2013). At the same time, other authors argue that the government lacks financial resources on the ground to solve these issues (Ampaire, et al., 2020). Therefore, to ensure gender equality in policies, it is essential to incorporate women's decision-making and voice. Moreover, Gender Equality and Social Inclusion (GESI) considerations must be integrated from the problem identification part into climate and agriculture strategies and create and enforce policies, programs, and regulations accordingly (Gumucio & Rueda, 2015; IUCN, 2011). Climate change issues are considered a public sector responsibility; however, adaptation costs are too high for governmental bodies, explicitly developing countries such as the Middle East and North Africa. The private sector should also be involved with the government in supporting their countries in designing and implementing sustainable climate change solutions. As stated by Pauw, et al., (2020, p.91) “The public sector should (1) provide a stable and attractive regulatory framework necessary to catalyse private investments in adaptation and (2) potentially intervene in areas that are not attractive for private investors. This includes investments with higher social benefits than private cash flows or where particularly vulnerable or marginalised communities need help”.

As stated, governments may face challenges securing funding and allocating technical research and implementation budgets. Therefore, here is the role of International Organisations and Development Agencies, where they can provide technical and financial support and facilitate partnerships and knowledge-sharing among various stakeholders. For example, the Green

Climate Fund (GCF) was established at the UNFCCC COP15 conference in Copenhagen in 2009, a decision by 194 countries in order to support countries in planning and financing climate adaptation and mitigation. (Kalinowski, 2020), with the ultimate goal of contributing to the global effort to limit global warming and helping vulnerable communities cope with the adverse effects of climate change. GCF is providing support for governmental agencies in developing countries and embracing more board of involvement in the private sector (Kalinowski, 2020).

The private sector must also be considered for its role in sustainable climate change solutions; it could be through targeted investments and partnerships, supporting women-led enterprises, cooperatives, and agribusinesses in accessing finance, markets, and technology. However, the solution is not that simple, as stated by (Pauw, 2015, p.585) "the role of the private sector in development." Pauw's research (2015) distinguishes between two types of private sector engagement in development studies, as conceptualised by (Byiers & Rosengren, 2012). The first type, "private sector development," focuses on domestic economies in developing countries, where governments implement policies to stimulate economic transformation through investment, productivity growth, business expansion, and employment. The second type, "engaging the private sector for development," is further categorised into activities that promote productive investment and leverage private-sector finance to support development initiatives.

Nongovernmental organisations (NGOs) and civil society organisations (CSOs) have a crucial role in advocating for women's rights, building the capacity of the local communities, and assisting critical stakeholders in the local community, including the private sector and governmental, community groups and associations and individuals. The contribution of NGOs is highly recognised both nationally and internationally by policy-making institutions for grassroots-driven, people-centred, and participatory approaches where they are considered to act as intermediaries between communities, governments, and the private sector. Moreover, they are regarded for their capacity to fill the gaps that could not be filled by the states in terms of development effort and humanitarian responses (Banks & Hulme, 2012; Jahan Chowdhury, 2008).

The involvement of various local groups, such as farmers' groups, producers' groups, community networks, credit groups, and village councils, is crucial for effective adaptation to



climate change (Goulden, et al., 2009). Gender scholars advise identifying active, vital stakeholders early in the decision-making process with a gender lens, such as representatives from women groups, gender advisors in governmental bodies, and gender advocacy organisations, to include the gender equality and social inclusion (GESI) lens in sustainable adaptation to climate change solutions (Gumucio & Rueda, 2015). Therefore, it is essential to ensure women's voices are heard and include active women's groups and community-based organisations in these coalitions (Mulema, et al., 2022) . These groups play a significant role in identifying community needs and promoting sustainable solutions to address the challenges posed by climate change.

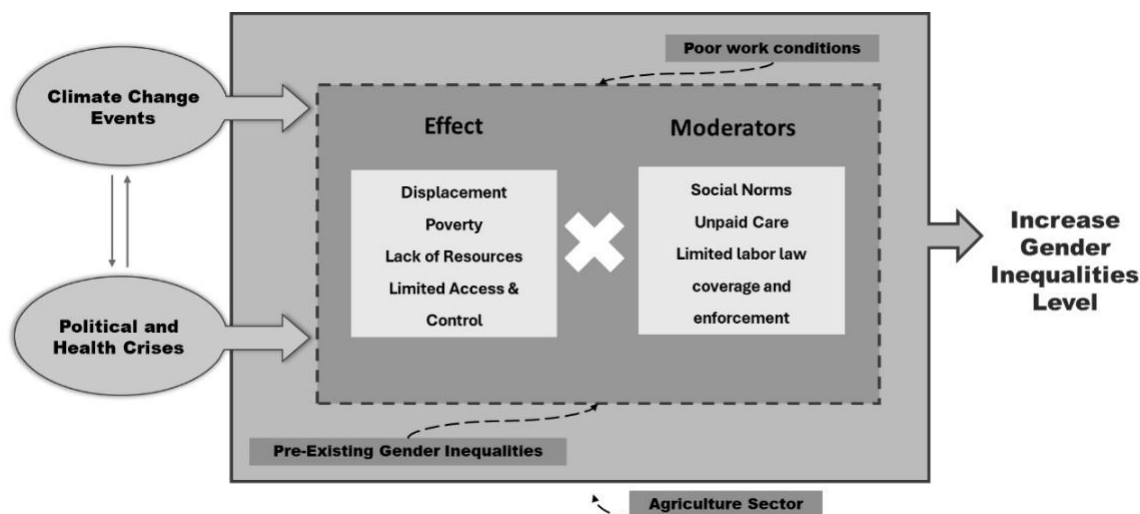
Research and academia institutions, such as higher education institutions, also significantly impact climate change mitigation and solutions and its impact on the gender dimension (Barth & Rieckmann, 2016; Giesenbauer & Müller-Christ, 2020) . These are considered partners in bringing evidence-based solutions and measuring the impact of the existing solutions. As stated by (Rolleston, et al., 2023; p.1), “Higher education institutions and research institutions have a major role to play in furthering climate justice through a range of channels, including research, teaching and curricula development, teacher education, community engagement and raising public awareness, as well as addressing the impacts of their operations and activities.” However, these institutions could have more of a role in engaging and interacting with the public sphere and other non-academic audiences, which has little attention in the literature (McCowan, 2020). Academic spheres need to broaden their focus beyond students and publications. They should aim to raise awareness through various platforms, not only to inform other experts and policymakers but also to create awareness among the community, which involves interacting with the public and other non-academic audiences outside their traditional domain (Gardner & Wordley, 2019; Gardner, et al., 2021; Green, 2020).

### **3. Conclusion**

As stated by ("World Meteorological Organization (WMO)," 2024), “Climate change is not ‘gender-neutral’, women and men are affected differently by weather and climate”, and as stated by (World Bank , 2023a) “women and girls are disproportionately affected by its impacts, as seen in the MENA region,” and therefore need gender-sensitive information and services to be designed and implemented for women and girls. Climate change's effect on the agriculture sector is mainly huge, more specifically with the increasing of women’s participation in the

agricultural workforce in the MENA region, possibly due to men and male youth leaving the sector to chase another source of incomes (Baada & Najjar, 2020). The trend of “feminisation of agriculture” has been reported in Algeria, Jordan, Syria, Libya, Palestine, Morocco and Egypt (Abdelali Martini, 2011). This effect is increasing with the gender inequalities practices in the MENA region and, more specifically, in the MENA region. The concerns related to gender and its impact on climate change and adaptation have not been adequately tackled (Terry, 2009).

**Figure 1:** *Impacts of Climate Change on Women in MENA with a focus on the Agriculture Sector*



Source: Own illustration

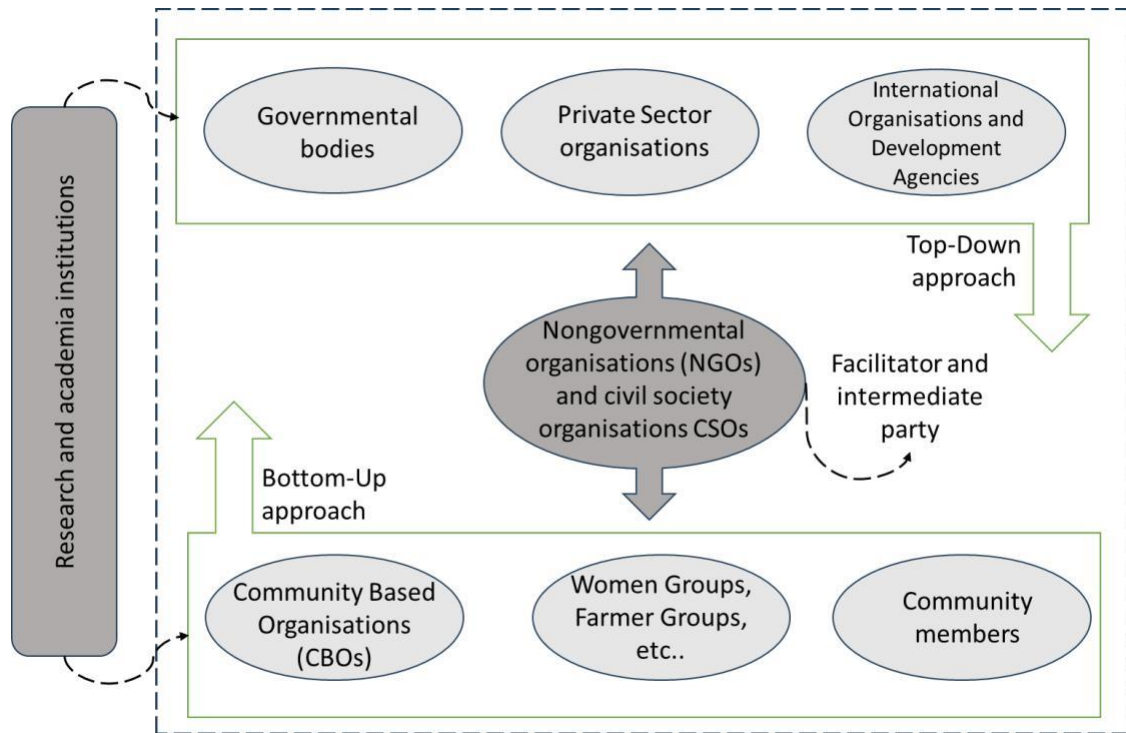
This paper proposes a domino effect triggered by climate change events, as shown in Figure (1), that impacts developing countries such as countries in the MENA region and, more specifically, the agriculture sector. These events can lead to health problems such as anaemia and viral and bacterial illnesses. Similarly, political crises and conflicts like wars can cause issues such as pollution, further exacerbating climate change. This creates a cycle where climate change, political crises, and health issues are interconnected. The consequences of this cycle can be displacement, poverty, and limited access to resources. Existing gender inequalities, social norms, weak laws, and poor living conditions can worsen these effects. This situation has the potential to increase gender inequality within marginalised agricultural communities significantly.

Climate change adaptation strategies may fall short if there is no collaboration among key actors, making the solutions ineffective and unsustainable. Each stakeholder is responsible for mitigating and responding to climate change events and offering solutions to increase the number of climate change events on women and increase gender inequalities in the region (Brown, et al., 2001). To summarise stakeholders' engagement, different stakeholders must work together using both proactive and reactive measures to break the cycle of negative impacts from climate change. As the figure (2) shows, their engagement falls into two main approaches: Top-down and Bottom-up.

**Figure 2: Stakeholder Engagement to Mitigate the Impacts of Climate Change on Women in MENA with a focus on the Agriculture Sector**

Source: Own illustration

- Top-down approaches involve governmental bodies, the private sector, international



organisations, and development agencies. These entities can regulate agricultural strategies for better climate change adaptation, enforce policies promoting sustainability and gender equality, and reform economic activities within the sector to include women's voices and empower marginalised groups.

- Bottom-up approaches focus on NGOs, CSOs, community groups, and farmers' groups. These groups play a vital role by mediating communication between communities, private sectors, governments, and international agencies. They also build technical capacities within communities and among farmers, raising awareness about negative social norms, unpaid care burdens, and gender-based violence.

- Finally, academic and research institutions, including universities, play a significant role in informing all stakeholders. They achieve this by creating evidence-based decision-making through research and data analysis for decision-makers and raising public awareness about climate change and its impacts on women and marginalised groups.

This combined effort from various stakeholders, working together through Top-Down and Bottom-Up approaches, is crucial to break the cycle of negative impacts triggered by climate change, particularly on women, girls and marginalised groups within the agricultural sector.

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# Sustaining resilience: a dual agenda for both greener and resilient supply chains in the house care product sector

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## ABSTRACT

The intertwining of sustainability and supply chain resilience has emerged as a critical concern for organizations striving to maintain competitiveness while adhering to environmental and social governance principles. However, the pursuit of supply chain resilience often presents apparent contradictions with sustainability objectives. This study aims to bridge the gap between sustainability and supply chain resilience. Employing a scoping literature review, this research analyzes high quality articles from renowned databases, emphasizing systematic reviews and case studies within the domain. By synthesizing insights from both academic literature and real-world organizational practices, this study seeks to expand the existing knowledge base, offering a unique understanding of the methodologies that both facilitate the construction of greener and resilient supply chains particularly in the house care product industry.

**Key-words:** Supply chain resilience, sustainability, literature review, risk management, green supply chain, FMCG, house care product

## 1. Introduction

Supply chains are crucial to the global economy enabling efficient movement of goods and services. However, they are increasingly susceptible to disruptions caused by natural disasters, geopolitical conflicts, pandemics like COVID-19, or fluctuating consumer demands (Ivanov, 2020). At the same time, sustainability has become a non-negotiable priority due to rising consumer awareness, environmental regulations, and the intensifying impacts of climate change. As the house care products industry increasingly adopts green practices, supply chain resilience, defined as the ability to anticipate, respond to, and recover from disruptions,

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becomes essential for withstanding sudden shocks while maintaining supply integrity and sustainability goals (Ponomarov & Holcomb, 2009). However, a significant challenge arises from the potential contradictions between sustainability and resilience. The house care products industry faces unique issues such as hazardous chemical waste, plastic pollution, and high water and energy consumption, which threaten environmental sustainability (Sahota, 2014). Efforts to reduce these environmental harms often require new materials, operational processes, and distribution channels, increasing costs and potentially undermining supply chain resilience. Striking a balance between these two essential goals is paramount for multinational organizations that must simultaneously improve environmental performance while protecting against supply chain risks.

This research aims to explore the nuances of sustainability and resilience efforts within the house care products sector. By understanding the contradictions between these two objectives, the study analyzes how leading multinational organizations can balance them through strategies and practices. The research seeks to uncover the methods employed to maintain supply chain resilience while improving sustainability, thereby reducing environmental impact and enhancing operational continuity. The study's research questions are:

- What are the currently trending efforts of multinational organizations towards increasing sustainability?
- How do multinational organizations balance sustainability efforts with supply chain resilience to mitigate risks?

The study implements a scoping literature review, analyzing top-cited, high-quality articles from Scopus, Web of Science, and Google Scholar, focusing on systematic reviews and case studies relevant to supply chain resilience and sustainability. Furthermore, the sustainability efforts of six leading multinational organizations are examined through their annual reports and sustainability disclosures. This provides first-hand insights into their achievements, challenges, and strategic alignment between sustainability and resilience, complementing the learnings from the literature review. The structure of the study consists of a literature review section, followed by a methodological chapter. The study then presents the results of the organizational report analysis and compares the learnings from the literature review and results chapter in the discussion. The research concludes with a conclusion section.

