WAGENINGEN UNIVERSITY & RESEARCH

Master Thesis Report

Enhancing Sustainability in the Food Sector: Empowering Employees with Pro-Environmental Practices

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Abstract

The food industry is currently facing enormous pressure to decrease its environmental footprint, while fulfilling the requirements of sustainability and corporate social responsibility (CSR). While ESG (Environmental, Social, and Governance) and CSR provide performance-based metrics and an ethical framework, respectively, their practical efficacy depends on employee behavior, especially on Pro-Environmental Behavior (PEB). PEB, which stands for purposeful actions that reduce environmental harm, is essential to connect the quantifiable results of ESG with the qualitative goals of CSR. In the food industry, where operational activities have a substantial environmental impact, employee-driven PEB is still understudied despite its potential significance. With an emphasis on Research and Development (R&D) departments in the Netherlands, this study examines PEB among employees in the food industry. It investigates how leadership, organizational support, and peer engagement are examples of external organizational influences that shape sustainability behavior at work, as well as internal psychological drivers (cognitive and affective factors). To measure these factors, 100 (N=100) R&D staff members from four food companies took part in a structured Qualtrics survey. The findings showed that the most significant predictors of PEB were cognitive factors (environmental concern, environmental commitment and perceived impact towards the environment), which were followed by social norms and peer engagement and organizational support. Remarkably, there was no direct influence of leadership support, sustainability awareness (awareness on sustainability training, ESG initiatives and waste management facilities), as well as affective factors (emotions of guilt and happiness) on PEB. Regarding the individual PEB actions that participants follow on their daily working routine, using reusable cups was the most adopted PEB, aligning with the EU Single-Use Plastics Directive 2019/904, while the least commonly chosen was switching off computers, where are not in use. By demonstrating how employee PEB directly supports and operationalizes ESG and sustainability goals, this study investigates a substantial knowledge gap within the food industry. Thus, it is crucial to continue developing focused training programs in ESG and sustainability in addition to improved organizational and leadership support that actively promotes and reinforces PEB in the workplace if the food industry is to become more sustainability driven.

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Abbreviations

CSR: Corporate Social Responsibility

CSRD: Corporate Sustainability Reporting Directive

ESG: Environmental, Social and Governance

GHG: Greenhouse Gas Emissions

OLS: Ordinary Least Squares

PBC: Perceived Behavioral Control

PCA: Principal Component Analysis

PEB: Pro- Environmental Behavior

POS: Perceived Organizational Support

SDT: Self Determination Theory

SET: Social Exchange Theory

SIT: Social Identity Theory

SLT: Social Learning Theory

VIF: Variance Inflation Factors

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1. Introduction

The food industry represents one of the most important industries across the world as of major significance to every country's economy (Despoudi et al., 2021). However, it is currently facing a lot of pressure to address the needs of the constantly increasing population, while keeping up with sustainability and health concerns (McDonagh et al., 2024). Current practices that are being implemented by the food industry, such as food production, processing, transportation and waste management have tremendous consequences for the global environmental footprint, such as greenhouse gas emissions (GHG), soil degradation and deforestation (Rejeb et al., 2020). It has been estimated that the emissions emerging from the food systems are approximately equal to one-third of the total global GHG, bringing a huge impact in climate change (Crippa et al., 2021). For this reason, it is necessary for the food industries to take a comprehensive view of the entire system of food production, which requires improvement to meet the responsibilities and seize opportunities for sustainability (Ross & Baldwin, 2022).

To achieve this, food companies need to prioritize CSR (Corporate Social Responsibility) initiatives, which entail community involvement, public educational support and environmental awareness (Kim & Kim, 2022). By integrating social and environmental concerns into corporate operations and relationships with stakeholders, including employees, owners and managers, food companies, can encourage ethical and sustainable corporate activities (Nagyová et al., 2016). However, CSR's qualitative nature makes it difficult to be assessed effectively, since it primarily focuses on a business's moral obligation to employ societal and environmental voluntary efforts (Grzegorz Lew et al., 2024). To address this, the growing adoption of ESG (Environmental Social Governance) reporting frameworks has emerged, which allows greater transparency in measuring and communicating sustainability initiatives of the companies (Gazzola et al., 2024). ESG incorporates the environmental dimension, which involves the company's dedication to protecting the environment and preserving natural resources, like waste management and the social dimension, which underlines how companies handle relationships with employees, supply chain partners, clients and communities while promoting social well-being. Lastly, the governance factor focuses on how well a company's governance structure complies with internal and external regulations and to what extent it is transparent and efficient (Chen, 2024).

It is important to highlight that both CSR and ESG underscore corporate sustainability, with ESG being an extension of CSR, they mainly differ in the way of assessment and approach (Grzegorz Lew, 2024). While CSR has been a philosophical and philanthropic concept of corporate responsibility (Zaupa, 2024), ESG introduces quantifiable metrics to assess a company's sustainability performance (Kaźmierczak, 2022). Important differences between them include communication (values vs. performance metrics), focus (internal vs. external stakeholders), and measurability (qualitative vs. quantitative) (TRC Companies, 2022). ESG procedures are crucial and very relevant for food industries to maintain their sustainability targets and competitiveness (Emergent Cold Latam, 2024). In line with this, the Corporate Sustainability Reporting Directive (CSRD) significantly boosts ESG practices across the European Union (Lámfalusi et al., 2024). In accordance with the EU Taxonomy, the CSRD requires large public-interest entities to report on compressive information about their ESG footprints (Peltomäki, 2024). Moreover, by establishing quantifiable ESG standards, the CSRD ensures that food companies are accountable for demonstrable sustainability outcomes, which may lead to financial benefits associated with improved ESG performance (Lámfalusi et al., 2024). It is worth noting that the recent proposal was adopted, by only imposing CSRD duties on the biggest businesses (those with more than 1,000 workers). This change focuses on reporting obligations on companies that are most likely to have major effects on the environment and society (European Commission, 2025).

Although CSR gives the ethical basis and ESG provides performance-based measuring methods, the effectiveness of both relies on employee behavior, especially on Pro-Environmental Behavior (PEB), since it represents an essential component of environmental and social responsibility within organizations (Norton et al., 2015). More specifically, PEB has been defined as a deliberate activity that can decrease an adverse environmental impact (Kollmuss & Agyeman, 2002). Furthermore, PEB is the main component of pro-ESG behavior, since ESG reports several environmental outcomes that workers, especially those who work on-site, can affect (Wagner & Boyle, 2022). In essence, any action taken by employees with the goal of improving their company's environmental performance is referred to as employees' PEB (Chawla et al., 2022). These activities include recycling, transportation, waste management, energy usage and the acquisition of eco-friendly products (Li et al., 2019). Therefore, PEB acts as the behavioral link between ESG and CSR. Although individual PEB might not seem significant, when adopted collectively, it can have a multiplicative effect and greatly advance an organization's sustainability objectives (Duarte & Mouro, 2022), since employees represent the stakeholder group most closely associated with the company (Hartmann, 2011). Therefore, individual employee actions play a critical role in achieving sustainability goals and improving a company's overall ESG performance (Grinberga-Zalite & Zvirbule, 2022). In this respect, educational sessions, like training and workshops should be provided by the food firms to raise sustainability awareness and engagement of the employees, with leaders actively supporting and showing the example (Prasanna et al., 2024). Since the food sector is so environmentally impactful, it is also responsible for minimizing its environmental influence in every way. Pro-environmental actions may seem like insignificant individual efforts, but when taken as a whole, they can have a profound impact on the food manufacturing industry. Thus, improving ESG performance and promoting environmental responsibility depends on organizations encouraging and tracking PEB (Afsar & Umrani, 2020).

Although there are current studies and reports focusing on the ESG and CSR initiatives of the food industries at the macro level, the employees' actions, such as PEB, which assist the sustainability goals of ESG, have not been previously studied as much (Wagner & Boyle, 2022). Therefore, there is a significant knowledge gap in how the PEB actions of the employees working in the food industries affect the sustainability performance of the organization, as well as the motivation and barriers influencing leadership and employees, as individuals in adopting PEB, as part of ESG strategies within the food companies. As employees directly affect operations daily, there is a need to investigate to what extent they are engaged in PEB. In this regard, the study of PEB in the food industry is significant because it addresses both the role of leadership in encouraging ESG-aligned practices within food firms as well as employee-driven sustainability initiatives led by internal phycological factors. Therefore, the aim of the current study is to bridge this critical gap by investigating the current state of PEBs among food industry employees and determining the main elements affecting their adoption, including leadership practices, motivational drivers and perceived barriers that employees believe in inhibiting their ability to act take environmentally responsible initiatives at work. Furthermore, it aims to investigate the relationship between food firms' ESG performance and PEBs at the employee level. Additionally, it seeks to create a quantifiable PEB scale for the food industry and assesses how much food businesses encourage these practices through leadership engagement, organizational support and sustainability guidelines, by providing sustainable training practices and workshops to the employees to cater and encourage PEB in the workplace. The theoretical framework for this study is described in the following section, which also looks at external and internal factors that affect employee PEB.

2. Theoretical framework

Examining PEB among employees in the food industry requires investigating the organizational and individual elements that impact sustainability behaviors. Prior studies have demonstrated that organizational environmental responsibility is influenced by institutional support, external social norms, and internal psychological factors (Steg & Vlek, 2009). All these factors will be elaborated further in the following sections, since they can also influence the PEB of the employees working in the food industry.

2.1. Internal factors influencing PEB in the workplace

2.1.1. Phycological factors

The psychology studies on PEB usually concentrate on the interaction between internal factors and behavior (Clark et al., 2003). Prior studies, which have delved into environmental behavior have focused on psychological elements such as environmental knowledge, awareness, attitudes, intention to act environmentally (cognitive factors), social and personal norms (social factors), environmental self-efficacy attitudes and personal values (affective factors) (Blok et al., 2015; Razali et al., 2023). Therefore, physiological factors influencing PEB encompass both cognitive and affective dimensions, which collectively shape employees' engagement in sustainable behaviors. At this section, the dimensions are going to be analyzed, as well as their impact on the overall sustainability performance of the food companies.

2.1.1.1. Cognitive factors

PEB among employees is greatly influenced by cognitive factors. For instance, social identity alignment, rational decision-making, environmental attitudes and perceived behavioral control. Environmental attitudes, in particular, which are characterized as a person's view of the significance towards the environment, act as a major factor in determining sustainable behavior (Graham-Rowe et al., 2015). According to Ajzen (1991), an attitude is the extent to which a person views a behavior or occurrence favorably or unfavorably. Therefore, cognitive processing allows individuals to make well-informed judgements by balancing the advantages and disadvantages (Gao et al., 2021). It has been stated that people with positive environmental attitudes are more likely to adopt sustainable practices and demonstrate PEB at the workplace (Tian et al., 2020). Additional important cognitive factors are considered values, which impact an individual’s attitudes toward the environment and how decisions are made. PEB is positively impacted by prosocial beliefs that emphasize helping others (altruistic) or protecting the environment (biospheric). On the other hand, PEB is negatively impacted by egoistic values that put one's own interests first (Tamar et al., 2020).

Another important predictor of PEB is environmental commitment, which describes a person's sense of obligation and commitment to protecting the environment. Strong environmental commitment increases the likelihood that employees will participate in PEBs in both their personal and professional lives (Alherimi et al., 2024). Environmental awareness, campaigns and knowledge about the environment also increases people's sense of power over taking part in sustainability projects (Kim & Kim, 2022). Employees who follow PEB actively participate in workplace waste reduction, sustainability initiatives, and voluntary green actions, all of which have a positive impact on waste management (Li et al., 2018). These actions are specifically aimed at resolving environmental concerns (Dada et al., 2024). Additionally, PEB is more likely to be displayed by workers who have strong environmental values and a sense of control (Gifford & Nilsson, 2014), since individuals with an internal locus of control and high self-efficacy feel that their work matters, enhances their commitment to sustainability (Fielding & Head, 2012). In particular, employees who are aware of eco-labels, certifications, and the effects of products are more comfortable making decisions that are environmentally friendly (Galván-Mendoza et al., 2022).

Apart from the environmental awareness, it has been stated that people act in ways that support the environment to satisfy their personal values, and these values can even predict their environmental actions (Wang et al., 2021). Consequently, food firms can successfully improve PEB and advance a sustainable culture by fostering environmental awareness, expertise, and dedication.

2.1.1.2. Affective and Motivational factors

According to previous studies, emotions and motivation are also influencing waste management and recycling efforts, among employees (Li et al., 2019). Therefore, it is essential to comprehend these psychological factors to effectively promote sustainable habits. According to the Self-Determination Theory (SDT), PEB is mostly determined by motivation (Ryan & Deci, 2000). The study by Ryan & Deci (2000) makes a distinction between two forms of motivation, autonomous motivation, which is motivated by individual own values and free will, and controlled motivation, which results from outside forces or internal guilt. Research shows that PEBs like recycling, water conservation, and the usage of biodegradable items are closely associated with self-determined (autonomous) motivation. This implies that people are more likely to act in an environmentally conscious manner if they truly value sustainability (Bissing-Olson et al., 2013). Furthermore, another research demonstrated that managerial support, institutional environment, and environmental ethics all have a major impact on employees' motivation for environmentally friendly conduct, since based on the SDT, employees are more likely to internalize green ideals when their firms exhibit strong environmental principles and offer supporting leadership, therefore increasing the self-motivation of employees to engage with sustainable practices (Junsheng et al., 2020).

In addition to motivation, emotions are a major factor in determining sustainable workplace practices. While negative emotions like anger and worry might operate as obstacles to sustainable behaviors, positive emotions like pride, hope, and empathy have been demonstrated to increase involvement in PEBs (Rafaeli & Worline, 2001). Results from previous research showed that there is a strongly positive correlation between PEB among employees and pride and guilt, since employees are motivated to implement environmentally friendly behaviors at work by anticipated guilt. On the other hand, PEB is also strongly predicted by expected pride, the good emotion associated with possible pro-environmental acts (Kanojia & Dhiman, 2025). Therefore, food businesses that will cultivate pleasant emotional experiences might increase employees' commitment to sustainability activities, as emotions and organizational functioning are interconnected (Chigeda et al., 2022).

Furthermore, according to behavioral spillover, taking one sustainable activity raises the probability of taking further ecologically friendly actions (Wang et al., 2021). This effect is amplified by positive emotional experiences and intrinsic motivation, resulting in a loop of pro-environmental acts that reinforce one another as previously stated by Junsheng et al. (2020). Therefore, comprehending the interplay between motivation, emotions and organization impact is crucial for developing effective interventions that not only will assist food firms to enhance their ESG score, but also will support long-term sustainability behaviors.

2.1.2. Generic factors influencing PEB (Age, Gender, Education)

Apart from the phycological factors, demographic variables such as gender and age can affect environmental attitudes and PEBs (Pellegrini & Tagliabue, 2024). Gender disparities in environmental attitudes have been investigated in previous studies, in which it was discovered that respondent's views on environmental preservation varied by gender, with women having a more positive environmental attitude in comparison to the males' participants (Tien & Huang, 2023). Another research has stated that when both men and women were asked about PEBs, like energy conservation, recycling, water conservation and transportation use, women reported more PEB actions (Duchene Chantal, 2011; Schahn & Holzer, 1990; Stern, 2000). However, there is not enough evidence on how PEB differs among genders in workplace environments and specifically within the food industry. Apart from gender differences in PEB demonstration, age and education seem also to play a role. In relation to education, it was found that Bachelor's degree holders, both men and women, were more inclined to act in ways that supported the environment than those who had only completed senior high school, since education also makes people more concerned about social welfare, which leads them to act in ways that are more ecologically friendly (Vicente-Molina et al., 2018).

Age-related generational variances also affect employment standards and environmental attitudes. These groupings are made up of the following generations: Baby Boomers (born 1946–1964), Generation X (born 1965–1980), Millennials (born 1981–1996) and Generation Z (born 1997–2012) (Chaney et al., 2017). According to prior studies, younger generations, Generation Z in particular, are giving environmental issues top priority, since they see them as critical societal challenges. Furthermore, Generation Z is known for having a very favorable opinion of businesses' CSR initiatives and is being more sensitive towards the social performance of the business in comparison to the older generations (Liuís Mas-Manchón et al. 2024). Compared to older adults, younger people are more concerned about the environment but recycle and conserve less (Wiernik et al., 2013). Stronger conservation practices and a closer bond with nature are demonstrated by older individuals who follow social norms. Therefore, younger individuals look for fresh information, whereas older people rely on habits and experience, even if environmental knowledge is similar across age groups (Wiernik et al., 2013).

Regarding CSR in the workplace, Millennials exhibit different work beliefs than Generation X. In particular, Millennials place a high value on internal and external CSR, which affects their hiring choices and job happiness (Rank & Contreras, 2021). Moreover, it has been estimated that approximately 69% of Millennials would turn down job offers from organizations they believe to be socially irresponsible, while 79% of them prefer to work for companies that are devoted to CSR (McGlone et al., 2011). Despite their environmental awareness of younger generations, it is worth mentioning that CSR is more important to older generations than to younger workers, since Generation Z employees are less involved in CSR activities (Titko et al., 2021). This is because older employees have established workplace customs and are more proactive with sustainability, ethical business, as well as community practices within their ingrained value and long-term organizational culture. On the contrary, Millennials and Generation Z are supportive of CSR but need some form of organized participation and extra incentive to engage in the company's workplace activities (Titko et al., 2021). Therefore, CSR engagement as well as the PEB actions followed within the workplace, among different age groups, and especially withing the food industry requires further investigation.

2.2. External factors influencing PEB in the workplace

2.2.1. Organizational Support and Working Climate

Organizational support refers to the degree to which an organization values employees' contributions and is concerned about their well-being (Eisenberger et al., 1986). It relies on the belief that employees view the organization or company as a social institution that values their welfare, acknowledges their efforts, and rewards them. It has also been linked with positive employee outcomes, based on previous studies, including improved job performance, stronger organizational commitment and higher ethical behavior (Zhang et al., 2024). Consequently, employees' PEBs are greatly influenced by organizational support, which supports both sustainability efforts and cultural support. This can be demonstrated by previous studies, which have shown that sustainability initiatives can improve employee's productivity by approximately 2% and represent a key factor for employees when choosing a company to work for (Baldwin, 2015). Strong organizational-level support, such as CSR activities, job-level support, autonomy in pro-environmental decision-making and involvement in sustainability programs, increase the likelihood that employees will take extra-role pro-environmental actions (Albrecht et al., 2021), which are actions that extend beyond a worker's official job duties and support the efficiency of the company (Cropanzano & Mitchell, 2005).