Given the rising emphasis on environmental accountability and the unpredictable nature of global markets, this study is vital for its practical implications. It aims to aid companies in understanding how sustainability and resilience can be jointly achieved without compromising



each other. Insights can help policymakers, managers, and supply chain practitioners create frameworks that integrate these principles, ultimately leading to greener and more resilient supply chains. This research contributes to academia and practice by bridging the knowledge gap between sustainability and resilience within the FMCG sector, particularly the house care products industry. By investigating leading multinational organizations, the study yields first-hand information on innovative strategies and practices that can inspire future research while offering organizations actionable frameworks to bolster their resilience without compromising sustainability.

## **2. Literature review**

The 2020s have brought unprecedented challenges and opportunities for supply chains globally, highlighting the importance of both sustainability and resilience. The COVID-19 pandemic underscored the fragility of traditional supply networks and their susceptibility to disruptions (Ivanov, 2020). Simultaneously, the urgency of climate change, resource depletion, and waste management has prompted increased regulatory, consumer, and investor pressure to adopt sustainable practices. Sarkis, 2021 emphasized that organizations must recalibrate their supply chains to navigate the twin challenges of ensuring environmental stewardship and operational continuity. He argued that supply chains lacking resilience and sustainability are at risk of prolonged disruptions and losing competitive advantages. Similarly, (Kumar et al., 2020) highlighted that sustainable supply chain practices should not only minimize environmental impact but also reduce operational risks, providing the agility to swiftly respond to market changes.

To ensure the correct interpretation of sustainability and resilience, the study presents frequently used definitions of both terms. Clearly defining sustainability and resilience assists in later clarifying the contradictions between the two efforts towards organizational success. Sustainability, as a concept, has evolved over time and encompasses a comprehensive set of principles. Elkington's (1998) "Triple Bottom Line" concept remains foundational, describing sustainability through three dimensions: economic viability, social equity, and environmental protection. Ahi & Searcy, 2013 expanded on this definition, stating that sustainable supply chain management incorporates the "creation of coordinated supply chain networks" that integrate social and environmental concerns while achieving long-term economic performance. The Brundtland report from 1987 defines sustainability as the efforts towards "development that meets the needs of the present without compromising the ability of future generations to

meet their own needs.” The United Nations Sustainable Development Goals (SDGs) further define 17 goals for organizations across environmental, social, and economic dimensions, covering a range of topics from climate action to social justice, further breaking down and defining the exact actions businesses can take to improve their environmental impacts.

In contrast, supply chain resilience is often defined in the literature as the ability to anticipate, adapt to, and recover from disruptions. (Ponomarov & Holcomb, 2009) described it as "the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them while maintaining continuity of operations." This definition aligns with the work of Christopher et al., 2004, who noted the importance of agility in building resilient supply chains that can quickly pivot to new strategies when disruptions occur. In their work, the definition of resilience is “the ability of a supply chain to anticipate, prepare for, and adapt to unexpected disruptions, and to recover quickly.” (Ivanov, 2020) introduced the concept of "viability," emphasizing the intertwined nature of resilience and sustainability. According to them, a viable supply chain goes beyond recovery and continuity by also considering long-term adaptability to ensure both operational and environmental robustness.

The house care products industry within the FMCG sector faces several challenges regarding sustainability and environmental impacts due to its reliance on intensive production processes and hazardous materials. House care products, particularly cleaning agents and detergents, often require resource-intensive manufacturing processes. This dependency leads to substantial energy consumption and significant contributions to greenhouse gas emissions. Palm oil, a key ingredient in many cleaning and beauty products, exemplifies these challenges. It has been at the center of significant environmental controversy due to the widespread deforestation caused by palm oil plantations, leading to habitat destruction, loss of biodiversity, and increased carbon emissions from the burning of peatlands (Khatun et al., 2017; Singh et al., 2009). Additionally, expanding plantations often encroach on indigenous lands, raising social and ethical concerns. Many house care products require water-based production processes, making water consumption a critical issue. According to (Sahota, 2014), cleaning agents, detergents, and other house care products heavily depend on water during both production and use. This demand strains local water resources and can further escalate water scarcity in already limited regions. Moreover, the wastewater produced often contains chemicals that can further harm aquatic ecosystems if not properly treated.

The house care products industry also relies heavily on plastic packaging for product safety and shelf stability, resulting in a significant amount of plastic waste. Single-use plastic packaging, such as bottles and sachets, often ends up in landfills or oceans, contributing to the growing

global plastic pollution problem (Jambeck et al., 2015). Recycling rates for these materials are low, and improper disposal can lead to microplastic contamination of water and soil. Many cleaning products contain harmful chemicals, such as surfactants, phosphates, and bleach, that can lead to water pollution, bioaccumulation, and the disruption of aquatic ecosystems (Linke, 2014). Additionally, the use of volatile organic compounds (VOCs) in aerosols contributes to air pollution and can exacerbate respiratory issues in vulnerable populations.

The house care products industry must also navigate complex social and ethical issues. The sourcing of raw materials, like palm oil, can result in labor exploitation, land grabbing, and conflicts with local communities (Schilling-Vacaflor et al., 2021). Furthermore, the predominance of large multinational corporations in the industry often leads to practices that may undermine fair wages or workers' rights in developing countries where production is outsourced. Additionally, the marketing and distribution of these products can sometimes fail to provide transparency regarding ingredients, potentially misleading consumers about the safety or environmental impact of the products they purchase.

Reviewing the available literature on the field, it is clear that the house care product industry is making significant strides toward sustainability by implementing a range of strategies to mitigate environmental harm and enhance social responsibility. A common approach among companies involves optimizing production processes to reduce resource and energy consumption. Advanced manufacturing technologies that decrease energy requirements are becoming prevalent, alongside shifts towards renewable energy sources to power operations (Urciuoli et al., 2014). The sustainability of raw materials, particularly those like palm oil associated with deforestation and biodiversity loss, is a critical focus. Companies are increasingly committing to sourcing all agricultural raw materials sustainably. Certification schemes, such as those by the Roundtable on Sustainable Palm Oil (RSPO), are often employed to ensure that suppliers adhere to established environmental and social standards (Sahota, 2014). Water-intensive production processes are receiving more attention, with efforts geared towards reducing water usage and improving water management across operations. Investments in water recycling technologies and initiatives to decrease water use, particularly in regions facing water scarcity, are examples of strategies employed to enhance water stewardship (Urciuoli et al., 2014). Organizations are also taking steps towards customer education, teaching consumers to also use products and consume water in a mindful way.

Innovations in packaging design and materials are critical in addressing the plastic waste challenge. There is an industry-wide movement towards using materials derived from recycled content or developing biodegradable packaging solutions to reduce the lifecycle environmental

impact of packaging. Efforts include enhancing the recyclability of packaging and reducing reliance on single-use plastics. The literature highlights that a growing number of organizations are incorporating circular economy principles into their sustainability agendas (Negri et al., 2021). Reducing the environmental and health impacts of chemicals used in cleaning products is another focus area. Companies are reformulating products to eliminate harmful chemicals and improve their biodegradability, utilizing green chemistry principles to leverage natural ingredients and safer synthetic alternatives (Levesque, 2012; Moore & Manring, 2009).

The endeavor to simultaneously achieve sustainability and resilience in supply chains often presents contradictory objectives, particularly within the FMCG sector. The literature outlines several areas where the goals of environmental sustainability can clash with the objectives of building resilient supply chains. For example, lean practices focus on reducing waste and enhancing efficiency, often by minimizing inventory levels across the supply chain. However, such strategies can conflict with the need for safety stocks, which are crucial for resilience by providing a buffer against supply disruptions (Christopher, 2011). The tension between maintaining minimal inventory for sustainability and ensuring sufficient stock to guard against disruptions poses a significant challenge. Safety stocks, while ensuring production flow, also increase the risk of scrapping in case of demand fluctuations, further enhancing waste and environmental harm.

Globalization has allowed companies to leverage cost efficiencies through offshoring production to low-cost countries. This approach, however, often results in extended, complex supply chains that are susceptible to various risks, including geopolitical tensions and transportation delays (Ivanov et al., 2017). Conversely, reshoring and local sourcing enhance resilience by shortening the supply chain and reducing dependency on distant suppliers, but they may increase costs and impact the environmental benefits gained from economies of scale achieved through global sourcing. Complex supply chains can offer more sources for raw materials and components, potentially increasing sustainability by allowing companies to choose more environmentally friendly options. However, such complexity can make supply chains less transparent and harder to manage during disruptions (Ivanov, 2020). Simplifying the supply chain might enhance resilience by making it easier to manage and control, but it may limit the ability to optimize for sustainability if fewer suppliers are engaged, especially if those fewer options are less committed to environmentally friendly practices.

Ethical sourcing, procuring materials in a way that is respectful to the environment and beneficial to the communities involved, often comes at a higher cost. These practices are crucial for sustainability but can contradict the goal of minimizing costs for better financial resilience

(Ahi & Searcy, 2013). Using recyclable materials supports sustainability by reducing waste and the demand for virgin resources. However, these materials can sometimes be less durable or reliable than non-recyclable alternatives, potentially reducing the overall resilience of the product or packaging to physical stresses or environmental factors. Organizations often do not have complete knowledge of what the recycled material was made of, or the altering source material poses threats of varying quality. Despite this, recycled materials are often even more expensive to source compared to virgin plastic. This trade-off poses a great dilemma: opt for potentially less effective but more sustainable materials, or choose more robust, less sustainable options (Negri et al., 2021).

The push for faster delivery times, particularly in consumer markets, often results in less efficient transportation modes, such as air freight, which have higher carbon footprints than sea or rail transport. This requirement for speed can undermine efforts to reduce environmental impacts, presenting a direct contradiction between providing quick service (enhancing customer satisfaction and resilience) and reducing ecological footprints (Ivanov, 2022). Table 1 shows the most frequently highlighted contradictions between resilience and sustainability based on the literature review.

**Table 6.** *Organizational contradictions between sustainability and resilience*

<b>Sustainability favored approach</b>	<b>Supply Chain Resilience favored approach</b>	<b>Literature reference</b>
Lean practices	Safety stocks	Christopher, M., Lowson, R., & Peck, H. (2004).
Global sourcing	Reshoring and local sourcing	Ivanov, D. (2022).
Complex supply chains	Simplification in supply chain	Ivanov, D., & Dolgui, A. (2020).
Ethical sourcing	Cost efficiency	Ahi, P., & Searcy, C. (2013).
Use of recyclable materials	Use of non-recyclable virgin materials	Negri, M., Cagno, E., Colicchia, C., & Sarkis, J. (2021).
Slow, sustainable logistics	Fast logistics (e.g., air freight)	Ivanov, D. (2022).

*Source:* Own editing based on Literature review

Organizations within the house care products industry are increasingly adopting integrated strategies to balance the demands of sustainability and resilience. Circular economy principles are pivotal in transitioning towards sustainable and resilient supply chains. These practices involve redesigning product life cycles through recycling and reusing materials, ultimately reducing waste and minimizing resource consumption (Ibn-Mohammed et al., 2021). Implementing closed-loop supply chains also plays a crucial role as it maximizes product life cycles and reduces environmental impact by keeping resources in use for as long as possible and recovering products at the end of their life cycles. This approach not only reduces the reliance on raw materials but also enhances resilience by decreasing vulnerability to raw material price volatility and supply disruptions (Chen et al., 2021).

Establishing a diverse and flexible network of suppliers helps organizations mitigate risks and ensure continuity in supply chains. By diversifying sources, companies are less likely to face severe disruptions if one supplier fails. Collaborating with suppliers to ensure they adopt sustainable practices is also essential, as this alignment helps to uphold sustainability standards across the entire supply chain. This approach enhances resilience by ensuring a more robust and reliable supply base (Hall et al., 2022). Building strong relationships with suppliers is fundamental to fostering sustainable practices and improving resilience. Engaging in joint initiatives to promote sustainability can lead to shared benefits, such as reduced costs and improved environmental performance. Furthermore, these collaborations often facilitate knowledge sharing on perceived risks and best practices, which can help preempt and mitigate potential supply chain disruptions (Wang et al., 2009). Where feasible, increasing the proportion of locally sourced materials can reduce transportation emissions and strengthen community relationships, enhancing both sustainability and supply chain resilience by reducing dependency on long, vulnerable supply lines (Sarkis, 2021). Demanding certifications like ISO

14001 (environmental management) and FSC (Forest Stewardship Council) demonstrates an organization's commitment to sustainability and ensures compliance with environmental standards. Regular audits are vital to maintain these certifications, encouraging continuous improvement and adherence to best practices in sustainability (Atilgan & McCullen, 2011).

Flexible manufacturing processes allow companies to adapt quickly to changing demands and reduce waste, supporting both sustainable operations and resilient supply chains. This flexibility can include the ability to switch inputs, adapt production processes, or even repurpose facilities to respond to supply chain disruptions. Additionally, developing robust distribution networks with alternative routes and modalities ensures continuity of operations during unexpected disruptions, enhancing resilience (Brandon-Jones et al., 2014). Utilizing advanced technologies like AI and IoT within supply chains can lead to greater efficiencies and improved monitoring of environmental impacts. These technologies help in predicting disruptions and optimizing resource use, aligning with both sustainability and resilience (Ivanov, 2020).

### **3. Methodology**

The research employs a scoping literature review, followed by a content analysis approach, reviewing annual reports, sustainability reports, and SDG (Sustainable Development Goals) reports from the top six FMCG companies in the house care products industry: Procter & Gamble, Unilever, Johnson & Johnson, L'Oréal, Colgate-Palmolive and Henkel. The top six companies were defined based on annual revenue of 2022 by Statista<sup>3</sup> within the FMCG sector limited to organizations producing house cleaning, house care, and beauty products. These reports are crucial for understanding the practical and organizational measures, leading companies are implementing to address sustainability challenges. The use of organizational reports is a direct method to extract specific data about corporate sustainability strategies, actions, and outcomes (Siraj & Fayek, 2019). A review framework is set on which the content analysis evaluates and overviews the available organizational reports. The key factors searched for are sustainability goals, clear sustainability projects, quantitative KPIs, SDG goals, potential challenges, and development plans. All available annual and sustainability reports of the reviewed organizations from 2022 were analyzed based on recurring themes within NVivo.

By analyzing the real-world data from organizational reports, the research aims to gain depth, providing insights into the actual practices and results of sustainability initiatives. This practical analysis helps bridge the gap between theoretical sustainability frameworks and their real-world applications, offering a clear picture of how strategies are implemented and how they perform

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<sup>3</sup> <https://www.statista.com/companies/ranking/3/top-100-consumer-goods-and-fmgc-companies>

(Yin, 2018). Reviewing and comparing the sustainability reports of the top FMCG companies enables the identification of common practices and unique strategies across the industry. This comparative approach not only highlights the best practices but also reveals the variability in how different organizations address similar challenges (Mays et al., 2004). By setting the findings from the organizational reports against the existing literature, the study ensures a rigorous theoretical grounding.

#### **4. Results**

The following section of the research reviews the sustainability projects and goals of the six international organizations chosen for analysis in the methodology of the research. The results are presented based on the findings from the thematic analysis of the annual and sustainability reports based on recurring factors.