By encouraging a feeling of purpose and belonging, Perceived Organizational Support (POS), further improves worker involvement in sustainability (Shafait & Huang, 2023). Employees with high POS believe they have a moral duty to support company sustainability initiatives in return (Shafait & Huang, 2023). This is because employees internalize CSR values when their personal values coincide with the environmental goals of the company, according to Social Identity Theory (SIT), which encourages voluntary participation in green workplace practices (Lee et al., 2023). On the contrary, misalignment can result in opposition to environmentally friendly initiatives, which can lower sustainability efforts' compliance and ESG performance, especially in the food production sector (Gomes et al., 2023; Liu et al., 2022; Montuori et al., 2022). Therefore, employees who share the company's environmental ideals are more dedicated to sustainability projects in organizations with a strong green culture (Cheng et al., 2022).

Therefore, establishing a pro-environmental work climate is the foundation of workplace sustainability, since work climate reflects an organization's practices, procedures and policies that shape employee's behavior by communicating environmental priorities (Hicklenton et al., 2019). Empirical research suggests that a well-established green workplace environment enhances employee commitment to sustainability goals and encourages environmental behavior (Norton et al., 2017; Sabokro et al., 2021). Hence, the optimal workplace would encourage PEBs by providing employees with autonomy over their environmental behaviors, such as controlling their energy consumption or actively participating in recycling programs. This autonomy allows employees to internalize sustainability values, which improves employees' long-term PEB (Hicklenton et al., 2019). Additionally, by giving staff members the information and inspiration they need to embrace eco-friendly practices, through environmental management strategies, like green training programs can improve volunteer PEBs even more (Amrutha & Geetha, 2021). This is particularly important for the food industry, where PEB implementation provides industries with a competitive advantage (Sandberg et al., 2023). Thus, food companies that are focused on sustainability through CSR initiatives, green training initiatives and good environmental policies not only raise employee satisfaction and regulatory compliance but also advance their companies.

2.2.2. Leadership support

Leadership is a vital driver of PEB, since it forms organizational culture, sets expectations and promotes sustainability support. Moreover, it influences employee engagement in environmental actions via organizational communication, role modeling and sustainability attributions (Aryati, 2025). Sustainability is also managed through supervisors who introduce general support that values worker's contribution, as well as specific support, which encourages sustainable activity (Costa et al., 2022). Workers will be more inclined to adopt PEBs if their managers are heavily engaged in sustainability initiatives, reinforcing perceived behavioral control and environmental commitment (Priyankara et al., 2018). However, supervisor support can act as a conditional factor, moderating how employees perceive and respond to an environmental organizational context. More specifically, high levels of support from the supervisor/manager have been found to decrease, in some cases, the direct impact of a green climate on employee attitudes, because employees are likely to refer to direct leadership messages and not to organizational norms. However, managers who convey effectively sustainability goals and support them with actions can affect social norms, enable participation and encourage collective green behavior (Paillé & Francoeur, 2022). Effective supervisor interventions include advising, integrating green policies into daily work and recognizing employee participation in sustainability (Costa et al., 2022).

Among leadership styles, transformational leadership is particularly effective in shaping PEB through four dimensions: idealized influence, inspirational motivation, intellectual stimulation and individualized consideration. Leaders who embody sustainability values and inspire employees by a vision of environmental responsibility, enhance employee green participation (Tosun et al., 2022). In PEB, if the leader expects and encourages employees to act in environmentally supportive ways, employees tend to align their actions with sustainability goals (Farrukh et al., 2025). These leadership impacts are in line with Social Learning Theory (SLT) and Social Exchange Theory (SET). SLT assumes that employee's model sustainable behaviors of leaders to reinforce environmental responsibility culture (Bandura, 1978). Therefore, if leaders embrace sustainability in corporate strategy and practice green activities, employees are more likely to form a sustainable culture (Tu et al., 2023). Furthermore, encouraging bottom-up participation by empowering employees to contribute to sustainability initiatives fosters a sense of ownership and long-term engagement (Gotsch et al., 2023), which can improve the overall environmental impact of the companies

2.2.3. Social norms and peer engagement

Social norms significantly influence workplace PEB, through descriptive norms that guide behavior by showing what colleagues commonly do, such as recycling or conserving energy (Saracevic & Schlegelmilch, 2021). According to the Focus Theory of Normative Conduct, it has been stated that employees would be more likely to adopt PEB if they feel that their fellow co-workers are environmentally conscious (Leitão et al., 2024). Previous studies have confirmed this, by stating that employees tend to offer their time for undertaking PEB voluntarily, when they feel strong peer-driven sustainability measures (Leitão et al., 2024). Additionally, pro-environmentally supportive colleagues represent a significant work resource, with both a positive effect on task related as well as proactive, environmentally responsible behaviors, often more than job autonomy or job demands (Albrecht et al., 2023; Katz et al., 2022). Hence, supportive colleagues make employees more likely to engage in sustainability activities, according to social contagion effects in organizational environmental engagement (Fahira & Suyono, 2024). However, further study is required to determine how peer support interacts with PEB adoption and how it promotes sustainability among employees within the food industry.

Figure 1 summarizes both internal and external factors influencing PEB among employees in the workplace.

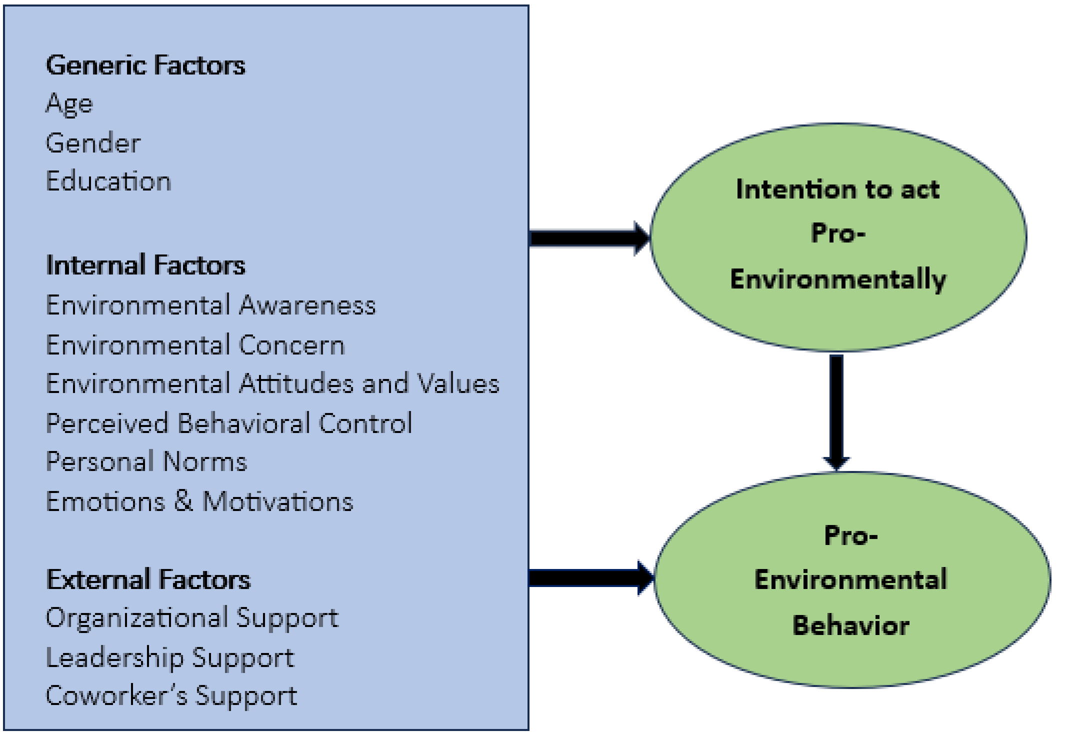

Figure 1 Pro-environmental factors influencing PEB of employees at the workplace

Problem Statement and Research Aim

While the food sector is more under scrutiny than ever before to reduce its environmental footprint and embrace sustainability ambitions, most previous studies are focused on macro-level ESG strategies and do not consider employee's individual's efforts. Moreover, current literature mainly addresses PEB in household contexts or other business domains, with minimal consideration of its application in the food industry, where it has a massive environmental impact. This signifies an enormous knowledge gap as to how internal drivers (environmental concerns, awareness, attitudes and motivation) as well as external drivers (leadership and organizational support and working climate) affect employees' adoption of PEB within the food industry. Additionally, most of the current research has concentrated on industries like hospitality and other service-oriented businesses (Chawla et al., 2022), overlooking the role that workplace education and management practices play in encouraging environmentally friendly behavior in high-emission sectors like the food industry. The adoption of educational training programs pertaining to sustainability has been suggested by earlier research (Prasanna et al., 2024) but these suggestions have rarely been appropriately adapted to the circumstances and difficulties faced by the food business. Thus, the practical use of sustainability awareness regarding the presence of sustainability training or workshops, organizational and leadership support in promoting PEB within the food industry stays underexplored. To address this knowledge gap is necessary to examine the situation of employee-driven PEB in the food sector today, pinpoint the main internal and external elements influencing its uptake, and provide a measurable scale to gauge PEB in the workplace. The study also aims to evaluate how food firms encourage these behaviors through internal policies and sustainability programs, as well as how employee participation enhances the oorganization's sustainable performance in relation to ESG practices.

Research questions

1) What are the most adopted pro-environmental actions among employees in the food industry?
2) To what extent do internal phycological factors, such as cognitive and affective factors, motivate employees within the food industries to adopt environmentally friendly practices in their workplace?
3) a) To what extent do food companies encourage the adoption of PEB among employees, through organizational level?

   b) To what extent does leadership behavior influence and encourage the employees' adoption of PEB?

4)To what extent does employee awareness of ESG goals, policies and sustainability initiatives influence their engagement in PEBs within the food industry?

3. Research Methods

3.1. Procedure and Participants

The data were collected from employees in the food industry within the Netherlands, particularly those working in the Research and Development (R&D) department, ranging from different generations, genders and educational degrees. R&D staff were chosen as the target group of this study, since they are engaged in product, process, and technology development, which has a great impact on sustainability decisions. Moreover, they are directly involved in sustainable product development, packaging, sourcing of ingredients, processing and innovation, which make a direct impact on the company's environmental footprint. Therefore, R&D staff represent a key factor for the integration of sustainability into the core business activities. For that reason, it is important to examine the PEB activities of this department following daily. Four food companies, from medium to large sized food industries were contacted since their environmental impact, in such organizations is greater than smaller enterprises, such as startups.

The participants were contacted through an internal contact who distributed a standardized anonymous Qualtrics questionnaire to their colleagues within the organization as well as via invitation email. After excluding 12 incomplete questionnaires, a total of 100 participants (N=100) filled out the survey. Most respondents, 53%, were aged between 18 and 29 (Gen Z), 33% were 30 to 44 (Millennials), 12% were 45 to 60 (Gen X), and 2% were beyond 60 (Baby boomers). In terms of gender, 56% of respondents identified as Female and 44% as Male, demonstrating, equal gender distribution in the sample. In terms of educational background, most participants (59%), hold a master's degree, followed by a bachelor's degree (25%), a PhD or higher (14%), and a high school diploma (2%).

3.2 Questionnaire

A Qualtrics questionnaire was developed to assess demographic data (gender, age), educational background, as well as employees' internal and external PEB determinants taking place within the food industry. The questionnaire can be found in Appendix A. Participants were asked to report on their daily PEB actions, their alignment with their firm's sustainability goals and the influence of organizational and leadership determinants on their environmental actions and attitudes. The questionnaire was grounded in environmental psychology theory that has been formulated, such as cognitive and affective dimensions to investigate how individual and organizational factors affect sustainability involvement, and it was based on previous studies investigating PEB, (Blok et al., 2015; Wesselink et al., 2017). The survey was conducted in five sections. At Section 1 demographic information (age, gender, education) to enable segmentation and identification of potential behavioral trends. The second section assessed internal motivational and normative drivers, including environmental concern, affective responses, moral obligation, commitment to sustainability and perceived behavior control These questions were rated on 5-point Likert scales (1 = Strongly Disagree, 5 = Strongly Agree). The third section measured how often employees engaged in PEB workplace behaviors, such as energy conservation, recycling, waste reduction, and sustainable commuting, which were assessed again with 1-5 Likert-type items, including a "Not Applicable" option for inclusiveness. The fourth section measured how participants perceived organizational and leadership support, with particular attention to managerial encouragement and role modeling of managers in sustainable practices. The last section (Section 5, Appendix A) assessed employees' awareness of company policy, ESG goals and initiatives, sustainability training, and accessibility in waste management facilities. The questions were assessed again with a 5-point Likert scale but with the only difference that 1 and 5 represented the following: 1=Not at all aware, 5= Fully aware). Table 1 further explains the concept and variables tested for the questionnaire.

Table 1 Variables tested to analyze the current state of PEB among R&D employees within the food industries *(Blok et al., 2015; Wesselink et al., 2017)*

Concept	***Survey question (variable)***	***Response categories***
Generic Factors (Age, Gender, Education)	• What is your age?	18-29 30-44 45-60 Above 60
	• What is your gender?	Male Female Nonbinary/third gender
	• What is your highest level of education?	High school diploma Bachelor's degree Master's degree PhD or higher
Cognitive Factors (Environmental concern, Environmental commitment, Perceived environmental impact)	• I worry about environmental problems • I feel personally committed to reducing my environmental footprint at work • I believe that my pro-environmental actions at work have an impact on the overall sustainability performance of my company	To what extent do you agree or disagree with the following statements: 1 = Strongly disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly agree
Affective Factors (Emotions of anticipated guilt and happiness)	• I feel happy when I perform environmentally friendly actions • I would feel guilty about not supporting the environmental efforts of my company	To what extent do you agree with the following statements: 1 = Strongly disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly agree
PEB Actions	• I use water/energy/ equipment only when needed. • I recycle paper and other materials that can be re-used • I turn off my computer/laptop when not in use. • I switch off lights when the office/lab is not in use • I use reusable cups instead of disposable ones • I opt for video calls instead of traveling for business meetings when possible.	Which of the following pro-environmental actions do you do at work? 1 = Strongly disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly agree NA= Not Applicable

	• I choose to travel to work by public transport, when possible	
Social Norms & Peer Engagement	• I discuss environmental issues with colleagues • I try to motivate my colleagues to adopt environmentally friendly actions at work	Which of the following pro-environmental actions do you do at work? 1 = Strongly disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly agree NA= Not Applicable
Organizational Support (Organizational enablement, encouragement and commitment)	• My company demonstrates a strong commitment to pro-environmental behavior and sustainability • My company encourages its workers to engage in environmentally friendly practices • My company allows me to adopt pro-environmental behaviors in my daily work routine	To what extent do you agree or disagree with the following statements? 1 = Strongly disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly agree
Leadership Support	• Leadership at my workplace actively supports and participates in sustainability efforts • My manager/boss keeps me informed about sustainability matters and the company's ESG goals • Seeing my boss/manager engaging in sustainable practices motivates me to do the same	To what extent do you agree or disagree with the following statements? 1 = Strongly disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly agree
Sustainability Integration, ESG goals awareness and Resource Support (Sustainability awareness)	• The sustainability policies, initiatives, and ESG goals of my company • Training, workshops, or team discussions are available for sustainability improvement • The recycling and waste management facilities at my workplace are sufficient and accessible	To what extent are you aware of the following? 1 = Not at all aware 2=Slightly aware 3= Somewhat Aware 4= Very aware 5 = Fully aware

3.3. Data analysis

The data analysis part was conducted on Google Collab, which can be used without any setup and run entirely on the cloud and executable in Python programming language. Extensive coding was conducted for the data preprocessing, cleaning and analysis. The libraries imported were Pandas, Seaborn, NumPy, Matplotlib and Factor analyzer. NumPy was used for scientific computing, Pandas for data exploration, Seaborn for statistical visualizations, as well as the Matplotlib. Factor analyzer was used for the PCA (Principal Component Analysis) analysis.

To preserve accurate replies for important demographic factors like age, gender, and education, the data set, which came from the shared questionnaires via Qualtrics, was first cleaned and filtered. The central tendencies of several behavioral and psychological dimensions, including leadership, PEB actions, social norms, cognitive and affective factors, organizational support, and sustainability awareness, were summarized using descriptive statistics, such as means and standard deviations, that were calculated at the item and construct levels. To show how frequently respondents took PEB actions, visualizations were made. Cronbach's alpha was used to examine each construct's reliability, and most of them met acceptable internal consistency levels. Moreover, normality was assessed to verify that the data distributions were approximately normal and not significantly skewed or kurtotic. This step is essential, as many inferential statistical techniques assume normally distributed data. Specifically, the Shapiro-Wilk test was applied to each construct to evaluate the null hypothesis that the data were normally distributed. Additionally, skewness and kurtosis values were reviewed, with acceptable values falling within the range of ±2, as per conventional thresholds. Most constructs met the criteria for normality, indicating that the data were suitable for parametric analyses.

KMO (KMO>0.5) and Bartlett's tests for factorability and sample adequacy were used to support the Principal Component Analysis (PCA) with Varimax rotation used to evaluate the dimensionality of the constructs. Composite scores were computed for additional analysis, and constructs with eigenvalues larger than one were kept (Eigenvalue>1). ANOVA and Tukey's HSD were used to compare groups and find significant differences between construct categories. Relationships between constructs and demographics were investigated using correlation analysis (Heatmap correlation matrix). Lastly, the impact of internal and external factors on PEB was evaluated using OLS (Ordinary Least Squares) linear regression models. Variance Inflation Factors (VIF) were used to assess multicollinearity, guaranteeing the robustness of the regression results.

4.1. Results

Descriptive statistics

Table 2 Means, Standard Deviations and Cronbach's alpha scores for each construct variable tested that relate to employees PEB

Constructs	*Mean*	*Standard Deviation (SD)*	*Cronbach's Alpha*
Cognitive Factors	3.74	0.82	0.76
Affective Factors	3.92	0.85	0.69
PEB actions	4.02	0.73	0.71
Energy usage	4.26	0.97	
Recycling	4.15	1.02	
Laptop usage (Switching off laptop when not in use)	3.42	1.31	
Light usage	4.13	1.41	
Use of reusable cups	4.40	1.05	
Video calls instead of travelling	3.88	1.31	
Transportation to and from the workplace by bike/public transport	3.92	1.37	
Social Norms & Peer Engagement	2.98	1.14	0.82
Organizational Support	3.58	0.88	0.84
Leadership Support	3.07	0.97	0.80
Sustainability Awareness	3.27	0.88	0.63
**Age*	1.63	0.77	
**Gender*	1.56	0.50	
**Education*	2.89	0.62	

*They have been transformed into numerical values

Firstly, the data were examined at the construct level, to acquire general outputs on participant's environmental attitudes and behaviors. The means and standard deviations (SD) were obtained for every different construct investigated, as well as Cronbach's alpha to ensure reliability among constructs. The construct's descriptives are depicted in Table 2. PEB actions as a construct, were rated by the R&D employees with an average score of 4.02 (SD = 0.73), measured on a scale from 1 to 5. The different PEB daily actions that the respondents follow, scored differently though. The means and SD are also illustrated at Figure 1, Appendix B, from the least frequent to the most frequently chosen PEB action by the participants.