Procter & Gamble (P&G) has a well-articulated sustainability strategy embedded in its "Ambition 2030" goals, which aim to enable and inspire positive impacts on the environment and society while creating value for the company and consumers. P&G is committed to becoming carbon neutral by 2030 by reducing its operational emissions. For any residual emissions that cannot be eliminated, the company plans to invest in natural climate solutions. This initiative aligns with broader global efforts to tackle climate change by reducing greenhouse gas emissions. By 2030, P&G aims to ensure 100% of its consumer packaging is recyclable or reusable. Approximately 79% of their packaging had already met these criteria, indicating substantial progress toward this goal. P&G has expanded its sustainability targets across all product categories, aiming to reduce supply chain emissions by 40% per unit of production by 2030. This broad focus on Scope 3 emissions, which include indirect emissions from activities such as raw material production and transportation, reflects an understanding of the company's extensive environmental footprint beyond direct operations. The company is also focused on building a water-positive future. P&G aims to restore more water than is used at their manufacturing sites in water-stressed areas and from the use of their products in water-stressed metropolitan areas. This commitment is part of a comprehensive water strategy that includes reducing water use in operations and enhancing water efficiency in their products.

Colgate-Palmolive's sustainability initiatives align with its broader corporate responsibility to enhance environmental and social impacts worldwide. The company's 2025 Sustainability & Social Impact Strategy highlights several key objectives. Colgate-Palmolive has set a goal to achieve net zero carbon emissions by 2040 across its operations and supply chain, with a



significant focus on reducing the carbon footprint of its products and processes. The company aims to enhance the recyclability of its products, notably transitioning over 40% of its toothpaste SKUs to recyclable tubes globally by the end of 2022. This initiative also includes sharing this technology with third parties to promote broader industry adoption. Colgate-Palmolive is committed to significant reductions in water usage across its operations, aligning with best practices for conserving water resources in its manufacturing and supply chain processes. Beyond environmental actions, Colgate-Palmolive emphasizes its social impact, particularly in advancing health and hygiene. Initiatives like the "Colgate Bright Smiles, Bright Futures" program, which reaches millions of children worldwide, highlight its dedication to improving oral health and hygiene education.

Johnson & Johnson's commitment to sustainability and corporate responsibility is extensively outlined in their "Health for Humanity 2025 Goals." Their strategy encompasses several key areas, focusing on environmental health, social impact, and governance, which are crucial to their mission of transforming global healthcare. Johnson & Johnson is committed to improving access to healthcare globally, particularly in low- and middle-income countries. They aim to provide medicines, technologies, and support to underprivileged areas, reflecting their strategic priority to enable global health equity. Their environmental initiatives include significant commitments to reducing greenhouse gas emissions, with a notable achievement of securing 100% renewable electricity for their operations in Europe and Brazil. They are also focused on sustainable product innovations, such as developing more recyclable product packaging and reducing the environmental footprint of their product formulations. Johnson & Johnson places a high emphasis on diversity and inclusion within their workforce. They have achieved notable diversity in management positions and continue to foster an inclusive culture through various programs and training that support employee development and engagement.

J&J also invests heavily in research and development to improve health outcomes and ensure the safety and quality of their products. Furthermore, they uphold high standards of governance and ethical practices across their supply chain, as reflected in their detailed reporting and compliance measures. Johnson & Johnson's approach includes collaborating with various stakeholders to enhance sustainability across their operations. This involves engaging with suppliers to ensure responsible sourcing and working with partners to address challenges like waste management and water use.

L'Oréal's sustainability strategy is encapsulated in its "L'Oréal for the Future" program, which aims to transform the company's business model to be more sustainable and responsible by 2030. L'Oréal has set ambitious targets to reduce the carbon footprint of its sites and products.

By 2025, the company aims to achieve carbon-neutral status across all its sites through enhanced energy efficiency and 100% renewable energy usage. Furthermore, L'Oréal is working towards enabling consumers to reduce their greenhouse gas emissions from product usage by 25% per average finished product, compared to 2016 levels, by 2030. The company has committed to making 100% of the water used in its industrial processes recyclable and reusable in a loop by 2030, addressing both the conservation and quality of water resources. L'Oréal aims to ensure that 100% of the bio-based ingredients for formulas and packaging materials are traceable and come from sustainable sources by 2030. The target includes a firm stance against deforestation and the promotion of biodiversity. By 2030, L'Oréal also plans to recycle or reuse 100% of the waste generated at its industrial sites, demonstrating a commitment to zero waste in production.

The company's social commitments include ambitious goals to improve the lives of people around the globe. By 2030, L'Oréal aims to benefit 3 million people through its brands' social engagement programs and help 100,000 people from disadvantaged communities gain access to employment. L'Oréal is committed to eco-designing 100% of its products by 2030, ensuring that every new product developed has a reduced environmental footprint.

Unilever's sustainability strategy, as outlined in its recent reports and updates, reflects a comprehensive and multifaceted approach designed to address a range of environmental and social challenges through ambitious goals. Unilever has set a target to achieve net-zero emissions across its value chain by 2039. To facilitate this, the company has introduced detailed plans such as the Climate Transition Action Plan (CTAP), which includes significant reductions in Scope 3 emissions, aiming for a 39% absolute reduction by 2030. Unilever's efforts extend to working closely with suppliers to encourage them to adopt science-based targets for reducing their emissions. The company is committed to reducing plastic waste and improving the recyclability of its products, pledging to ensure all its plastic packaging is reusable, recyclable, or compostable by 2025. Moreover, Unilever is investing in circular economy solutions to reduce overall waste and increase the sustainability of its packaging materials. The company aims to implement water stewardship programs that reduce water usage and improve water management across its operations, particularly in water-stressed areas. This involves enhancing the efficiency of water use in its manufacturing processes and adopting technologies that support sustainable water management. Unilever places a strong emphasis on enhancing the livelihoods and well-being of people across its value chain, which includes improving health, nutrition, hygiene, and overall quality of life through various initiatives and programs. Additionally, Unilever is dedicated to ensuring fair labor practices and enhancing diversity and

inclusion within its workforce. The company is also focused on sustainable sourcing practices, which includes efforts to ensure that the raw materials used in its products are sustainably sourced, with particular attention to preventing deforestation and promoting biodiversity.

Henkel's 2022 sustainability efforts are encapsulated in its "2030+ Sustainability Ambition Framework," which outlines a comprehensive approach aimed at major ecological and social advancements. Henkel has made significant strides in increasing the use of renewable energy across its operations, aiming for greater sustainability in energy consumption. The company has entered into a 10-year virtual Power Purchase Agreement with IGNIS to ensure the supply of around 200 GWh per year of renewable energy to their European sites. Henkel is focusing on enhancing the sustainability of its packaging, including the relaunch of the Schauma hair care brand, where the PE bottle bodies now consist of 50% recycled plastic, and the PET bottle bodies consist of at least 98% recycled plastic. Additionally, Henkel has invested in an innovation fund from Emerald Technology Ventures to support the development of sustainable packaging technologies. Henkel's "Sustainability at Heart" program aims to educate and engage employees more deeply on sustainability issues. The company has also launched extensive aid initiatives, such as a partnership with Habitat for Humanity to support refugee families in Romania. Henkel has improved the traceability rate for palm-based raw materials to 89%, reflecting its commitment to greater transparency and sustainability in its supply chains. The company has strengthened collaboration with customers and partners in sustainability through platforms like the Innovation & Sustainability Days event and the Henkel Inspiration Center in Düsseldorf. These initiatives facilitate cross-industry exchanges and the development of sustainable solutions. Table 2 shows the consolidated efforts and agendas of the reviewed organizations.

**Table 7. Organizational comparison: Sustainability goals**

<b>Sustainability Topic</b>	<b>Procter &amp; Gamble</b>	<b>Unilever</b>	<b>Johnson &amp; Johnson</b>	<b>L’Oréal</b>	<b>Henkel</b>	<b>Colgate-Palmolive</b>
<b>Climate Action</b>	Carbon neutral operations by 2030; Reduce GHG emissions 50% by 2030	Net zero emissions by 2039	100% renewable electricity in Europe	Carbon-neutral sites by 2025	65% reduction in carbon footprint by 2025	Net Zero carbon emissions by 2040
<b>Sustainable Packaging</b>	100% recyclable/reusable packaging by 2030	100% reusable, recyclable, or compostable	Sustainable product packaging	100% of plastic packaging from recycled or bio-based	100% recyclable or reusable packaging by 2025	Transition to recyclable toothpaste tubes

		packaging by 2025		sources by 2030		
<b>Water Stewardship</b>	Enhancing water efficiency by 35% in products	Improve water management and reduce usage by 40%	20% water reduction in operations	100% of water in industrial processes recycled/reused by 2030	Improve water efficiency at production sites	Significant reductions in water usage
<b>Waste Reduction</b>	Zero manufacturing waste to landfill	Reduce waste and increase recycling	100% recycle or reuse all industrial waste	100% waste recycling at industrial sites	Increase proportion of recycled materials	Enhance recyclability of products
<b>Social Impact</b>	Partnerships to enhance sustainability	Improve livelihoods and well-being globally	Global health equity and access to healthcare	Social engagement programs benefiting millions	Commitment to social responsibility	"Colgate Bright Smiles, Bright Futures" program
<b>Sustainable Sourcing</b>	Supply chain emissions reduction, 100% renewable electricity	100% sustainable sourcing with zero deforestation focus	Ethical sourcing and supplier engagement	Traceable and sustainable sourcing of bio-based ingredients	Sustainable sourcing practices	Promoting broader adoption of sustainable practices

*Source:* Own editing based on organizational reports

The commitment of major multinational companies like Procter & Gamble, Unilever, Johnson & Johnson, L'Oréal, Colgate-Palmolive, and Henkel to the United Nations Sustainable Development Goals (SDGs) underscores their strategic approach to sustainability. Each of these organizations integrates various SDGs into their operations and sustainability reporting, reflecting their focus on addressing global challenges through corporate action. Procter & Gamble actively supports SDGs related to clean water and sanitation (SDG 6) through its water conservation initiatives and to responsible consumption and production (SDG 12) with its commitment to sustainable packaging and reduced greenhouse gas emissions, integrated into their broader "Ambition 2030" goals. Unilever's sustainability strategy, the Unilever Compass, directly addresses a broad range of SDGs, including SDG 3 (Good Health and Well-being) through their product formulations that aim to improve health outcomes, and SDG 13 (Climate Action) by setting ambitious targets to reduce carbon emissions across their value chain by 2039. They also focus on SDG 5 (Gender Equality) and SDG 10 (Reduced Inequalities) by fostering inclusive work environments and supporting diverse communities.

Johnson & Johnson emphasizes SDG 3 through their extensive global public health programs and supports SDG 13 by sourcing renewable energy and striving for carbon neutrality in their operations. Additionally, their focus on SDG 5 is reflected in initiatives to empower women within healthcare settings and beyond. L'Oréal commits to SDG 12 by improving the environmental impact of their products through sustainable sourcing and eco-design. Their strong commitment to SDG 13 is evident in their aggressive carbon reduction targets and efforts to achieve carbon-neutral manufacturing sites. Colgate-Palmolive prioritizes SDG 6 with programs aimed at reducing water use and improving water conservation techniques within their operations. Their commitment to SDG 12 is highlighted through efforts to make packaging more recyclable and the development of sustainability innovations such as recyclable toothpaste tubes. Henkel demonstrates a strong alignment with SDG 12 by promoting circular economy principles across its product lines and focusing heavily on reducing waste and increasing the recyclability of its packaging materials. Henkel also supports SDG 7 (Affordable and Clean Energy) by entering long-term agreements to use renewable energy sources for their operations.

**Table 8. Organizational comparison: SDG goals**

<b>SDG Topic</b>	<b>Procter &amp; Gamble</b>	<b>Unilever</b>	<b>Johnson &amp; Johnson</b>	<b>L'Oréal</b>	<b>Colgate-Palmolive</b>	<b>Henkel</b>
<b>SDG 3: Good Health and Well-being</b>	Health hygiene education programs	Product formulations to improve health	Global public health programs	Products improving health outcomes	Health and hygiene education programs	Safety and health standards at workplaces
<b>SDG 5: Gender Equality</b>	Diversity and inclusion initiatives	Programs for empowering women in communities	Workplace diversity initiatives	Initiatives for gender parity in employment	Programs supporting women's leadership	Gender diversity and inclusion efforts
<b>SDG 6: Clean Water and Sanitation</b>	Water conservation initiatives	Water stewardship in production	Water use reduction efforts	Sustainable water management practices	Significant water reductions in operations	Water efficiency and recycling practices
<b>SDG 7: Affordable and Clean Energy</b>	Renewable energy initiatives	Renewable energy targets	Commitments to carbon neutrality	Commitments to renewable energy usage	Energy efficiency improvements	Renewable energy contracts
<b>SDG 12: Responsible Consumption and Production</b>	Sustainable packaging; Waste reduction	Circular economy focus; Waste reduction	Sustainable sourcing and recycling practices	Eco-design of products; Recycling initiatives	Recyclable packaging and waste reduction	Circular economy practices; Waste management
<b>SDG 13: Climate Action</b>	Carbon neutrality goals	Net-zero emissions strategy	Renewable energy and carbon reduction	Carbon reduction targets	Net Zero carbon emissions commitment	Climate protection initiatives

*Source:* Own editing based on organizational reports

In pursuing their sustainability agendas while maintaining supply chain resilience, companies like Procter & Gamble, Unilever, Johnson & Johnson, L'Oréal, Colgate-Palmolive, and Henkel face significant challenges and compromises, as communicated in their reporting. Balancing these dual objectives often requires navigating complex trade-offs, where advances in one area might necessitate concessions in another. Investing in sustainable technologies and processes can be expensive. Upfront costs for renewable energy installations, sustainable sourcing, and advanced recycling technologies may impact short-term financial performance.

Building resilience often involves diversifying suppliers and increasing inventory levels to guard against disruptions. However, these strategies can conflict with goals such as reducing emissions and waste associated with increased logistics and production. Simplifying the supply chain to improve sustainability can sometimes reduce its resilience against global disruptions, such as those seen during the COVID-19 pandemic. The shift towards sustainable materials, for example, biodegradable or recyclable packaging, can conflict with performance and durability standards required for supply chain efficiency. Sustainable materials may not yet have the same performance characteristics as traditional materials, potentially compromising product quality or shelf life, which is critical for maintaining supply chain effectiveness.

As companies expand into new markets, they must navigate varying regulatory environments that may not always align with their sustainability goals. For instance, some regions might lack the infrastructure for recycling or renewable energy, which complicates efforts to maintain a consistent sustainability standard across all operations. The drive for rapid innovation and faster product development cycles to stay competitive can conflict with the thorough assessment and integration of sustainability principles. Ensuring that new products or processes are both sustainable and resilient can require more time and resources, potentially slowing down innovation cycles. Balancing stakeholder expectations can be challenging. Investors may seek quick returns, whereas sustainability initiatives often require long-term investments with delayed payoffs. Similarly, consumers demand sustainable products but are not always willing to pay a premium for them, placing additional pressure on profit margins.

The reviewed multinational organizations communicate a range of practical strategies to ensure both supply chain resilience and sustainability. Unilever and Henkel are investing in localizing their production and sourcing to reduce dependency on long supply chains, which minimizes transport emissions and enhances resilience by spreading risk. Procter & Gamble implements diversified sourcing strategies to mitigate risks from geopolitical issues or natural disasters affecting specific regions. Johnson & Johnson and L'Oréal have committed to significant increases in their use of renewable energy, reducing greenhouse gas emissions and enhancing energy independence, which contributes to both sustainability and operational resilience. Colgate-Palmolive aims for net-zero carbon emissions by 2040, which includes transitioning to renewable energy sources across its operations.

Procter & Gamble, L'Oréal, and Henkel focus on sustainable packaging solutions, aiming to make all packaging recyclable or reusable by 2030. This initiative not only addresses waste reduction but also ensures the supply chain's adaptability to evolving regulatory environments concerning packaging waste. Henkel emphasizes increasing the recyclability of materials used

in their products by incorporating more recycled plastics and reducing packaging weight. Unilever utilizes sophisticated forecasting tools to predict demand more accurately, allowing for more efficient inventory management. This strategy reduces waste and ensures product availability, balancing the goals of sustainability and resilience. Johnson & Johnson employs robust scenario planning to manage inventory efficiently across its global supply chain, ensuring that they can respond to sudden market or operational changes without excessive stockpiling.