From Table 2, it can be concluded that the PEB action with the highest mean score, 4.40 (SD=1.05) was the action related to the use of reusable cups instead of disposable ones. The second most frequently adopted PEB action was the use of energy/water, with a mean score of 4.26 (SD=0.97). The third was recycling, with a mean equal to 4.15 (SD=1.02), followed by light usage with a mean score of 4.13 (SD=1.41). After that the choice of travelling by bike and or by public transport to and from the workplace, with an average of 3.92 (SD=1.37). Lastly, the choice of video calls for business meetings, with a mean of 3.88 (SD=1.31) and switching off the laptop when it is not being used, having the lowest mean score of 3.42 (SD=1.31). Cronbach's alpha regarding the PEB actions, as a construct was found to be equal to 0.71.

Regarding the Cognitive factors as construct, in which the Environmental concern, Environmental commitment and Perceived environmental impact were entailed, Cronbach's alpha showed good reliability, equal to 0.76. The mean score of the Cognitive factor was also relatively high, equal to 3.74 (SD=0.82), on a 1-5 scale, showing that the participants of this study are environmentally concerned, committed and they are paying attention to their environmental impact on the overall sustainability performance of their company. Similarly, Affective factors, which included the emotions of happiness and guilt when performing environmentally friendly actions, scored relatively high, with an average score of 3.92 (SD=0.85). This indicates that the participants in this study did feel emotionally happy when they performed environmentally friendly actions and guilty when they failed to do so. However, Cronbach's alpha for this construct showed moderate reliability (0.69), probably due to a lower number of items.

With respect to Social norms & Peer engagement, the reliability of Cronbach's alpha was even higher (0.82). This construct reported a mean somewhat below the midpoint (1-5 scale), equal to 2.98 (SD=1.14), showing the lowest score. For Organizational and Leadership support, mean scores of 3.58 (SD=0.88) and 3.07 (SD=0.97) respectively, with good reliability scores (Cronbach's alpha 0.84 and 0.80). Lastly Sustainability awareness, which includes awareness regarding the sustainability policies of the companies and ESG integration, that the respondents work for, sustainability training and waste management facilities, had an average score of 3.27 (SD=0.88). Overall, most variables showed good reliability, apart from the constructs of affective factors (Cronbach's alpha: 0.69) and sustainability awareness (Cronbach's alpha: 0.63).

After conducting Shapiro-Wilk test for normality (Normal Distribution), ANOVA test was also performed and showed that the means of the different construct variables were statistically significant (p value=0.0, F-statistic=20.68). To identify the statistically significant differences between the mean scores among the different constructs a post-hoc HSD Tukey test was conducted. The results are depicted in Table 1, Appendix B. Several significant differences between the constructs were found by the Tukey HSD post-hoc test. Compared to Leadership Support (mean difference = -0.84, $p < 0.001$), Social Norms Peer Engagement (-0.93, $p < 0.001$), and Sustainability Awareness (-0.65, $p < 0.001$), Affective Factors' mean score was considerably greater. Additionally, Cognitive Factors outperformed Social Norms Peer Engagement (-0.61, $p < 0.001$) and Leadership Support (-0.52, $p = 0.0012$). PEB Actions (+0.82, $p < 0.001$) and Organizational Support (+0.51, $p = 0.0017$) were substantially higher than Leadership Support. Social norms and peer influence and leadership involvement were perceived as being weaker by Social Norms Peer involvement, which scored lower than PEB Actions (-0.91, $p < 0.001$) and Organizational Support (-0.60, $p < 0.001$).

Table 3 Means, Standard Deviations for each item variable tested that relate to employees PEB

Construct	*Variable name*	*Mean*	*Standard Deviation*
Cognitive Factors	Environmental Concern	4.04	0.91
	Environmental Commitment	3.69	0.94
	Perceived Impact	3.50	1.11
Affective Factors	Emotion Happiness	4.18	0.89
	Emotion Guilt	3.65	1.05
Social Norms & Peer Engagement	Talk with Colleagues	3.03	1.23
	Motivate Colleagues	2.94	1.25
Organizational Support	Organization Commitment	3.60	0.99
	Organizational Encouragement	3.47	1.04
	Organizational Enablement	3.68	0.99
Leadership Support	Leadership supports Sustainability	3.18	1.08
	Leadership communicates ESG	2.80	1.19
	Leads by Example	3.24	1.19
Sustainability Awareness	Sustainability Policies Awareness (ESG Integration)	3.28	1.15
	Sustainability Training	2.87	1.19
	Facilities (Resource Management)	3.66	1.14

To further analyze these findings, item-level descriptive analysis was conducted and can be found in Table 3. From Table 3, it can be concluded that this study group showed strong environmental attitudes and emotions, with the highest mean score observed on environmental concern (M= 4.04, SD=0.91), among all the construct items of Cognitive factors (Environmental concern, Environmental commitment and Perceived impact). Regarding the variable items related to the Affective factors, regarding the sense of happiness, while performing environmentally sustainable actions, R&D participants scored higher, with a mean score of 4.18 (SD=0.89) than the sense of guilt when they fail to do so (M=3.65, SD=1.05).

In respect to the items incorporated in the Social Norms and Peer Engagement construct received relatively low scores, indicating that peer influence on environmental behavior was restricted. Discussing environmental issues with colleagues had a mean score of 3.03 (SD = 1.23), while motivating colleagues towards adopting environmentally friendly initiatives had an even lower mean score of 2.94 (SD = 1.25). When it comes to the items incorporated within the Organization support construct, the results showed that the highest score was regarding organization enablement (M= 3.68, SD=0.99). This indicates that respondents believed that their firm facilitated and allowed pro-environmental efforts. The lowest was observed on "Organizational encouragement" (M= 3.47, SD=1.04). Regarding Leadership support construct variables, moderate scores were observed with the highest mean in "Leaders led by example" (M=3.24, SD=1.19). On the contrary, the item "Leaders communicates ESG values" had the lowest score (M = 2.80, SD = 1.19), indicating a gap in communication about sustainability goals. This finding highlights opportunities for improvement in leader's communication with the employees on ESG commitments.

Lastly, the respondents' awareness of sustainability within the firm varied across multiple aspects (1: Not at all aware, 5: Fully aware). "Facilities (resource management)" earned the highest score (M = 3.66, SD = 1.14), indicating that employees believe the waste management facilities and resources supporting sustainability are strongly present within their company. "Sustainability policy awareness (ESG integration)" had a moderate score (M = 3.28, SD = 1.15), indicating a general but not great acquaintance with formal policies. In contrast, "Sustainability training" was rated the lowest (M = 2.87, SD = 1.19), indicating a potential shortfall in capacity-building activities. Overall, while resource availability is highly regarded, training, policy communication and ESG integration may require improvement.

The distribution of answers to distinct Likert-scale items assessing different Linkert scale item is depicted in Figure 2, Appendix B. The distribution of answers across several Likert scale items is shown in this 100% stacked bar chart, where percentages represent the degree of agreement with each statement. Every item is divided into five categories (Scale 1 to Scale 5, from Strongly disagree by Scale 5, Strongly Agree). By showing which behaviors and perceptions are more commonly endorsed, visualization makes it possible to clearly understand response trends across items.

Correlation analysis among different constructs

Correlation analysis was also performed. In Figure 2 the correlation matrix between different variable constructs is depicted. The correlations coefficients are considered significant from 0.80 and above (r>0.80). All inter-construct correlations are below 0.80, according to the correlation matrix with the strongest relationship between cognitive and affective factors being 0.74. This suggests that the model exhibits acceptable discriminant validity, and that multicollinearity is not an issue to this study.

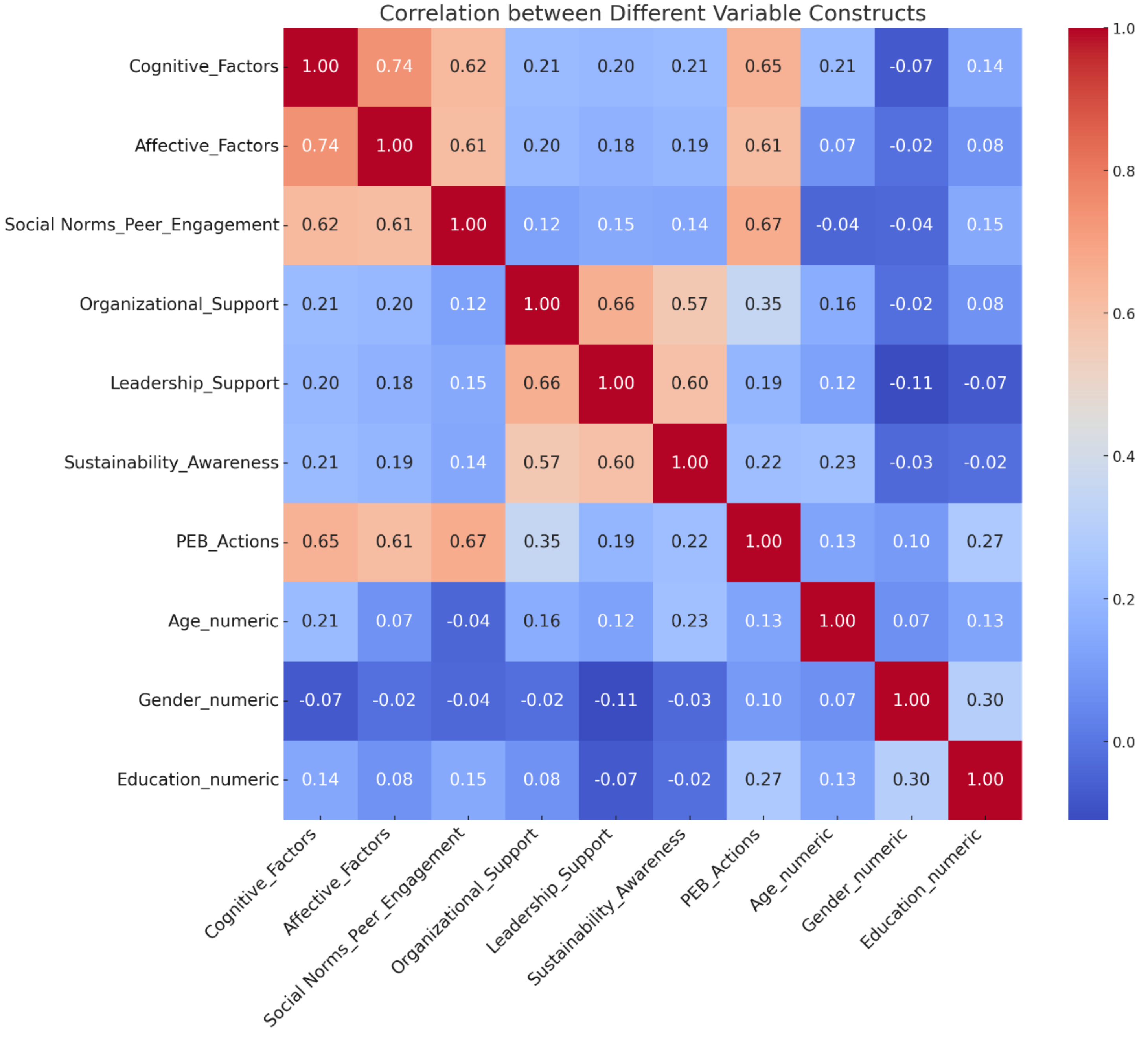

Figure 2 Heatmap correlation matrix between different variable constructs tested that influence PEB

Regression analysis (OLS)

To test the extent to which each construct affects actions among R&D employees in the workplace, OLS regression was applied. This analysis helps in calculating coefficients and understanding the relationship between each construct that can have a potential effect on PEB actions. In other words, it can show the extent to which each variable construct affected PEB among the respondents. The results are depicted in Table 4.

Table 4 Results from the OLS regression analysis each variable tested that affected employees PEB activities

Constructs	*β Coefficient*	*Standard Error (SE)*	*p-value*
Cognitive Factors	0.32	0.104	*0.002
Affective Factors	0.047	0.089	0.597
Social Norms & Peer Engagement	0.22	0.056	**0.00
Organizational Support	0.23	0.072	*0.002
Leadership Support	-0.07	0.067	0.262
Sustainability Awareness	-0.01	0.069	0.869
Age	0.38	0.063	0.553
Gender	0.14	0.096	0.147
Education	0.08	0.079	0.292
R^2	0.648		
F-statistics	18.04		

N=100, **p<0.001, *p<0.05

From Table 4, it can be concluded that the overall model is statistically significant (F-statistic=18.04) and explains a significant amount of variance,64.8% (R^2= 0.648). Cognitive Factors, as concern for the environment, commitment, and perceived personal impact, showed the strongest statistically significant impact on PEB (β = 0.32, p = 0.002). This indicates that employees who care about environmental issues tend to act more sustainably if they think their actions make a difference. Social norms and Peer Engagement also had a significant and positive influence on PEB (β = 0.22, p < 0.001).

Employees participating in sustainability dialogues or trying to motivate their colleagues are more inclined towards adopting PEB. Organizational Support emerged as another important predictor (β = 0.230, p = 0.002). It shows that employees are likely to sustain their behavior if it is supported by the organization, such as having policies, organizational infrastructure, and incentives that encourage sustainability. Meanwhile, Affective Factors, such as anticipated pride and guilt were not a significant predictor of PEB in this model (β = 0.047, p = 0.597).

Additionally, Leadership Support (β = -0.076, p = 0.262) and Sustainability Awareness (β = -0.011, p = 0.869) were not statistically significant. This indicates that, at least within this sample, environmentally responsible behavior is not directly affected by the exemplary behavior demonstrated by the leaders. Though there was some sustainability awareness among participants, including knowledge of corporate ESG objectives, environmental training programs, and current sustainability policies, this did not significantly affect their PEB actions. This demonstrates that changing behavior requires more than just understanding of sustainability. The organizational culture, individual motivation, perceived autonomy, and active leadership support are more crucial in converting awareness into action. The results indicate that to successfully encourage employees to adopt sustainable practices, food companies need to create a green culture that is empowered, participatory, and well-supported, going beyond simple communication and policy disclosure.

Moreover, the p values of most of the constructs are far below 0.05. It is also worth noting that none of the construct's variables showed high collinearity, according to the VIF (Variance Inflation Factors**)** calculations that can be found in Table 5. All variables have VIF values below 5, indicating that multicollinearity, which is the occurrence of high intercorrelations among two or more independent variables in a multiple regression model, is not a concern in the model for this study. with Cognitive Factors showing the highest VIF at 3.57, which remains within the acceptable range, meaning below the threshold of 5.

Table 5 Variance Inflation Factors (VIF) for all the variable constructs affecting PEB

Constructs	*VIF*
Cognitive Factors	3.57
Affective Factors	2.85
Social Norms & Peer Engagement	2.01
Organizational Support	1.98
Leadership Support	2.13
Sustainability Awareness	1.79
Age	1.17
Gender	1.13
Education	1.22

4.2. Discussion

The findings of this research showed that among various PEB actions reported by R&D employees, the most frequent was the use of reusable cups. This finding shows not only individual sustainability choices, but also regulation compliance to single use plastic product bans in the food companies, that prohibit domestic plastic items, according to the EU Single-Use Plastics Directive 2019/904 (Publications Office of the European Union, 2021). Additionally, it indicates how external policies and institutional systems can support internal CSR, ESG practices and illustrates how PEB can act as a bridge between CSR's moral outputs and ESG measurable results. This highlights how internal CSR initiatives and external regulations work together to shape employee PEB (Afsar & Umrani, 2020; Grzegorz Lew et al., 2024). While the least commonly adopted PEB action among R&D employees was on "Switching off laptop when not in use". This is probably because they did not perceive it as convenient and environmentally impactful PEB action. Furthermore, prior research has demonstrated that employee PEBs can reduce GHG emissions by approximately 5% to 15%, especially when backed by feedback systems and organizational culture (Berger & Wyss, 2021; Lo et al., 2012; Ones & Dilchert, 2012; Stern, 2000b; United Nations Environment Program, 2019). These results imply that, when widely implemented, even seemingly insignificant actions can have a substantial impact on reducing emissions. Figure 3, Appendix B, shows the approximate percentage values of GHG reductions linked to various PEBs.

Another key area of interest in this research was to explore the extent to which internal drivers, like cognitive and affective factors, influence PEB among R&D staff members in food companies. The results showed that cognitive factors, which include environmental concerns, environmental commitments and perceived environmental impact, emerged as the strongest factors in predicting and adopting PEB among employees. This aligns well with previous literature stating that enhanced environmental commitment increases the likelihood that employees will participate in PEBs in their professional lives (Alherimi et al., 2024).Furthermore, staff members who acknowledge the environmental contribution of their behaviors, are more likely to embrace sustainable habits (Graham-Rowe et al., 2015; Gao et al., 2021; Tian et al., 2020). On the contrary, affective factors, anticipated guilt and sense of happiness were statistically insignificant predictors of PEB actions in this study. However, previous research suggests that there is a significant positive association between PEB and a sense of happiness, underling that the more individuals practice these sustainable behaviors, the greater their emotions of pleasure are (Corral-Verdugo et al., 2011). A potential explanation for this disparity might be that without cognitive engagement or structural support, emotions might not be enough to motivate behavioral change. Additionally, emotional motivations may be undervalued in professional settings, especially in the food industry where operational efficiency is prioritized. Emotions are still important, though, as Chigeda et al. (2022) underlines that fostering positive emotional experiences may greatly increase employee's commitment to sustainability, since organizational functioning and emotional experiences are interconnected. Therefore, these results highlight how crucial it is to give knowledge-based interventions, value alignment, and employee empowerment as top priority and not entirely based on emotions.

In terms of social norms and peer engagement construct, the results showed low average scores. Although, the results showed a significant and positive effect on PEB adoption. This shows that employees taking part in sustainability discussions and/or trying to motivate their colleagues are more likely towards adopting PEB. This finding aligns with previous literature, suggesting that peer-driven sustainability not only supports PEB but also can foster sustainability within the food companies, through social contagion (Albrecht et al., 2023; Fadhira & Suyono, 2024; Katz et al., 2022) (Albrecht et al., 2023; Katz et al., 2022). The relatively low scores indicate that a robust-peer driven culture is not yet established within the food firms that participated in this study. A possible explanation might be the food industry's high workload and operational demands, especially in R&D, where keeping up with the latest trends and demands is crucial, which may restrict time and effort for peer discussions on sustainability. Food companies should consciously make room for peer-led sustainability initiatives, though, to address the low levels of peer engagement despite its proven beneficial impact on PEB adoption.