Colgate-Palmolive and Unilever work closely with their suppliers to build capacities in sustainable practices and ensure compliance with environmental standards. This collaboration not only fosters more sustainable supply chains but also enhances their resilience by creating more reliable and compliant supplier networks. Henkel runs training and engagement programs with suppliers to promote sustainable development and ensure a stable supply of sustainably sourced materials. L'Oréal has invested heavily in the development of new, sustainable product formulas and manufacturing processes that reduce environmental impact and improve efficiency. Procter & Gamble collaborates with external partners to innovate in areas like low-resource laundry solutions, demonstrating a commitment to sustainability that also offers potential resilience benefits through reduced dependency on water and energy.

These strategies reflect how these companies integrate sustainability into their core operational practices while enhancing the resilience of their supply chains. The approaches are diverse and tailored to each company's specific operational needs and strategic goals, showcasing a sophisticated understanding of the dual challenges of sustainability and resilience in today's global market environment.

## **5. Discussion**

The research has explored insights by reviewing the available theoretical frameworks discussed in the literature review and the practical applications and strategies deployed by leading multinational organizations in the house care product sector. The synthesis of the discussion section reveals both the complexities and the innovative approaches that bridge the gaps between sustainability goals and supply chain resilience.

The literature review highlighted the evolving nature of sustainability, traditionally defined by the triple bottom line approach, encompassing environmental, social, and economic dimensions, as well as the critical importance of resilience in maintaining supply chain continuity amidst disruptions (Sahota, 2014). Organizations are increasingly required to



integrate these sometimes contradictory goals to thrive in a volatile global market. The real-world application of these theoretical concepts by companies like Procter & Gamble, Unilever, Johnson & Johnson, L'Oréal, Colgate-Palmolive, and Henkel illustrates a strategic alignment of sustainability initiatives with resilience tactics. From the organizational reports, it is evident that companies face significant challenges such as cost management, regulatory compliance, and stakeholder expectations in their journey toward sustainability. For instance, efforts to reduce resource consumption and greenhouse gas emissions must be carefully balanced against the need for robust supply chains that can withstand various disruptions. These companies often resort to innovative solutions such as diversifying suppliers, investing in renewable energy, and redesigning products with sustainable materials to maintain both their competitive edge and operational readiness.

The comparative analysis reveals that companies are employing several innovative strategies to meet their sustainability and resilience goals. Companies are making strides in implementing closed-loop systems where resources are reused to minimize waste (Chen et al., 2021), exemplified by Henkel's investment in sustainable packaging technologies. To reduce emissions from transportation and improve supply chain agility, firms like Unilever and Henkel are increasingly localizing their manufacturing and sourcing operations. The use of AI and IoT to predict disruptions and optimize resource use is becoming prevalent, as seen in Johnson & Johnson's scenario planning for inventory management. Effective stakeholder engagement, highlighted as a crucial element in the literature, is validated by the practices observed in these organizations (Srinivasan et al., 2022). Through collaborations with NGOs, government bodies, and other partners, companies are not only enhancing their resilience capabilities but also advancing their sustainability agendas (Hall et al., 2022). For example, Colgate-Palmolive's "Bright Smiles, Bright Futures" program demonstrates a commitment to social impact, aligning with global health and education goals.

From the analysis of both the literature and the sustainability reports of prominent multinational organizations, it is clear that there are several trending efforts towards increasing sustainability. These efforts include a significant push towards reducing carbon emissions, with most companies setting ambitious goals to achieve net-zero emissions within the next few decades (Ivanov, 2020). For example, Procter & Gamble aims to be carbon neutral by 2030, while Unilever has set a target for net-zero emissions across its value chain by 2039. Water stewardship is also prominent, with companies like Henkel investing in technologies and practices that reduce water usage and increase recycling in their operations. Additionally, these

companies focus on sustainable sourcing to ensure that the materials they use, such as palm oil, are obtained in environmentally friendly and socially responsible ways.

Sustainable packaging is another major focus, with companies like L'Oréal committing to making all their plastic packaging from recycled or bio-based sources by 2030. Similarly, Johnson & Johnson, Henkel and Colgate-Palmolive are enhancing their product packaging to improve recyclability and reduce environmental impact.

Multinational organizations balance sustainability efforts with supply chain resilience through several strategic approaches. One common strategy is diversifying sourcing and enhancing local production to minimize dependency on long, complex supply chains, which reduces both emissions and vulnerability to global disruptions (Sahu et al., 2016). For instance, Unilever and Henkel are investing in localizing production, which not only supports sustainability by reducing transport emissions but also enhances resilience by spreading supply chain risks. Another strategy is investing in renewable energy and energy efficiency to not only reduce greenhouse gas emissions but also improve energy independence, crucial for maintaining operational continuity in the face of disruptions. For example, Johnson & Johnson is achieving carbon neutrality in its operations by sourcing 100% of its electricity from renewable sources.

Technological integration plays a critical role as well, with advanced forecasting and inventory management systems being used to efficiently balance inventory levels, thereby reducing waste and ensuring product availability (Ivanov et al., 2017). Unilever's use of sophisticated forecasting tools is a prime example of how technology can align sustainability with resilience. Supply chain collaborations and partnerships are also vital. These organizations work closely with suppliers to foster sustainable practices and build capacities that ensure compliance with environmental standards, which in turn supports supply chain resilience by creating a more reliable and compliant supplier network.

Overall, the drive to balance sustainability with resilience is leading these organizations to innovate and continuously adapt their strategies to meet both environmental and operational challenges effectively. This synthesis of strategic approaches demonstrates a nuanced understanding of the dual objectives within the framework of current global trends and organizational behavior. These insights not only enrich the academic discourse on supply chain management but also offer practical frameworks for companies aiming to enhance their sustainability and resilience in a complex global market.

## 6. Conclusion

The intertwining of sustainability and supply chain resilience in the house care product sector forms the backbone of this study, addressing the apparent contradictions between these two essential organizational objectives. While sustainability initiatives often focus on long-term environmental and social benefits, resilience strategies emphasize the robustness and quick recovery of supply chains from disruptions. The research utilized a scoping literature review combined with a content analysis of annual and sustainability reports from top multinational companies in the house care products industry. This method allowed for an in-depth examination of how these corporations integrate sustainability into their business models while maintaining resilient supply chains.

The findings highlight that leading multinational organizations are actively engaging in various sustainability efforts, such as adopting renewable energy sources, implementing sustainable packaging, and enhancing supply chain transparency. These companies balance these sustainability efforts with supply chain resilience through strategic diversification, robust risk management frameworks, and innovative supply chain designs that incorporate flexibility and adaptability.

The study primarily relies on data from officially published company reports, which may present a polished view of corporate activities, potentially overlooking internal challenges and external criticisms. The focus on only the top six companies in the house care product sector also limits the generalizability of the results across the entire industry or to smaller enterprises with different resources and influence.

Future studies could adopt a more quantitative approach to rigorously assess the impacts of sustainability and resilience strategies on organizational performance and supply chain efficiency. Additionally, expanding the research to include a wider range of companies, including small and medium-sized enterprises, could provide a more comprehensive understanding of the industry's challenges and innovations. Further exploration into the trade-offs and synergies between different sustainability goals and resilience strategies would also enrich the academic and practical knowledge base, supporting the development of more integrated and effective business practices. This study advances the understanding of how sustainability and resilience can be synergized within the house care products sector, offering a blueprint for other industries aiming to navigate the complex interplay between environmental stewardship and operational robustness.

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# Could food supplementation of athletes be sustainable?

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## ABSTRACT

Nowadays the world's population is over 8 billion. Within the food industry, the rise of nutritional supplements and their increasing use is clear for all to see. More and more people are moving away from eating meat and trying vegetarian or vegan lifestyle. We also hear that meat-free lifestyle is healthier and can reduce the harmful effects of the greenhouse effect. However, this diet also requires more care to avoid deficiencies of various nutrients and minerals. Are there sustainable sports supplements? What can we as athletes do to ensure sustainability? In this study, we seek answers to these questions, among others.

**Keywords:** sustainability, nutrition, vegetarianism, food supplement, sport nutrition, food industry

## 1. Introduction

This study is a literature research about the sustainable athlete diet and supplementation. We have unveiled the importance of sustainability. We would like to get to know the readers about the new ways about sustainable athlete diet and the related research topics.

## 2. Literature review

### 1. *The role of sustainability in food and agriculture*

Agriculture produces a significant proportion of our food raw materials. As the market for food supplements itself is part of the food industry, it is worth observing what factors contribute to environmental and sustainability efforts, starting from the agricultural sector. In this section,

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we seek to highlight the need for, and potential of, sustainable food production. The positive effects of organic farming are worth mentioning. Among others, we can highlight the improved soil quality, increased biodiversity, reduced pollutant content (Panyor, 2020).

It is worth noting that the environmental impacts of food production affect not only the terrestrial but also the marine environment. Agriculture is a major contributor to resource depletion, consuming one third of all arable land, approximately 75% of all water resources and one fifth of all energy (Smil, 2000). It is therefore not surprising that direct greenhouse gas emissions from agriculture are the largest contributor to our total greenhouse gas emissions (IPCC, 2014).

Among the gases directly emitted by agriculture, carbon dioxide, nitrous oxide and methane are worth mentioning, as they are responsible for the majority of agricultural greenhouse gas emissions (IPCC, 2014). 65% of  $N_2O$  is produced by agriculture, as denitrification occurs when it is released into the soil as fertiliser (Bajželj et al., 2014, Miranda et al., 2015). Lower amounts of methane can come from rice production (Vermeulen et al., 2012). To a greater extent, it is a consequence of ruminant manure or intestinal fermentation (Gerber et al., 2013, Miranda et al., 2015). It can be said that the farm-to-table concept contributes to the environmental burden, with the meat industry and production being the largest contributors to greenhouse gas emissions. There is a growing number of countries where sustainability is included in dietary recommendations, but unfortunately this has not yet been implemented into the diets of athletes (Fritz et al., 2020).

Of course, we must not forget the food waste in industry and households. Worldwide, approximately one third of all food produced ends up in the trash (Gustavsson, 2011). In developed countries, consumer food waste is most significant (Parfitt, Barthel, 2010). In developing countries, food waste is more significant in production and harvesting. However, it is important to know that food waste can occur from harvesting to the point of delivery to the consumer, i.e. throughout the supply chain (Reynolds et al., 2015). A truly surprising and frightening figure is that 40% of food is wasted in the United States of America (Gunders, 2016). On a per person basis, that is 9 kg of food waste per month (Jones, 2016). This food waste contributes significantly to the depletion of our environmental resources. These discarded foods also account for a quarter of the methane gas produced in waste, contributing significantly to greenhouse gas emissions (Gunders, 2016).

A study of 123 students studying economics at a university in Hungary was carried out in relation to the United Nations Sustainable Development Goals. The statistical analysis proposed

a 3-factor design for the elbow test. The first is placed on students with a global mindset who are sensitive to world problems. The second is for pioneering students, where there is no identifiable reference order between sustainability goals. And the third factor includes people-centred deans who take people's needs into account (Berényi, 2023). Individualised development of environmental awareness means that environmental and social values and the corresponding forms of action and behaviour need to be communicated to individuals and that behaviours need to be fixed (Berényi, 2009).

The rise of healthy eating has also brought sustainability, as it can be said that such eating is more sustainable than large-scale food production. The use of natural resources can bring positive change, which can also reduce our carbon footprint (Simonyi, 2015). Fortunately, it can also be said that the European Union has made the sustainability of sport itself a priority, which of course has an impact on sporting events. As a result, we are seeing the emergence of sustainability guidelines in the protocols of more and more international sports federations (Faragó, 2024).

## *2. Supplementation sustainably*

The most common supplements among athletes include protein powders and other protein-enriched protein bars, creams and other snacks. So whether your goal is weight loss, muscle gain or weight maintenance, a protein-rich diet can have a positive impact on achieving these goals. And more and more people are choosing plant-based diets, not only for their benefits to human health, but also for their positive effects on the environment.

If we see through of the shelves of the shops', we can see that most of the protein supplements are animal-based. The most common raw material of these supplements are cowmilk. There are so many products which are enriched with beef protein. Thanks to allergic diseases and sustainability breakthroughs and to vegan movements, nowadays the number of the plant-based products are increasing. The most common ingredient is pea protein which is followed by rice protein. The Hungarian Central Statistics Office's database shows that the quantity of the daily animal-based protein consumption in Hungary is decreasing since 2020 (ksh.hu, 2024).

Depending on the training goal, athletes need to consume 1.2-2.0 g of protein per kg body weight (Phillips & Van Loon, 2011, Thomas et al., 2016). In his research, Ernő Gyimes points out that the appropriate dose of protein is still a matter of professional debate. For certain groups, even higher protein intakes can be expected in the future (Gyimes, 2023). People are trying to test the effects of protein powders empirically. Most people use these products because they are quick to consume and they are also found to be useful for developing muscle mass

(Szabad et al., 2021). Plant-based proteins require further research, but a 3-month study showed that there was no difference in the results of athletes who consumed whey and pea protein for muscle gain and strength development (Babault et al., 2015).

Some forms of vegetarianism, such as flexitarian or other semi-vegetarian diets, and plant-based lifestyles are also becoming increasingly popular. Even occasional substitute meals that reduce animal products can significantly reduce the environmental impact of diets (Aleksandrowicz et al., 2016, Derbyshire, 2017). With the quality of plant-based proteins declining (Leser, 2013), higher protein consumption is recommended for non-meat consumers (Kniskern & Johnston, 2011). In any case, a more varied diet is recommended to avoid essential amino acid deficiencies. However, neither performance gains nor performance losses have been shown in vegan or vegetarian athletes (Lynch et al., 2018).

**Figure 1.** *Five steps to sustainable diets in athletes*

Area to reduce	Area to rethink and redo
1. Reduce animal-sourced foods (especially red and processed meat)	Increase plant-based foods; consider flexitarian, plant-forward approaches
2. Limit protein supplements	Practice food-first approaches using whole foods whenever possible
3. Reduce processed, frozen, and canned foods	Increase food literacy and prioritize locally grown, seasonal, fresh food
4. Reduce food waste	Teach purchasing, cooking, storage, food safety, and food literacy
5. Avoid unnecessary packaging	Use sustainable options but evaluate solutions in the light of food safety and food waste

*Source:* Meyer et al. (2020)

For athletes, a flexitarian diet can be a win-win strategy. This is because it can meet your protein needs and you are likely to get the right quality protein intake. It can also meet sustainability guidelines. And of course, the athlete can decide on his or her own principles whether to increase the number of plant-based meals or days (Meyer, 2020). It is very important to note that it is important to pay attention to the consumption of quality and safe food (Fabulya et al., 2015, Fabulya & Hampel, 2016).

Edina Lendvai and Csilla Slajkó's research shows that the cost of treating animal materials and sewage sludge is high, and that the reprocessing of these materials is not profitable for the food producing companies, but it is for the protein processing plants (Lendvai, Slajkó, 2017). János Csapó et al. mention in their book (2006) that with the utilisation of by-products from food

production could decrease the food waste. If we would exploit them then less unused protein resources would be. For example whey, blood and feathers from slaughterhouses could be used. However, it can be said that significant breakthroughs have already been made in the production of single-cell proteins. This means that microorganisms can produce a variety of proteins. *Candida* strains can grow in continuous fermentors on paraffin bases which are capable of producing significant amounts of proteins (Csapó et al., 2006).

It can therefore be concluded that, according to the current state of research, essential amino acids can be produced by fermentation as well as by chemical processes. Fermentation can produce L-lysine, L-threonine, L-tryptophan, L-isoleucine. And by chemical means, we can produce DL-methionine. The amino acids thus produced can be mixed with plant proteins to increase their biological value (Csapó et al., 2006).

According to health experts, vitamin B12, which is essential for the human body, is not provided in sufficient amounts only when consuming foods of plant origin. For this reason, the consumption of nutritional supplements and fortified foods may be justified. However, these can be produced by bacterial fermentation and do not require the consumption of animal products. They are mainly found in algae, animal products and foods produced by bacterial fermentation (Balogh, 2017).

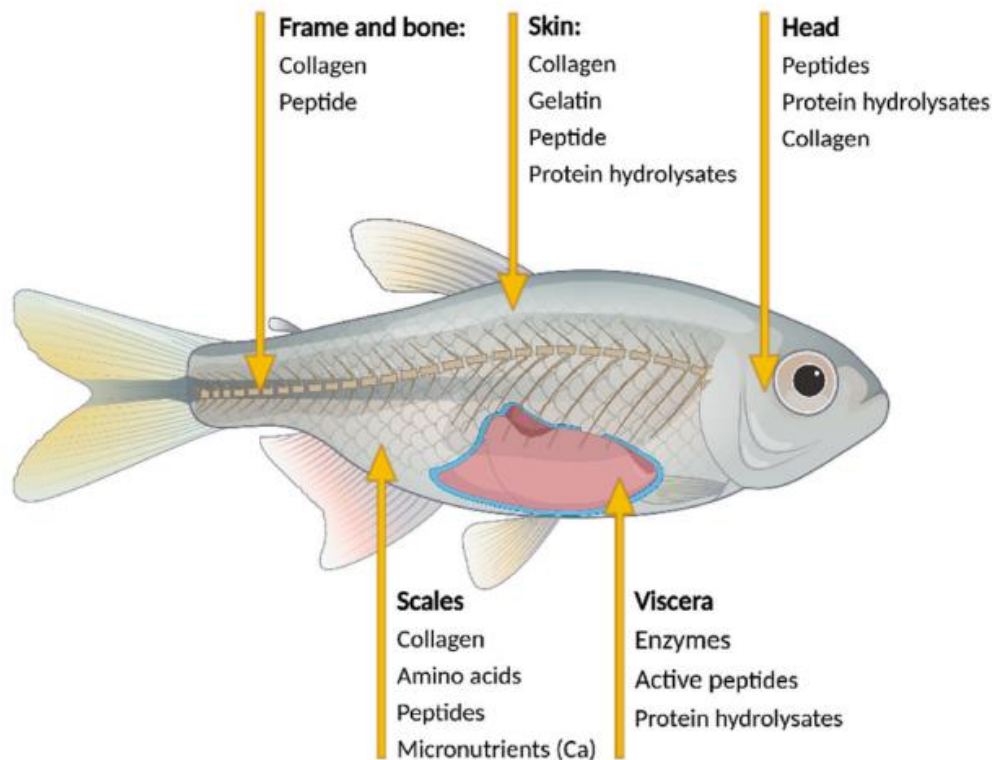
### *3. By-products of fish processing technology as sustainable raw materials*

In 2012, the European Commission launched a long-term programme called "Blue Growth" to optimise natural resources. Protecting fish stocks from industrial pollution and, of course, protecting the environment are key elements. The Sustainable Development Goals must be achieved by 2030. The multi-purpose use of fish waste has many positive aspects. They have very good nutrient content, can be processed quickly, are relatively low cost and very accessible, and are becoming easier for researchers to study for protein (Yuan et al., 2024). However, we must also bear in mind that the biogenic and abiogenic substances that enter the fish habitat, the water, can be diverse and can have toxic, taste-tasting properties for the consumer (Benkő-Kiss, 2017).

One of the by-products of fish processing itself is collagen, which constitutes approximately 8-10% of the fish weight (Nurilmala et al., 2022). However, collagen is mainly extracted from pigs and cattle even today. However, the processing of fish collagen is receiving increasing attention due to various religions and diseases affecting mammals. Thus, this field of research has a history of more than 20 years (Yuan et al., 2024). Gelatin can also be extracted naturally

from fish skin. Thus, for dietary supplements, not only can collagen capsules be produced from fish processing waste, but also the density and hardness of capsules and gels can be influenced.

**Figure 2.** *Fish by-products and main proteins*



*Source:* Yuan et al. (2024)

However, not only collagen and gelatine can be extracted from fish by-products, but also proteins. For this purpose, we should use the enzymatic hydrolysis technique, which is nowadays a widely used process. Here, the main factors are pH, temperature, choice of enzyme-substrate ratio, homogenisation, degree of hydrolysis, which have a major and decisive influence on the biological value and functionality (Alahmad et al., 2022). Proteins can be hydrolysed from fish skin, head and visceral organs. The amino acids that build proteins can be extracted from the scales of scaled fish (Yuan et al., 2024).

In terms of sustainability, and considering fish gelatin as a by-product, it has great film-forming properties, low cost and good biodegradability. Also, we should not overlook the fact that religious restrictions make gelatine a suitable alternative for many more people. Research is still needed in reducing hygroscopicity, oxygen permeability, so modification of gelatin film formulations is still a focus, but it has great potential as it can be used to produce biopolymers (Mondal et al., 2022).

### **3. Results**

The Earth's population is growing, greenhouse gas production and our overall carbon footprint on the environment seems to be increasing. In order to ensure that our planet can continue to serve us and that humanity can live in better conditions, we need to take steps to take better care of our environment and to take steps towards sustainability.

Agro-industry, food production is a very large emitter of greenhouse gases. In addition, various studies show that we could use more food by-products as food. New technologies and processes are also emerging one after the other to strengthen sustainability efforts. Overall, therefore, the impact on the current environment makes it worthwhile to pay more attention to research into alternative, new technologies for our own future and that of future generations.

There are already many options for nutrition and supplementation for athletes. Among the most widely used are nutritional supplements; the group of proteins is already a well-researched topic, with breakthrough results expected in the future. In conclusion, by making "Green Choices" based on the choice of the individual athlete, the nutrition and supplementation of athletes can be sustainable. These individuals need to be mindful of the source and quantity of the food and supplements they consume.

### **4. Discussion**

There are many areas of sustainable agriculture, food and other consumer goods that need attention and further research. With the growing population of our planet, and thus the increasing demand for nutrients, in order to prevent the depletion of our earth's resources, researchers are tasked with finding solutions to help protect our environment. From creating higher quality nutrient-dense foods, to greenhouse gas emissions, to new and innovative sources of nutrients and ways to create them, there is much to research. And it will be worthwhile for industry and individuals to incorporate these innovative processes into their lives and diets, so that together we can work towards a sustainable future.

### **5. Acknowledgements**

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# The Sustainable Human Resource Management (HRM): A Systematic Literature Review

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## ABSTRACT

This article aims to provide a systematic review of the literature in order to examine the current state and future prospects of sustainable human resource management. Our review follows a structured approach to analyse the existing research on SHRM practices, their implementation challenges, and their impact on organizational and sustainability outcomes. In total, we identified 107 relevant documents from the past five years using the Web of Science database and analysed their abstracts using Nvivo12. Our preliminary assessment of the abstracts led to the following key findings: (1) The study's primary focus is on green human resource management, particularly green recruitment. (2) Our analysis emphasizes the concept and classification of sustainable human resource management. (3) The main research questions centre on performance, including environmental performance, sustainable performance, innovation performance, and circular economy performance. (4) The majority of the research employs the PLS-SEM model. The article's main goal is to contribute to the current discussions on this topic by assessing the present state of human resource management and suggesting potential areas for future research. Based on the findings from the examination of current literature, several promising directions for future research and practice in SHRM have emerged.

**Keywords:** Sustainable HRM; Sustainability; Green HRM; Human Resource Management

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## 1. Introduction

Human Resource Management (HRM) plays a pivotal role in the contemporary business environment, influencing the workforce and ultimately shaping the trajectory of organizations (Opatha, H. & Uresha, K., 2020). Historically, HRM has primarily focused on immediate organizational requirements and operational efficiency, often to the detriment of long-term sustainability and strategic foresight. It is through this short-term orientation that a gap exists in the design and practice of HRM, particularly in dealing with ever-persistent challenges and opportunities for sustainability (Guest, D., 1987). While world discourse has come to appreciate that the resources of nature are limited and that environmental conservation is paramount, the need for sustainability in business operations has come out strongly.

Sustainability is all about doing a business by considering the long-term effect of the present action. It upholds not only environmental conservation but also social accountability and economic viability, as echoed by Politis and Grigoroudis (2022). The importance of sustainability in the contemporary business environment cannot be overemphasized it is a driver of innovation, a source of competitiveness, and increasingly becoming a fundamental consumer expectation, which, to some extent, is what Sheehy and Farneti (2021) reiterated. Businesses are now required to do more than reduce their carbon footprints; they need to take the lead as stewards of the well-being and health of the greater society and economy. The move towards sustainability has rather far-reaching implications for human resource management. It demands many changes in conventional practices, with the adoption of a more sustainable approach to managing human capital, as argued by Duvnjak and Kohont (2021).

Sustainable HRM emerges as a response to this call for action, representing an evolution of traditional HRM practices to align with the principles of sustainability (Stankevičiūtė, Ž. & Savanevičienė, A., 2018). It aims to integrate environmental, social, and economic considerations into HR policies and practices, thereby contributing to the sustainable development goals of the organization and society at large. Sustainable HRM practices include green recruitment, where emphasis is placed on hiring individuals who not only possess the required job skills but also share the organization's commitment to sustainability (Paulet et al., 2021).

The purpose of this article is to conduct a systematic review of the literature in order to evaluate the current state and potential future developments of sustainable human resource management. We have adopted a systematic approach to analyze the existing research on SHRM practices, their implementation challenges, and their impact on organizational and sustainability

outcomes. In section 2, we elaborate on the methodology utilized in this study. Section 3 presents the results of our analysis and interpretations. In section 4, we discuss the implications of our findings, highlighting their significance and proposing future research directions.

## **2. Method**

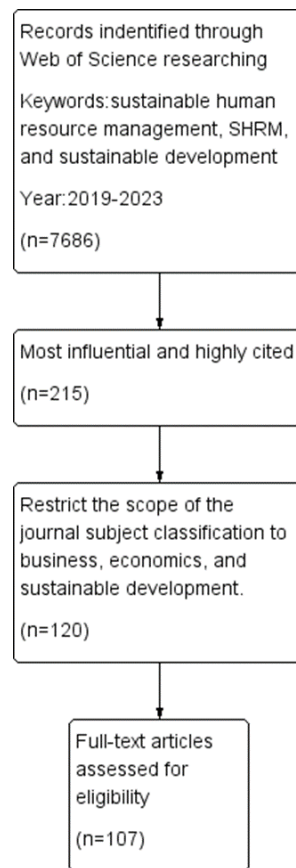
In the end, we settled for the Web of Science due to several reasons its advantages; first is its thorough analysis and methodology – it has an excellent system for categorization of publications, which enhances the standardization and consistency in records of publication (Lu et al., 2023). Also, WoS offers quality data, not with a minimum error rate, which is always current, furnishing researchers with current and updated information all the time (Wei et al., 2020). Besides, it has been performing exceptionally well in getting citations from older studies conducted before 1996 and, thereby is the best source for doing an exhaustive literature review (Kulkarni et al., 2009).

Therefore, compared to Scopus, which has an even greater range of source types, including international and interdisciplinary literature coverage and much more recent information, Web of Science is considered more accurate, dependable, and consistent for citation indexing (Giuli, 2023). The classification of journals in the Web of Science and the visualization effects are some of the things that make it popular with researchers (Lu et al., 2023).

The study covered three significant terms: sustainable human resource management, SHRM, and sustainable development, within a specified period of 2019-2023, with a total of 7686 articles. Following extensive analysis, we pinpointed the 215 most influential and highly cited pieces of writing, all of which were composed in English and published in esteemed periodicals. Our screening methodology was refined to restrict the scope of the journal subject classification to areas such as business, economics, and sustainable development.

Consequently, after we delete non accessible paper, we were able to evaluate a total of 107 documents. The figure 1 shows the flow of this study.

**Figure 1**



### 3. Result and Discussion

According to the data published in journals, the top five are: Resources Policy, with a total of 18 articles, accounting for 16.8% of the total; Journal of Cleaner Production, with a total of 15 articles, accounting for 14.0%; and Science Of The Total Environment, with a total of 6 articles, accounting for 14.0% of the total. Journal Of Environmental Management has 4 articles, accounting for 3.7%, and Business Strategy And The Environment has 3 articles, accounting for 2.8%.

Based on the information of the year of publication, in 2019, the number of publications amounted to 25 articles, which accounted for 23.36% of the total. In 2020, there were 13 articles, representing 12.15% of the total. In 2021, there were 21 articles, making up 19.63% of the total. In 2022, there were 18 articles, accounting for 16.82% of the total. And in 2023, there were 30 articles, representing 28.04% of the total.

Regarding methodology, among these 107 research topics, we can roughly divide the methodologies used into the following categories:

- 1) Quantitative research methods: Utilizing econometric and statistical methods, such as Bayer and Hack cointegration tests, bootstrap causality techniques, Zivot-Andrews unit root tests, autoregressive distributed lag (ARDL) models, second generation Measurement technology, panel autoregressive distributed lag (CS-ARDL) technology, dynamic capabilities theory, resource-based view (RBV), and conceptual model development, artificial intelligence (AI) technology, land use simulation (PLUS) model, life cycle assessment (LCA), and so forth, researchers typically employ these techniques to investigate the relationships and impacts of data. It is presumed that this category of methods constitutes approximately 55% (59 articles) of the total number of topics.
- 2) Qualitative research methods: The majority of the articles reviewed utilise qualitative research methods, such as semi-structured interviews, case study analysis, systematic review, and narrative synthesis, among others. These methods are typically employed to attain a comprehensive comprehension of the intricate nature of the researched phenomenon. It is estimated that this category of research method constitutes roughly 30% (32 articles) of the overall study population.
- 3) Mixed Research Methods: Employs the use of both quantitative and qualitative research methodology; comprises research techniques such as mixed methods research, surveys, questionnaire design, etc. in giving a more comprehensive view of the research. It is expected to account for around 15% of the total topics (16 articles).

The document with the highest number of citations among 107 analyzed is "Moving Towards a Sustainable Environment: The Dynamic Linkage between Natural Resources, Human Capital, Urbanization, Economic Growth, and Ecological Footprint in China" by Ahmed et al. in 2020, with 646 citations. On the other hand, the article that has received the least number of citations is "Impact of Capital Investment and Industrial Structure Optimization from the Perspective of Resource Curse: Evidence from Developing Countries" by Wang et al., published in 2023, with only eight citations. The first step was that we converted the collected articles with their associated data to Excel files, and then thematic analysis was conducted on the data by using Nvivo12.

Thematic analysis is a manual procedure that involves identifying patterns and themes in a dataset and reporting them within an analysis of qualitative data (Buckley & Nurse, 2019). The process concerns analyzing qualitative research data to identify common patterns and themes (Hemming et al., 2021). The thematic analysis enables the researcher with a technique that interprets and presents the textual data analysis structure, from which one flexibly identifies,



analyzes, and reports patterns in the data (Bowen, 2009). This is the method used for the recognition of any pattern within the data, where new themes are now categories for analysis (Rasmussen et al., 2012).