Among the external variables influencing PEB, organizational support is featured in this research as a significant variable in the prediction and adoption of PEB among R&D staff in the food sector. In particular, the findings suggest that employees are likely to maintain environmentally friendly practices when their organization strongly encourages and reinforces them. The examination of the individual items within the organizational support construct revealed that organizational enablement had the highest mean score, meaning employees perceived they were well facilitated with infrastructure and systems for pro-environmental participation. This aligns well with previous literature stating that strong organizational support, in the form of CSR initiatives and green infrastructure, has been shown to enhance employees' voluntary contribution to the environmental goals and activities of the company (Albrecht et al., 2021; Cropanzano & Mitchell, 2005). On the contrary, organizational encouragement was ranked the lowest, which indicates that while resources exist, motivational efforts and positive feedback, in terms of reward, might not be available at the food firms participated in the study. This gap is a valuable area for organizations to increase communication, encouragement and visible reinforcement of sustainability efforts. Consequently, these findings highlight that alongside implementing systems, food businesses must actively cultivate a green work culture. This includes value alignment, ongoing encouragement and promoting sustainability through both formal policies and informal praise. Findings from different studies also support oorganizations that can benefit from developing a culture of trust and allowing employees to contribute to organizational ESG goals (Gill et al., 2023).

Another external factor which was examined in this research was the leadership support. While leadership is usually considered to be a key driver of organizational culture and employee engagement in sustainability (Aryati, 2025). In this study though leadership support did not emerge as a significant predictor of PEB. Despite previous literature stating that leadership encourages sustainability and puts great emphasis on the company's adoption of sustainable practices. (Kiesnere & Baumgartner, 2019), there are several reasons why R&D may report low perceived leadership support. Firstly, although leaders may support ESG objectives or convey sustainability messages, these messages might be too subtle, infrequent, or disconnected from day-to-day operations to have an impact on employee behavior. Moreover, leadership may work remotely and have little daily contact with employees in many R&D settings. Because of this low visibility, there are fewer opportunities for explicit role-modeling, which is crucial for encouraging behavior change. A different explanation could be perceived inauthenticity of leadership's green initiatives. If workers perceive that leadership action is symbolic or image-oriented instead of genuinely committed, their cooperation with green initiatives might decline. Other leaders may also lack the expertise or training required to effectively incorporate sustainability into R&D activities such as sustainable innovation. However, previous research suggests that most managers in larger food enterprises are aware of the ESG company's targets (Ganc & Felczak, 2025), but proactive leadership is not always a result of this awareness. Managers perhaps do not actively steer towards these goals, which means they recognize ESG goals but do not incorporate them into routine operational procedures, team management, or decision-making.

Lastly, a rigid, top-down culture can drown communication and undermine sustainability messages, especially when presented as compliance rather than core values. One-way communication and centralized decision-making give little room for staff involvement, therefore lowering ownership and drive to participate in PEBs. Consequently, if the culture doesn't empower people or encourage open, two-way communication about sustainability, even encouraging leaders may have little impact on this matter. This gap emphasizes the need for more visible, genuine, and applied leadership in sustainability initiatives, especially in technical departments like R&D, where sustainability is sometimes regarded as border to core goals. To significantly impact employee engagement in this situation, managers must actively convert ESG targets into tangible goals, actions and behaviors. From that respect, a bottom-up approach is highly pertinent since it acknowledges the capacity of staff members to develop and execute sustainability internally. It also considers their perceived influence, dedication, and the worth of receiving recognition or rewards for voluntary CSR activities, as mentioned by Gotsch et al. (2023). Thus, incorporating sustainability into everyday organizational culture and increasing motivation are two benefits of such empowerment.

When it comes to Sustainability awareness construct, which incorporates sustainability training, ESG integration and resource management facilities, the findings showed that these variables were not significant predictors of PEB. Particularly, factors like sustainability training and policy communication scored lower than infrastructure availability and waste management facilities. Although, employees can understand their oorganization's sustainability goal, they lack enablement, involvement or empowerment from their company. This can occur since sustainability messaging is often vague or irrelevant so that employees cannot apply this generic knowledge to their work actions. Secondly, inadequate focused sustainability training, particularly within technical fields like R&D, constrains employees' ability to implement environmental practices. There is a critical need to develop new models of education for employees that not only enhance their understanding of ESG principles but also equip them to implement these values in daily business and incorporate them into employees' daily tasks. Moreover, managerial capacity to convert ESG goals into actionable, practical guidance is essential to align employee behavior with corporate sustainability goals. Meanwhile, investment in training the employees and organizing brainstorming sessions regarding sustainability matters will increase the ESG performance of the food businesses. Consequently, food firms can successfully improve PEB and advance a sustainable culture by fostering environmental awareness, expertise, and dedication.

Lastly, it is worth mentioning that age, gender and education did not seem to play a role in PEB adoption. Despite previous evidence regarding the different CSR adopted behaviors and PEBs among different generations, it seems that in this case, the effect of age on PEB was not significant. Therefore, the study did not align with previous literature stating that stronger sustainability practices are demonstrated by older individuals compared to the younger ones (Wiernik M. et al., 2013). The sample's demographic profile is one possible explanation: most respondents (53%) were between the ages of 18 and 29 and 33% were between the ages of 30 and 44. This led to a uniform age distribution and little representation of older generations (45+). Thus, during this research it can be stated that both Gen Z (18-29) and Millennials (30-44) exhibited similar behaviors. Previous studies, like those by Tien and Huang (2023), have demonstrated that women are more likely than men to participate in PEBs in household contexts, this was not evident in the workplace though, where both male and female participants displayed similar sustainability behaviors. There were no discernible variations in PEB between qualification levels in terms of education. This could be because a sizable percentage of the sample (59%) had a master's degree, which is generally linked to a high level of environmental awareness, particularly in R&D settings. Overall, these results imply that the sample's comparatively young, highly educated, making organizational culture and workplace norms more significant PEB drivers in this situation than individual traits.

5. Limitations and Future recommendations

This study offers valuable insights towards PEB adoption among employees within the food industry, although it acknowledges several limitations. First, the relatively small sample size (N=100), although it was adequate for statistical analysis, was limited to R&D employees from food companies based in the Netherlands. This narrow scope limits the findings' generalizability to diverse organizational functions and international contexts. Future study should broaden the sample to include employees from a variety of areas, including manufacturing, logistics, marketing, and quality assurance, as well as food industries from different countries, and performing comparative study among nations. The inclusion of manufacturing floor workers and operational personnel would also provide a more complete picture of PEB across organizational hierarchies. Secondly, the cross-sectional character of the study limits the capacity to make causal conclusions. Because PEB is influenced by changing organizational practices, future research should utilize a longitudinal design to track behavioral changes over time and analyze the impact of continued exposure to ESG initiatives, leadership engagement, and training interventions on sustainable behavior.

Additionally, the use of self-reported surveys increases the potential of social desirability bias, which occurs when individuals over-report environmentally responsible behaviors or organizational support to meet social expectations, even when the questionnaire is being constructed on a Linkert scale. To address this, future research should use mixed-method approaches, such as in-depth interviews, focus groups, or direct behavioral observations, to validate quantitative replies and provide more context. Next to that, some of the dimensions, particularly affective components and sustainability awareness, had reduced internal reliability, indicating the need for future research to refine and validate more robust measuring tools. Moreover, while leadership support was not found to be a statistically significant predictor of PEB in this study, this could be due to organizational dynamics unique to R&D functions, in which leadership may be regarded as more remote or less involved in everyday environmental initiatives. Future research should investigate the impact of various leadership styles, such as transformational, servant, and ethical leadership, across departments and roles. Furthermore, this study did not consider the impact of external regulatory or institutional influences, like government policy, EU laws or ESG investing criteria. Thus, future research should investigate how these external influences interact with internal elements, which may reinforce or impede PEB on employee level.

Deeper psychological factors, such as moral disengagement, psychological ownership, green identity, a nd behavioural spillover, deserve further exploration because they provide a more comprehensive and understanding of how human beliefs and perceptions impact workplace PEB. In addition, investigating the design and implementation of sustainability training is critical. Future study should compare the effectiveness of various formats, such as gamified learning, peer-led workshops, and experiential learning, in promoting long-term PEB uptake. Parallel to this, the impact of reward systems and incentives for PEB requires further investigation, particularly to determine whether recognition, feedback, or material benefits might strengthen sustainability participation.

Future studies should also expand on evidence that employee PEBs can lower GHG emissions in the food industry. By creating a behavioral-GHG modelling framework, beginning with a behavioral inventory that classifies important PEBs by category (e.g., energy usage, transport), is a promising approach. Emission factors (e.g., kg CO_2 saved per kWh or km) can be applied based on employee count and behavior frequency using carbon equivalency mapping. In the food industry, which is energy intensive and includes daily employee actions that impact its carbon footprint, GHG emissions can be considerably decreased by even modest PEB improvements, such as lowering energy consumption, transportation emissions, or waste management.

Finally, it is vital to identify the unique reasons that motivate employees to participate in PEB. More actionable insights for organizational strategy could be gained by investigating how elements such as ethical views, alignment with business values, work happiness, and a sense of personal impact influence behavior. Similarly, more emphasis should be placed on peer involvement and social norms, particularly given the study's results that, while peer influence is an important element. Overall, these directions emphasize the importance of comprehensive, multi-level research methodologies that consider not only organizational structures and processes, but also the psychological, social, and cultural components of sustainable participation.