Thematic analysis is quite flexible as a qualitative approach to research. It can be conducted with or without any particular theoretical or epistemological consideration, thus making it a pretty valuable tool for different research purposes (Scott et al., 2019). The process encompasses a series of steps, ranging from data familiarization and coding to the development of a coding framework, identification of themes, review and revision of themes, and finally, the selection of representative quotes (Attride-Stirling, 2001). Thematic analysis is a sensitive and powerful approach to handling qualitative analyses, organizing, and presenting findings.

After conducting open coding on the keywords of the articles, we obtained 10 nodes, 104 codes, and 132 reference points. For titles, we got 13 nodes, 133 codes and 190 reference points. Table 1 and 2 summarized the result of nodes.

Table 1

*Keywords Coding Results*

Nodes	Reference Points
Resource	31
Human Resource	19
Sustainability	18
Green	12
Ecological	10
Development	10
Performance	9
Practices	8
Behaviour	8
Technologies	7
<b>Total</b>	<b>132</b>

Table 2

*Title Coding Results*

Nodes	Reference Points
Resource	34
Sustainable	29
Management	17
Development	16
Human Resource	15
Green	14
Natural Resources	13
Performance	11
Ecological	9
Innovation	9
Energy	8
Human Capital	8
Economy	7
<b>Total</b>	<b>190</b>

Based on our initial evaluation of the abstract, we have identified the following key findings: (1) The primary theme of the study is green human resources management, especially on green recruitment. (2) Emphasis on the concepts and classification of sustainable human resource management. (3) The research questions primarily concentrate on performance, including environmental performance, sustainable performance, innovation performance, and circular economy performance. (4) The research methods primarily employ the PLS-SEM model.

### *Green Human Resource Management*

The initial finding highlights the significance of Green Human Resource Management (GHRM) within the context of SHRM, which emphasizes eco-friendly practices within organizations (Bombiak & Marciniuk-Kluska, 2018). GHRM is viewed as a strategic approach that incorporates consideration of the environment in HRM practices to enhance sustainability within an organization. By promoting environmental behavior among employees, GHRM enriches the organization's performance towards the environment (Chaudhary, 2019).

Green Human Resource Management (GHRM) is the development, implementation, and support of activities to attune employees to goals based on sustainability (Agarwal & Jain, 2022). Studies have established the link between HRM and commitment, employees' environmental behavior, and the environmental impact of an organization (Ali et al., 2021).

Employability is being seen as organisational priorities that apply to everyone, and thus there is more concentration on organisational practices that will guarantee the sustainability of the workforce longer than ever before (Ybema et al., 2017). Earlier research works have established that GHRM has a positive influence on the task-related performance of employees with regard to the environment (Chaudhary, 2019). The GHRM practices are also crucial for the businesses to assume and develop sustainable and profitable models and execute the HR operations effectively and harmonizing to the contemporary pattern of environment behavior (Mtembu, 2018).

The current study revealed that green recruitment is a component of practices that organizations apply to ensure sustainability, and which is considered one of them. This is the method by which the organization recruits and eliminates applicants with correct qualifications of knowledge, skills, behaviours and attitudes towards EMS. The concepts of green recruitment practices are important in influencing employees to embrace environmental friendly practices in an organization. Literature review shows that green recruitment leads to higher levels of environmental performance; therefore, industries, especially hotels as a case, making their positioning and recruiting environmentally concern employees more prominent (Wulandari & Nawangsari, 2021; Saeed et al., 2018; Yusoff et al., 2018).

Thus, green recruitment is one of the significant subcategories of GHRM. It also includes green training, pay & rewards structure as well as employee's engagement as postulated by Jamal et al. (2021). The literature review has demonstrated a positive and significant relationship between green recruitment and selection practices and the enhancement of sustainability and

Organizational Environmental Performance Metrics (OEPM) (Yong et al., 2019; Ullah et al., 2022). In an organization that has adopted green recruitment, the green strategies used by the HRM strategy include improvements of the organization's environmental performance, greening of the organization's image and the achievement of sustainability. These green recruitment approaches are for example in the application of green IT and automated applications, green interviewing processes, and advertising of the jobs through pro-environmental methods that will call for change in pro-environmental actions from the employees (Kiplangat et al., 2022; Ajadi et al., 2022).

Green recruitment is one of the elements within a broader array of practices in GHRM focusing on raising employees' preparedness to manage environmental impact (Moktadir et al., 2019). Green training pay and rewards offered and employee involvement is therefore a systems perspective towards enhancing the environmental profile of the firm and the corporate sustainability agenda. Through filling the gap on green recruiting methods organisations can achieve organisational sustainability, enhancing key competencies and enhancing the organisations green reputation (Kiplangat et al. , 2022). Green hiring increases the employee efficiency and companies' sustainability, as well as green development, training, performance evaluation, and rewarding (Samola, 2022).

### *Sustainable Human Resource Management*

Several definitions of sustainable human resource development have been uncovered. Each perspective contributes to the wide range of concepts currently employed in sustainable human resource management. Despite the various terminology, they all recognize the significance of the human and social resources of the organization on the success of the business (Kramar, 2014).

Although SHRM is an organization-wide approach, human resource management is concerned with the methods through which human resources can be optimally mobilized for economic, social, and environmental improvement so that the firm can sustainably compete with its rivals (Delery & Roumpi, 2017). These activities include utilising the HR sources to implant a sustainability plan in the organisation to create an HR system for the improvement of enduring performance of the firm (Lu et al. , 2019).

Sustainable Human Resource Management (HRM) pursues the objective of fulfilling the present requirements of the organization and society without impairing the capacity to meet future demands, thereby securing the durability of human resource practices (Lulewicz-Sas et

al., 2022). This would involve the embedding of environmental sustainability in HR policies and practices of business organizations. Sustainable HRM indicates that partnership and external relations in learning and personal development pertain to intellectual capital management as a resource-based strategic approach (Wulandari & Nawangsari, 2021; Stachová et al., 2019).

Sustainable HRM is very crucial to the future development and success of an organization; it is a part of organizational activities. Therefore, the sustainable HRM concept integrates the interests of different stakeholders and the importance of stakeholder analysis in the HRM of attaining organizational success (Mohiuddin et al., 2022; Stankevičiūtė & Savanevičienė, 2018).

Sustainable HRM is based on a sustainable resource management approach that emphasizes the sustainability of economic, ecological, and human resources within firms (Ehnert & Harry, 2012). In the context of organizational sustainability, SHRM is of particular importance since it integrates the objectives of economic, social, and ecological levels to meet emerging challenges such as the COVID-19 pandemic (Kinowska, 2021). Six key defining features characterize sustainable HRM. It has developed over more than 15 years into probably the most crucial conceptual area within managing people for long-term development and renewal. Here, we provide a quick overview and a synopsis of the features (Kramar, 2022):

- 1) **Incorporation of Sustainability:** The incorporation of sustainable HRM denotes the integration of economic, ecological, and social sustainability in the practices of HRM to contribute to the overall sustainability of an organization (Ehnert et al., 2015; Kainzbauer et al., 2021; Duvnjak & Kohont, 2021).
- 2) **Green HRM Practices:** Incorporating environmental concerns into HR policies, commonly referred to as Green HRM, is essential in improving an organization's ecological sustainability, hence increasing competitiveness (Bombiak & Marciniuk-Kluska, 2018; Mehta & Chugan, 2015).
- 3) **Long-term human resource development:** It is a core part of sustainable HRM, which includes regeneration and renewal beyond the traditional practices of HRM to ensure that the working population remains adaptable, resilient, and capable of facing future organizational challenges (Stankevičiūtė & Savanevičienė, 2018; Dvořáková, 2020).
- 4) **The Triple Bottom Line (TBL) Approach:** This is a type of sustainable Human Resource Management (HRM) in which Green HRM and socially responsible HRM are combined, to reach three objectives of financial, social, and ecological sense at the same time, as is

emphasized by Anlesinya & Susomrith (2020).

- 5) **Employee-Centric Approach:** Sustainable human resource management practices focus on respect for employee opinions, integrity of relations, equality in terms of justice, and professional growth, which are all crucial organizational life principles (Buren, 2021; Stankevičiūtė & Savanevičienė, 2018).
- 6) **Organizational Performance:** HRM practices such as recruitment and motivation that are sustainable will highly influence the performance of employees and, therefore, the organization's success. The practices ascertain that the employees are competent, motivated, and aligned to the organization's future goals to enhance performance and sustain growth (Weerasinghe & Silva, 2021; Bag et al., 2021).

Such considerations enable organizations to develop HRM strategies that improve financial performance while ensuring environmental responsibility, social well-being, and long-term sustainability. Sustainable HRM aligns HR practices with organizational goals and aims and, therefore, promotes a holistic approach toward human resource management in a sustainable manner. This approach ensures that HR practices aid in the realization of organizational goals and objectives while at the same time promoting environmentally responsible and socially conscious practices. Sustainable HRM by organizations will lead to a difference not just in society and the environment but also in ensuring their financial bottom line in the long run.

### *Performance Management*

The third finding established that sustainable human resource management correlates significantly with performance indicators such as environmental, sustainable, innovation, and circular economic performance. Studies have documented that sustainable HRM practices in terms of recruitment, training, motivation, and rewards have a significant favorable influence on employee performance (Weerasinghe & Silva, 2021). The implementation of such sustainable HRM practices can, therefore, lead to better job performance, with the training also further moderating the relationship between HRM practices and job performance (Manzoor et al., 2019). Several positive relationships have been established between sustainable HRM and increased work engagement, perceived employability, and organizational trust (Ferreira-Oliveira et al., 2020).

In addition, the incorporation of Green Human Resource Management practices in sustainable HRM systems is also seen to increase employees' green performance and thereby contribute to organizational sustainability through increased resource efficiency in improving effectiveness. The inclusion of employees, line managers, and top management makes participation in the

sustainable management of HR exceed the traditional roles and responsibilities associated with HR functions. In turn, more detailed GHRM practices guarantee adopting sustainable HRM initiatives more effectively within organizations.

Moreover, in trying to embed GHRM into the more excellent framework of sustainable HRM, organizations will propagate a culture of environmental responsibility and continuous improvement in performance, allowing them to bring their employee behaviors and organizational goals into synchronization with sustainability objectives. Such an inclusive approach would be more effective for long-term sustainability and competitive advantage in a greening business landscape.

Green performance in an organizational setting is a practice by the business to include environment-friendly practices in the operational systems. Hence, as to collectively contribute towards the betterment of the natural surroundings. In a business context, it is about green human resource management: the integration of environmental considerations into various HR functions to increase organizational sustainability. These areas of GHRM consist of green recruitment and selection, green training and development, green performance management and appraisal, green reward and compensation, and green empowerment. This is associated with encouraging employees to pro-environmental behavior to assist in a larger objective that a particular organization wants to achieve towards sustainability (Saeed et al., 2018; Nngsari, 2019).

Several studies have shown that Green Human Resource Management (GHRM) practices greatly enhance environmental behavior and sustainability within organizations (Wulansari et al., 2018). These practices include creating policies that encourage various environmentally sustainable activities, such as proper waste disposal and upholding green health standards in the workplace. Such policies allow organizations to develop and apply indicators based on environmentally sustainable practices carried out at the workplace (Wulansari, Sugiharto, & Idris, 2018).

Wang (2020) highlights that implementing green performance practices brings numerous benefits to organizations. These practices enhance environmental quality and boost overall organizational performance. The resulting performance improvements lead to greater competitiveness in the market. By integrating sustainability into their operations, organizations can achieve dual benefits: contributing to environmental conservation and advancing their business goals simultaneously.

### *Partial Least Squares Structural Equation Modelling*

This is something which is factual about the PLS-SEM model being utilized. The elimination technique known as Partial Least Squares Structural Equation Modelling (PLS-SEM) is preferred in numerous social science domains because of its great characteristics (Hair et al., 2014). This is especially true since PLS-SEM allows the precise estimation of the measurement model needed to assess the relationships between the latent constructs and the index variables.

The PLS-SEM model based approach is more common in most of the social science research as it can handle formative indicators which are very essential to measure the constructs in a multi-dimensional way for a better understanding of phenomena (Attar et al., 2019). This ability helps the researchers to build and estimate the models which would harmonize with the real social science phenomena and the practices such as knowledge sharing and creation, managing the intellectual capital, and measuring the organizational performance.

#### **4. Conclusion**

This systematic review aims to critically examine the field of sustainable human resource management, which is gaining momentum in an increasingly climate-conscious world. The article unfolds SHRM practices and implementation challenges with their organizational and sustainability implications based on an analysis of 107 documents through the Web of Science database in the last five years. The findings contribute to green HRM, being the specific focus of green recruitment, and classify some elements of SHRM. The following sections contain most empirical studies related to performance: environmental and sustainable performance, innovation, and contributions toward the circular economy, which are analyzed with the PLS-SEM model.

In this light, the present article adds to the debate on sustainable HRM by giving a comprehensive overview of the latest trends and research methodologies. The paper not only highlights current imperatives that emphasize the need to integrate sustainability within HRM practices but also identifies possible ways forward in the future for research in this critical area. Notably, the systematic review of SHRM practices, challenges, and consequences is a rapidly developing field that bears more significant potential for the future development of HRM, notably in the context of sustainability. Some promising lines for future research and practice that emanate from the findings of the review conducted on current literature are:

- 1) Expanding the Scope of SHRM Practices:

Green recruitment is a quite predominant concept in the literature. Further research may examine areas of SHRM that are not fully documented. For instance, how sustainable employee retention strategies, development and training programs on sustainability competencies, or the inclusion of sustainability in the employee performance evaluation system can be implemented. It is through the investigation of a broader range of SHRM practices that a more profound understanding can be gained of how human resource management can contribute to organizational sustainability objectives.

## 2) Quantitative and Qualitative Methodologies:

The use of PLS-SEM models has been prominent, however, future research could benefit from incorporating a combination of quantitative and qualitative methodologies. Qualitative studies, in particular, have the potential to offer deeper insights into the processes and mechanisms by which SHRM practices affect organizational culture, employee behavior, and sustainability outcomes.

## 3) Stakeholder Engagement:

Future research may concentrate on the function of human resource management (HRM) in engaging a range of stakeholders, such as workers, clients, providers, and local communities, in sustainable initiatives. It is vital to comprehend how to effectively enlist and integrate these stakeholders in the pursuit of all-encompassing sustainability results.



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# Governance Framework and Implementation Paths of the Green Transformation of Vocational Education and Training in the European Union

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## ABSTRACT

The European Union is deeply committed to weaving the principles of green transformation into the fabric of Vocational Education and Training (VET) systems, aiming to advance the achievement of sustainable development goals. In light of this commitment, a governance framework specifically tailored for this purpose has been developed, following a thorough analysis of the myriad factors that play a crucial role in steering the vocational education sector towards a greener future. This framework is built upon four key pillars: the roles and interests of stakeholders, the relevance and depth of the educational content, the strategic direction and aims of vocational training, and the teaching methodologies employed. It delineates four strategic directions to ensure the successful embedding of green transformation within VET: leveraging policy objectives to nurture and disseminate the principles of green transformation; refining educational techniques to better meet the expectations of the labor market; boosting the capabilities of educators to incorporate green transformation concepts in their teaching; and broadening the scope of financial support mechanisms to enhance fairness and accessibility in green-oriented educational initiatives. Furthermore, a series of case studies from various EU member countries, including France, Spain, Denmark, and Estonia, have shed light on effective governance models that include anticipating future skill needs, encouraging partnerships across different sectors, securing support from government funding, and emphasizing the education of communities at a disadvantage. These case studies provide a window into a holistic strategy for infusing green transformation into VET, with the dual objectives of preparing learners with the competencies necessary for a sustainable future and guaranteeing equitable, inclusive educational pathways in a rapidly changing employment landscape.

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**Key words:** Vocational education and training; Green transformation; European Union; governance framework

## **1. Introduction**

As global crises and challenges intensify, climate and energy issues have become critical threats to human survival and development, with "green," "sustainable," and "carbon neutrality" emerging as frequent keywords. Looking globally, the 1992 United Nations Conference on Environment and Development adopted the United Nations Framework Convention on Climate Change, which set the ultimate goal of joint efforts by all countries to tackle climate change. It also introduced a "global action plan for sustainable development" known as Agenda 21. Particularly at the 24th Conference of the Parties to the United Nations Framework Convention on Climate Change, "green transformation" was recognized as crucial in combating climate change. The greening of skills was seen as the cornerstone of this transformation process, paving the way for promoting decent work in the labor force (ILO,2019).

The European Union occupies an important position in the global political and economic landscape, playing a significant role in global environmental and climate governance. In 2018, the EU first introduced a strategic vision for achieving carbon neutrality and in 2019, it released the European Green Deal, proposing to make Europe the first carbon-neutral continent. This goal was transformed from a political commitment into a legal obligation through the European Climate Law. In 2020, EU member states collectively signed the Osnabrück Declaration on vocational education and training as an enabler of recovery and just transitions to digital and green economies. This aims to promote the digitalization and greening of Europe's education and training sectors, enhance employability and competitiveness, and stimulate economic growth.

As the green development concept and practice continue to deepen, vocational education and training (VET) also face a green transformation. Some scholars focus on green transformations beyond the national level, analyzing goals and reasons for the greening of adult education and VET in various international organizations based on policy texts (Liu & Guan, 2022; Li & Liu, 2017; Zhang, 2021; Ouyang et al.,2023). Other scholars focus on green transformations at the national level, including both developed (Du, 2021) and developing countries (Rajput et al., 2021), analyzing the current state and paths of change in VET's green transformation from different perspectives such as students (Thirupathy & Mustapha, 2020), teachers (Kutto,2020) and other stakeholders (Brown, 2015). Overall, the existing research on the governance of the

green transition in vocational education and training (VET) within the European Union is still incomplete, and its research value has not been fully explored. Therefore, this paper, based on motivation analysis, reviews case practices from several EU member states (France, Spain, Denmark, and Estonia), summarizes the governance frameworks for the green transition of VET in these countries, and attempts to explore governance path choices at both the EU and national levels. The aim is to provide useful references for the sustainable development of vocational education in China.

## **2. The Drivers of Green Transformation in Vocational Education and Training (VET) Governance in the European Union**

### **2.1. Responding to Global Sustainable Development Initiatives**

In 2015, all 193 member states of the United Nations unanimously adopted the "Transforming our World: The 2030 Agenda for Sustainable Development," which set forth 17 Sustainable Development Goals (SDGs) to shape global development and governance for the next 15 years. In 2016, 178 parties signed the Paris Agreement, reaching a consensus on the climate objective of "keeping the increase in global average temperature to well below 2°C." Addressing global environmental and climate changes has become a global consensus, marked by its urgency and significance. As warned by the United Nations Environment Programme (UNEP) in the "Global Environment Outlook 6," the Earth has suffered extreme damage. Without urgent and more substantial actions to protect the environment, the ecosystems of the planet and the endeavor for sustainable human development will face increasingly severe threats. To achieve the vision of "healthy planet, healthy people," nations worldwide should "completely abandon the development model that only focuses on immediate benefits at the expense of future welfare, and transition towards an economy with nearly zero waste" (Duan & Ling, 2020).

In response, the European Union explicitly set forth in the European Green Deal the goal to "increase the EU's 2030 greenhouse gas reduction targets to at least 50% and 55% compared to 1990 levels" and to achieve "net-zero greenhouse gas emissions by 2050, decoupling economic growth from resource use" as part of its medium and long-term vision (EU, 2023). Further emphasized in EU reports (2022) is that "the green transformation is a global, cross-sectoral process: it affects all industries, albeit in different ways. Skills play a core role in achieving the green transformation" (VOCED, 2023). Therefore, focusing on the governance of the green transformation of vocational education and training is considered an effective pathway to advance the green transformation of the EU's economy, society, and ecology.

## **2.2. Addressing Labor Market Supply and Demand Challenges**

According to International Labour Organization (ILO) statistics (2018), around 1.2 billion jobs worldwide, representing 40% of all employment, directly depend on natural ecosystems. With global temperatures rising, it is projected that by 2030, 72 million full-time jobs could be lost, placing many vulnerable groups at risk of unemployment. However, if countries implement sustainable development goals and vigorously develop the green economy, about 18 million new jobs could be created globally (ILO, 2018). The ILO forecasts that under the premise of achieving sustainable energy and a circular economy, about 2% of the global workforce will be impacted, necessitating skill upgrades or new skills learning through vocational education and training to preserve jobs. Therefore, a forward-looking skills strategy is urgent for educating and training new workers, as well as updating the skills of the existing workforce to adapt to new job positions.

In the European Union, the green transformation, alongside digitalization and automation, will be a significant change direction in the coming decades, prominently reflected in career choices. This shift will lead to challenges in skill enhancement and innovation for the workforce. The focus of EU vocational education and training, employment, and skills policies will also lean towards green transformation: Firstly, individuals in declining sectors or professions facing skill obsolescence will need skills retraining oriented towards green transformation. Secondly, a significant number of young people and adults will need training to meet the growing demand for existing green jobs. Third, employees less affected by the green transition also need skills enhancement; fourth, emerging occupations related to green industries require innovation in green skills. (Cedefop, 2021). EU forecasts show that if vocational education and training can smoothly transition to green transformation, from 2020 to 2030, employment in the EU could increase by 3.7% and GDP by 1.7%, which would be higher than the growth during the same period without implementing the European Green Deal.

## **2.3. Enhancing the Resilience of Vocational Education and Training Development**

In the understanding and application by international organizations, resilience is closely linked to sustainable development. The United Nations document "Enhancing Human Resilience: Maintaining Millennium Development Goals Progress in an Economically Uncertain Era" (2011) notes that crises have become a systemic feature of today's society and emphasizes the importance of resilience for sustainable human development (UNDP, 2015). The OECD's "Education at a Glance 2021" highlights that "preparing students for lifelong learning so they can upgrade and reacquire skills in adulthood is key to ensuring they can withstand major trends

and external shocks" (OECD, 2021). The European Union in its "European Skills Agenda for sustainable competitiveness, social fairness, and resilience" (2020) also particularly stresses the need to provide young people and adults with the knowledge, skills, and competences to enable them to make a fair transition to the green and digital economy during periods of demographic change and throughout all economic cycles (EUR-Lex, 2021).

Creating more job opportunities in the pursuit of sustainable development of both nature and society requires practical governance measures that continuously enhance the resilience of vocational education and training, thereby strengthening the capacity for sustainable development. As the International Labour Organization points out, "the transition to a green economy requires a transformation of the production systems, on a scale comparable to an industrial revolution" (ILO, 2018). This transformation relies on green technologies, involving the application of knowledge, skills, mechanisms, designs, and equipment to produce products or engage in activities that have minimal environmental impact or can improve environmental conditions (ILO, 2019). The development and application of green technologies are among the primary drivers of the "greening" of skills and occupations. The development of green skills within the context of lifelong learning is fundamental to achieving sustainable development goals. Therefore, in response to the societal challenge of transitioning to a green economy, enhancing the resilience of vocational education and training is a critical issue.

Based on the above motivation, the research questions are formulated as following:

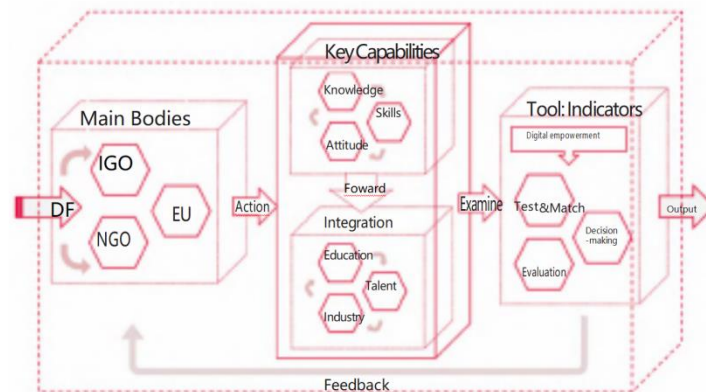
1. What is the governance framework of the green transformation of vocational education and training in the European Union?
2. What are the implementation paths of the green transformation of vocational education and training in the European Union?

### **3. The Governance Framework for Green Transformation in Vocational Education and Training in the European Union**

The various principles and actions adopted by the European Union in the governance of the green transformation of vocational education and training are a positive response to the needs of EU societies and global sustainable development. During this process, a more complete governance framework has been established, as shown in Figure 1, guiding the green transformation practices in vocational education and training across member states and regions.



**Figure 1:** Governance Framework for Green Transformation in Vocational Education and Training in the European Union



Source: *Own Compilation*

### 3.1. Actors: Tripartite Governance in the Policy Network

The governance of the green transformation in vocational education and training (VET) within the European Union incorporates various forms of interest alignment and governance, ensuring the diversification of governance actors and equality of participants through coordination and cooperation (Liu, 2018). This process forms a political integration structure between states and societies or between public and private sectors, while also emphasizing the active search for institutional expression by social forces within different policy networks.

Firstly, intergovernmental organizations hold irreplaceable governance value. Michael Barnett and Martha Finnemore, in their book “Rules for the World: International Organizations in Global Politics”, argue that the authority of international organizations features diversity, which decisively contributes to constructing social realities (Barnett & Finnemore, 2004). As an intergovernmental organization, the EU can leverage its influence to fully mobilize institutions and resources, exerting governance effectiveness beyond the national level, particularly in defining directions for action and establishing boundaries for these actions.

Secondly, non-governmental organizations (NGOs) play roles in coordination and assistance. The establishment of various international organizations implies a decentralization of power, often necessitating the coordination and influence of enterprises, unions, foundations, and civil society among NGOs. NGOs not only engage in cooperative, complementary, and checks-and-balances interactions with government departments of member states but also play a significant role in building and improving civil society (Fan, 2015), especially acting as policy participants, evaluators, and monitors in the governance of green transformation in VET.

Thirdly, sovereign states have decisive influence. Without the involvement of its member states, the EU's green transformation in vocational education and training cannot be truly achieved. Although the influence of various international, regional, and non-governmental organizations is growing globally, sovereign states remain the most central actors in the governance of world politics, economics, social issues, and environmental matters, especially in advancing policies and practices, and even in determining the implementation of governance concepts and goals.

### **3.2. Content: Key Competencies Under Green Orientation**

Nicolas Schmit, the EU Commissioner for Jobs and Social Rights, believes: "Enhancing and innovating workforce skills is one of the core measures to address economic recovery and can prepare for the greening and digital transformation (EU, 2020)". Seizing the opportunities of economic and social green transformation requires the development of green skills in the workforce. Establishing a framework based on green core competencies is the cornerstone of the green transformation in vocational education and training. The European Green Deal specifically proposes the creation of a European Competence Framework to assist in the development and evaluation of knowledge, skills, and attitudes related to climate change and sustainable development.

From a historical perspective and sustainable development practice, formulating a macro-guidance Sustainability Competence Framework can describe the meanings and uses of key competencies in sustainable development and education, making it a fundamental tool to promote green skills education. With the support of the European Commission's Joint Research Centre (JRC), Chiara Scalabrino conducted a preliminary literature analysis and identified twelve sustainable development competencies divided into four capability areas: embodying the values of sustainable development, embracing the complexity of sustainable development, envisioning the future of sustainable development, and acting for sustainable development. These competencies were further explained and exemplified using Bloom's taxonomy of knowledge, skills, and attitudes (KSA) (EU, 2022).

Respecting the principle of subsidiarity in educational policy, the Sustainable Development Competence Framework can be interconnected with existing frameworks like the European Digital Competence Framework (DigComp), the European Entrepreneurship Competence Framework (EntreComp), the Digital Competence Framework for Educators (DigCompEdu), and the European Framework of Personal, Social and Learning to Learn Competences (LifeComp). This interconnection ensures coherence in educational policies and programs, achieving the vision of "Education for Sustainable Development."

### **3.3. Direction: Integrated Triple Helix Transformation Path**

The deep integration of industry and education is not only an inevitable requirement for changing economic development methods and promoting regional industrial transformation and upgrading but also a necessary path for the development of modern vocational education and training (VET). The green transformation affects the EU's economic and labor markets and the field of VET, involving a dynamic adjustment that drives profound changes in both the supply and demand sides of the labor market. The mutual integration of green-related industries and green knowledge and skills is a strategic choice for effectively linking supply and demand.

Leydesdorff and Zawide (2010) proposed that the Triple Helix model, comprising market, organizational, and technological opportunities, can realize social functions such as creating social wealth, organizational control, and organized knowledge production. In the context of building a green-skilled society, the "Triple Helix" interaction among schools, markets, and governments is the new trend in the transformation of VET across EU countries. Firstly, the construction of the educational chain and talent chain constitutes the first spiral of the EU's green transformation. The training goals for green transformation are set based on the green labor market; through teaching synergy, knowledge synergy, and capability synergy, green changes are implemented across courses and specialties in basic theoretical knowledge, professional knowledge, industry common knowledge, and job advancement knowledge.

Secondly, the coupling of the industrial chain and educational chain forms the second spiral of the EU's green transformation. The transformation and upgrade of the VET curriculum system are based on the green development strategies of the EU and its member states, with regional industrial development influencing and guiding the setting of talent training plans, curriculum structures, and knowledge and skill frameworks.

Thirdly, the matching of the talent chain and industrial chain constitutes the third spiral of the EU's green transformation. The industrial chain provides resources, platforms, and direction for the talent chain, while the talent chain provides innovative drive for the industrial chain. On this basis, the green transformation of vocational education and training and the integration with green industries can achieve consistency at three levels: alignment with the talent training goals of industry enterprises and vocational schools; consistency with the needs of industrial green transformation; and alignment with the societal process of sustainable development.

### **3.4 Tools: Indicator System under Digital Empowerment**

The greening and digital transformations are priority areas in the development of vocational education and training (VET) in the European Union, serving the overall strategy of sustainable

economic and social development within the EU. Mara Brugia, Deputy Director of the European Centre for the Development of Vocational Training, pointed out: "There is a crucial link between green transformation and digitalization, as the latter is a major driver of economic greening (Cedefop, 2018)." Digital governance can permeate the entire process of VET green transformation governance, achieving dynamic, efficient, comprehensive, and open continuous monitoring and adjustment.

Firstly, digital governance enables skill matching and forecasting in green transformation. A key area in the governance of green VET is the collection, forecasting, and anticipation of skills intelligence during green transformation. By leveraging big data analytics methods such as the European Skills Index (ESI), Online Job Vacancies and Skills Analysis (OJVs), and the Skills and Job Survey (ESJS), obtaining information related to labor market and skill trends is crucial for constructing a green skills formation system and achieving success.

Secondly, digital governance promotes the upgrade of decision-making tools. Based on labor market skills forecasts for green transformation in VET, the successful integration of Information and Communication Technology (ICT) and Labor Market Information (LMI) in career guidance services forms Decision-Making Tools (DMT) (Cedefop, 2021). This facilitates the collection and analysis of green information, the formulation of educational programs, and the enhancement of data tool performance.

Thirdly, digital governance has significant advantages in the quality assessment of vocational education and training and strategic adjustments in green transformation policies. By utilizing the collection and forecasting of VET green skills intelligence to establish Occupational Skills Profiles (OSP), a quantifiable, standardized, and comprehensive individual work skills information system is formed. This aligns with the European Skills, Competences, Qualifications, and Occupations taxonomy (ESCO), the Statistical Classification of Economic Activities in the European Community (NACE), and the European Qualifications Framework (EQF), providing quantitative analysis and key references for the quality assessment of green skills at the occupational group, sectoral, national, and pan-European levels

#### **4. Implementation Paths for the Green Transformation of Vocational Education and Training in the European Union**

Constructing pathways for the governance of green transformation in vocational education and training requires understanding its essential characteristics and inherent demands. This involves establishing feasible pathways to promote green transformation governance practices based on an analysis of transformation goals and challenges, guided by the green transformation

governance framework. Currently, the EU has primarily developed four implementation paths for the green transformation of vocational education and training.

#### **4.1 Leveraging Policy Goals to Guide and Promote the Spread of Green Transformation Concepts**

Policies have the functions of guiding, coordinating, and integrating. By releasing policies, recommendations, and reports on the green transformation of vocational education and training (VET), clear goals can be set for the governance of green transformation in VET across member states, along with comprehensive reform and development initiatives.

Firstly, overarching policy documents from the European Union that call for global "carbon neutrality" affirm the value of VET in the context of the EU's economic and social green development. Documents such as the European Green Deal, European Skills Agenda for Sustainable Competitiveness, Social Fairness, and Resilience, Communication on Achieving the European Education Area by 2025 (2020), and the Digital Education Action Plan (2020) provide conceptual and directional guidance for member states and regions.

Secondly, based on European skills forecasting, more specific development suggestions are proposed. Documents like Digital, Greener, More Resilient: Insights from the EU's Centre for the Development of Vocational Training on European Skills Forecast (2021) and Green Jobs and Skills Transition: Insights from the European Green Deal Skills Forecast Scenarios (2021) offer an overall understanding of the EU's green development and the labor market's demand for green skills. They call for effective measures to invest in VET and provide feasible recommendations, guiding the construction of high-quality, inclusive, and open European green VET systems.

Lastly, the EU actively collaborates with other international organizations to commit to VET transformations and practice sustainable development goals. For instance, joint publications with the International Labour Organization (ILO), the Organisation for Economic Co-operation and Development (OECD), and UNESCO, such as Work-based Learning and Green Transition (2022), further emphasize the implementation strength and determination to promote the green transformation of vocational education and training.

#### **4.2 Advancing Pedagogical Reforms to Foster Coordination with the Labor Market**

In the process of green transformation governance in vocational education and training (VET), the European Union faces significant challenges related to the mismatch between the supply and demand of green skills. This mismatch is evident in the scale, structure, and quality of the

workforce trained by VET, which does not adequately meet the developmental needs of the economy and society. In response to this issue, the EU has identified work-based education reform as a key pathway for advancing the governance of the green transformation in VET. Only through various forms of Work-Based Learning (WBL), which involve direct participation in creation and innovation processes, can continuously updated green skills be developed. These skills are crucial for forming the technical and organizational processes needed for the green transformation, ensuring that vocational talent output matches the labor market needs.

The EU views work-based learning as a win-win situation that benefits all key stakeholders, including learners, employers, and social partners. Particularly, apprenticeships, as a major type of work-based learning, play a significant role in addressing youth unemployment issues in the context of green transformation. In 2021, during a high-level meeting between the European Alliance for Apprenticeships (EAfA) and the International Labour Organization, Nicolas Schmit called for increased investment in apprenticeships and the enhancement and retraining of skills to meet the challenges of the labor market and the digital and green transformations. Cesare Onestini, Director of the European Training Foundation, also noted, "Apprenticeships need to evolve with the changing skills, which includes adapting to the digitalization and greening across all sectors (ETF, 2021)." With the efforts of EU-related agencies, many partner countries have started implementing pilot apprenticeship programs or structural reforms. Assistance is also provided to EU candidate countries through the European Alliance for Apprenticeships to promote the quality, provision, image, and mobility of all work-based learning, including apprenticeships (ETF, 2023).

### **4.3 Ensuring the Enhancement of Teacher Capabilities to Implement the Green Transformation in Vocational Education and Training**

In the context of rapidly changing technology and skill markets, the European Union recognizes that teachers, as drivers of economic recovery and fair transition to digitalization and greening, are at the forefront of educational practice. They play a crucial role in linking curriculum development, teaching, and the connection between education and work. Enhancing and updating teacher competencies is a key area for solving the implementation challenges of green transformation governance in vocational education and training.

Since 2002, the EU's focus and systematic investment in the professional development of teachers and trainers have continually strengthened, becoming one of the core agendas of EU policy. The project framework of "Teachers' and Trainers' Professional Development"

emphasizes "building inclusive, green, and digital capabilities for vocational education teachers and trainers." In terms of scope, the professional development of vocational education teachers and trainers in the EU's green transformation governance includes Initial Professional Development (IPD) conducted within higher education or higher educational level frameworks, and Continuing Professional Development (CPD) in specific areas after entering the workforce.

In terms of means, on one hand, organizational leadership is leveraged to help vocational education teachers and trainers form professional development groups to enhance their skills. For instance, the European Centre for the Development of Vocational Training has facilitated the establishment of working groups like "Schools for Success: 2030 School Agenda" and "Digital Education: Learning, Teaching, and Assessment," providing convenient channels for strengthening exchanges among vocational education teachers and trainers across different countries and fields (Cedefop, 2023). On the other hand, feasibility studies are conducted at the pan-European level, providing a digital resource platform for vocational education and training practitioners and policymakers. This platform serves as a medium for conducting surveys across Europe targeting vocational school principals, teachers, in-company trainers, and learners, providing timely guidance in the green transformation, and offering information for the formulation of policies on the professional development of vocational education teachers and trainers in the context of green transformation.

#### **4.4 Diversifying Funding Sources to Ensure Inclusivity and Equity in the Green Transformation**

The International Labour Organization's 2018 survey results reveal that the impacts of environment and employment are reciprocal: climate change can lead to unemployment among low-end industry workers; simultaneously, reduced employment rates and training opportunities can further deteriorate the environment (ILO, 2023). Thus, ensuring that vulnerable groups have access to vocational education and training is not only an effective approach to achieving green transformation governance but also a necessary requirement. The European Union actively provides diverse funding channels to enhance the inclusiveness and fairness of the green transformation governance in vocational education and training.

On one hand, the Erasmus+ program offers funds through phased and specific plans to support the development of education, training, and youth. From 2021-2027, this program plans to invest €26 billion, building on the successes of the previous phase (2014-2020), to provide more support for more participants and a broader range of organizations, positively impacting a more inclusive, cohesive, greener, and digitalized society. Annually, over 130,000 vocational

education and training learners and apprentices, as well as 20,000 professionals, are expected to benefit from it (EU, 2023).

On the other hand, the EU has established several specialized funding organizations to provide continuous and robust financial support for member states' green transformations. Firstly, the European Social Fund (ESF). Vocational education and training are key priorities for the European Social Fund to achieve green and digital recovery. The fund has a budget of nearly €99.3 billion for 2021-2027 (EU, 2023), particularly through its shared management chains with Employment and Social Innovation (EaSI) projects, which help vulnerable groups adapt to the labor market through skill enhancement and innovation. Secondly, the European Training Foundation (ETF). The ETF believes that "green transformation and the development of green capabilities depend on the effective functioning of everything from teacher training to qualification frameworks" (ETF, 2023) supports transitional countries in unlocking the potential of their human capital through reforms in education, training, and labor market systems. Thirdly, the Recovery and Resilience Facility (RRF). The RRF primarily funds infrastructure projects, modernizing the infrastructure necessary for the transformation and development of vocational education and training to better align with labor market needs (Cedefop, 2023).

## **5. Governance Case Studies of Green Transformation in Vocational Education and Training in the European Union**

In recent years, many EU member states have developed national action plans and strategies to promote the green transformation of vocational education and training. To avoid the one-sidedness and limitations of analyzing a single country's case, this article examines the practices in four EU member states—France, Spain, Denmark, and Estonia—analyzing how they drive the green transformation of vocational education and training at the national level.

### **5.1 Skills Demand Forecasting**

The forecasting of green skills demand is based on insights into labor market trends and their social impact factors. It involves periodic development as milestones and uses mathematical statistics as a means (Liu & Wang, 2021) providing information intelligence to government agencies, business employers, and individual workers. This plays an active role in the green transformation of vocational education and training.

In 2010, France established the National Observatory for Jobs and Skills in the Green Economy (Onemev), which built a skills forecasting network in collaboration with various national ministries and agencies, leading public employment service organizations, major vocational



education and training associations, the national statistics institute, research institutions, and regional employment and training observatories. The observatory recognizes nine green occupations and about seventy greening occupations and has developed two monitoring approaches: one is data statistics and quantification based on jobs and professions; the other is observation and analysis based on "ecological activities," discussing the comprehensive impact of green transformation on work and skills (Cedefop, 2019).

Spain's skills forecasting system is developed in parallel by different institutions involved in employment and education. It primarily consists of two parts: one is an occupational observatory supervised by the central public employment service, which needs to analyze about 200 fast-growing professions each year and clarify the skills gaps related to these professions under the analysis of regional network groups at the observatory (Cedefop, 2019); the second is monitored by the National Institute for Qualifications (INCUAL), which tracks the development of occupations, defines green skills, identifies green skills gaps, forecasts green skills needs, and determines training measures.

The cases from France and Spain demonstrate that by leveraging the functions of skills forecasting institutions, they achieve analysis of the characteristics and needs of target groups while maintaining a stable source of data, statistical information, and indicator data. Furthermore, they transform related data and qualitative analysis results into comprehensive intelligence through data processing and analysis (Cedefop, 2023).

## **5.2 Multilateral Collaborative Cooperation**

The green transformation of vocational education and training (VET) requires the coordination of multiple stakeholders to leverage their strengths. This collaboration begins with schools, uses cities as nodes, focuses on enterprises, and relies on industries as supports (Liu & Zheng, 2023), thereby creating a combined governance force. This approach promotes the green transformation of VET and drives sustainable development shifts towards green employment, green industries, and a green ecology at the societal level.

In Estonia, VET providers and other stakeholders have sought opportunities for green transformation in the context of energy crises, climate change, and worsening environmental conditions affecting Europe. Initially, through the "Green Morning" online monthly meetings, stakeholders meet with experts in the green economy, green policies, and circular economy to discuss integrating environmental themes into VET. In 2020, the cross-sector "Green Tiger" cooperation platform was established to facilitate collaborative efforts among entrepreneurs, the public sector, NGOs, and individuals. Further, through the 2022 project "Green

Awakening—Environmentally Conscious VET," school administrators, local governments, and other stakeholders can visit companies involved in the green economy to learn from valuable experiences in green transformation in VET (Cedefop, 2022).

In France, public employment service agencies monitor and report on the development of green occupations and skills and organize employee training across regions to cultivate talent for the local green industry, promoting the economic green transition. The private sector in France can participate in the green transformation in two ways: either by directly funding training activities for employees or through training costs paid by companies under the management of nationally approved OPCAs organizations (Cedefop, 2018).

Case studies from Estonia and France reveal that the green transformation of national vocational education and training governance involves multiple practices such as web conferences, project plans, diploma certification, and expert seminars. These activities promote a sensible transition to green VET, green skills, and even the green economy through collaborative interactions among various relevant stakeholders.

### **5.3 National Financial Support**

In the face of continuous technological innovation, workers can increase their human capital and improve labor productivity through continual learning of new technological knowledge, which in turn promotes economic growth. Robust financial support has always been a solid foundation for the development of vocational education and training (VET) in the European Union and a driving force for developing green human capital.

The Danish Minister of Education stated: "The green transformation is a prerequisite for achieving Denmark's climate goals, and many vocational education policies are central to this (Cedefop, 2021)." The country's 2021 budget proposed strong continuing education and retraining for unemployed and employed individuals to help achieve the green agenda and Denmark's climate goals (Ministry of Children and Education of Denmark, 2021). In the same year, the Danish government allocated €7.25 million to establish knowledge centers responsible for developing and testing short-term instructional courses and materials related to the green transformation of VET, as well as assisting in enhancing teachers' green capabilities; in 2022, the allocation for climate adaptation and green transformation was increased to €13.44 million (Cedefop, 2021). In Spain, under the national "Plan for Recovery, Transformation, and Resilience" and the "Circular Economy Strategy," Madrid launched the "2021-2023 Employment Strategy," investing about €345 million annually to assist long-term unemployed individuals, youth, women, disabled persons, and other marginalized groups in receiving job

training. The "Canal de Isabel II" implemented the Young Talent Plan, providing training and scholarships for young professionals to learn and develop green skills and capabilities (Comunidad de Madrid, 2023).

The cases from Denmark and Spain show that although the specific forms of financial support and governance focuses differ between the two countries, both are aimed at achieving governance goals by incorporating the supply of green skills, socio-economic sustainable development, and climate neutrality objectives into national fiscal plans, reflecting the governance determination of member states.

#### **5.4 Education for Vulnerable Groups**

Training in green job skills and expanding employment opportunities are considered effective paths for promoting economic development and green transformation on a relatively equitable basis. Vocational education and training, including apprenticeships, are seen as the most effective ways to help vulnerable groups gain access to green jobs.

In Madrid, Spain, with the support of the European Social Fund, a "Green Employment Plan" (Empleaverde) was launched. This program focuses on developing workers' awareness of sustainable development, environmental skills, and the skills required by the labor market to adapt to the green development process of society. From 2015 to 2022, the program provided approximately 1,900 green skill courses for around 60,000 employed workers, prioritizing women, workers from rural and environmentally protected areas, older workers, those with lower education levels, and workers from lagging industries. Additionally, the Biodiversity Foundation (MITECO) implemented the "Destination Green Jobs" (Destino Empleaverde) plan, which offers 200 hours of training related to green jobs for vulnerable groups (RAND Corporation, 2023).

In France, to successfully achieve carbon neutrality, the "France Relance" plan was launched in 2021, with a total investment of €100 billion from the national government and the EU. Of this, €36 billion was allocated to train the future workforce, enhancing vocational training opportunities and strategically training young people in high-growth sectors. This support aims to assist young people and vulnerable groups seeking employment and to narrow inequality gaps. For this purpose, France's Ministry of Ecological Transition and the Ministry of Labor jointly developed a toolkit to support job seekers in transitioning from vulnerable sectors to ecological and sustainable energy sectors (RAND Corporation, 2023).

The case studies of Spain and France show that based on the skill-oriented, inclusive, universal, and diverse nature of vocational education and training, it has unique value in helping

vulnerable groups obtain social rights. In the context of rapid societal transformation, focusing on vulnerable groups as the primary recipients of green skills education and training helps alleviate unemployment issues, maintain social order, and promote social equity.

## **6. Conclusion**

Addressing global climate issues and resolving energy crises to achieve sustainable societal development are common goals for all humanity. Vocational education and training (VET), being closely linked to socio-economic factors, plays a crucial strategic role in the green transformation of the entire labor market and in the sustainable development of society. To this end, the European Union has implemented multiple measures to drive the green governance transformation of VET, demonstrating the EU's commitment and vision towards achieving the United Nations' "Sustainable Development Agenda" goals. The EU's governance practices provide logical guidance and a pathway reference for the green transformation of VET in other countries, including the need to strengthen top-level national planning, actively explore and innovate in VET talent training models, and enhance the quality of education for talents needed in the development of the green economy.

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