6. Conclusions

This study provides a complete understanding of the internal and external elements that influence PEB among food sector personnel, with a particular emphasis on R&D departments. While less practical or less significant behaviors, like shutting off laptops, were least adopted, the most popular action was regarding using reusable cups, which reflects both individual commitment and adherence to laws like the EU Single-Use Plastics Directive (2019/904). This implies that policy support, convenience, and visibility all affect behavioral uptake. The data also showed that cognitive characteristics including environmental concern, environmental commitment, and perceived environmental impact are the strongest predictors of PEB. This emphasizes the importance for food companies to invest in knowledge-based interventions and instill employee confidence in the value of their sustainable initiatives. While affective factors, such as anticipated guilt and happiness did not seem to play a role. Moreover, organizational support and peer engagement had a beneficial impact on PEB. The findings indicate a significant divergence between sustainable infrastructure and policy communication, highlighting the need for improved training, awareness, and engagement methods. This disparity emphasizes the urgent need for more inclusive engagement tactics, enhanced managerial capability to operationalize ESG targets, and focused, role-relevant training.

Surprisingly, leadership support was not a major predictor of PEB, indicating an opportunity to consider managerial communication and environmental practices, especially in technical departments, such as R&D. The analysis also showed that awareness on sustainability training was rather weak and that despite the provision of waste management infrastructure, employees lack the autonomy and clarity required to match their activities with ESG objectives. To address this, food companies need to bridge the awareness to action gap by implementing more focused and inclusive training programs, improving managerial education and promoting voluntary sustainable efforts. Consequently, developing PEB is a multidimensional task that requires coordinated efforts across leadership, organizational culture, peer support, and individual drive. Addressing these variables allows food companies to not only improve their ESG performance but also generate substantial environmental change from the bottom up, through the actions of their employees.

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Appendix

Appendix A Questionnaire

Section 1: Questions on demographic variables and generic factors (Age, Gender, Educational background)

1) What is your age ?

18-29 30-44

45-60 Above 60

2)Which is your gender

1. Male
2. Female
3. Nonbinary/ third gender

3)What is your highest level of education

1. High school

2. Bachelor’s degree

3. Master’s degree

4. PhD or higher

Section 2: Questions on internal motivational drivers (Affective and cognitive factors)

4)To what extent do you agree or disagree with the following statements (1-5 scale. 1: Strongly Disagree, 5: Strongly Agree)

1. I worry about environmental problems
2. I feel happy when I perform environmentally friendly actions
3. I feel personally committed to reducing my environmental footprint at work
4. I would feel guilty about not supporting the environmental efforts of my company
5. I believe that my pro-environmental actions at work have an impact on the overall sustainability performance of my company

Section 3: Behavioral PEB and Personal norms on actual energy and resource efficiency

5) Which of the following pro-environmental actions do you do at work (1-5 scale 1: Strongly Disagree 5: Strongly agree, NA: Not Applicable)

1. I use water/energy/ equipment only when needed.
2. I recycle paper and other materials that can be re-used
3. I turn off my computer/laptop when not in use.
4. I switch off lights when the office/lab is not in use
5. I use reusable cups instead of disposable ones
6. I opt for video calls instead of traveling for business meetings when possible.
7. I choose to travel to work by bike and /or by public transport, when possible
8. I discuss environmental issues with colleagues
9. I try to motivate my colleagues to adopt environmentally friendly actions at work

Section 4: Organizational and leadership support

6) To what extent do you agree or disagree with the following statements? (1 = Strongly Disagree, 5 = Strongly Agree)

1. My company demonstrates a strong commitment to pro-environmental behavior and sustainability
2. My company encourages its workers to engage in environmentally friendly practices
3. My company allows me to adopt pro-environmental behaviors in my daily work routine
4. Leadership at my workplace actively supports and participates in sustainability efforts
5. My manager/boss keeps me informed about sustainability matters and the company's ESG goals
6. Seeing my boss/manager engaging in sustainable practices motivates me to do the same

Section 5: Sustainability Integration and Resource Support

7)To what extent are you aware of the following? (1 = Not at all aware, 5 = Fully aware)

1. The sustainability policies, initiatives, and ESG goals of my company
2. Training, workshops, or team discussions are available for sustainability improvement
3. The recycling and waste management facilities at my workplace are sufficient and accessible

Appendix B

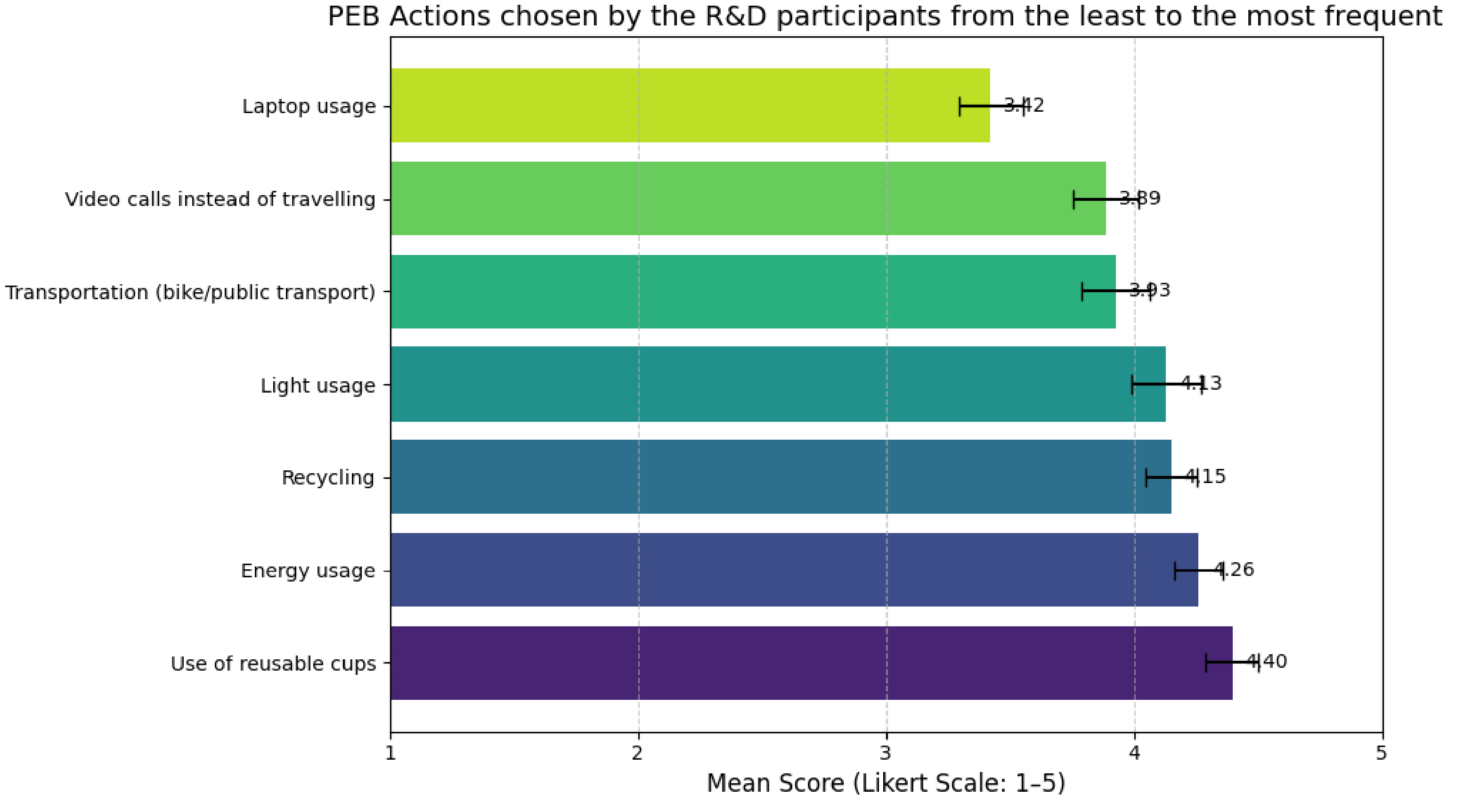

Figure 1 Mean and Standards Errors for each PEB from the least to the most frequently chosen among R&D participants

Table 1 Post-hoc Tukey HSD analysis for different variable constructs

Group 1	*Group 2*	*Mean Difference*	*p-value*
Affective Factors	*Cognitive Factors*	-0.32	0.1577
Affective Factors	*Leadership Support*	-0.84	0.0
Affective Factors	*Organizational Support*	-0.33	0.1391

Affective Factors	*PEB Actions*	-0.02	1.0
Affective Factors	*Social Norms Peer Engagement*	-0.93	0.0
Affective Factors	*Sustainability Awareness*	-0.65	0.0
Cognitive Factors	*Leadership Support*	-0.52	0.0012
Cognitive Factors	*Organizational Support*	-0.01	1.0
Cognitive Factors	*PEB Actions*	0.3	0.2305
Cognitive Factors	*Social Norms Peer Engagement*	-0.61	0.0001
Cognitive Factors	*Sustainability Awareness*	-0.33	0.1566
Leadership Support	*Organizational Support*	0.51	0.0017
Leadership Support	*PEB Actions*	0.82	0.0
Leadership Support	*Social Norms Peer Engagement*	-0.09	0.9935
Leadership Support	*Sustainability Awareness*	0.2	0.7329
Organizational Support	*PEB Actions*	0.31	0.1911
Organizational Support	*Social Norms Peer Engagement*	-0.6	0.0001
Organizational Support	*Sustainability Awareness*	-0.31	0.1911
PEB Actions	*Social Norms Peer Engagement*	-0.91	0.0
PEB Actions	*Sustainability Awareness*	-0.63	0.0
Social Norms Peer Engagement	*Sustainability Awareness*	0.29	0.2954

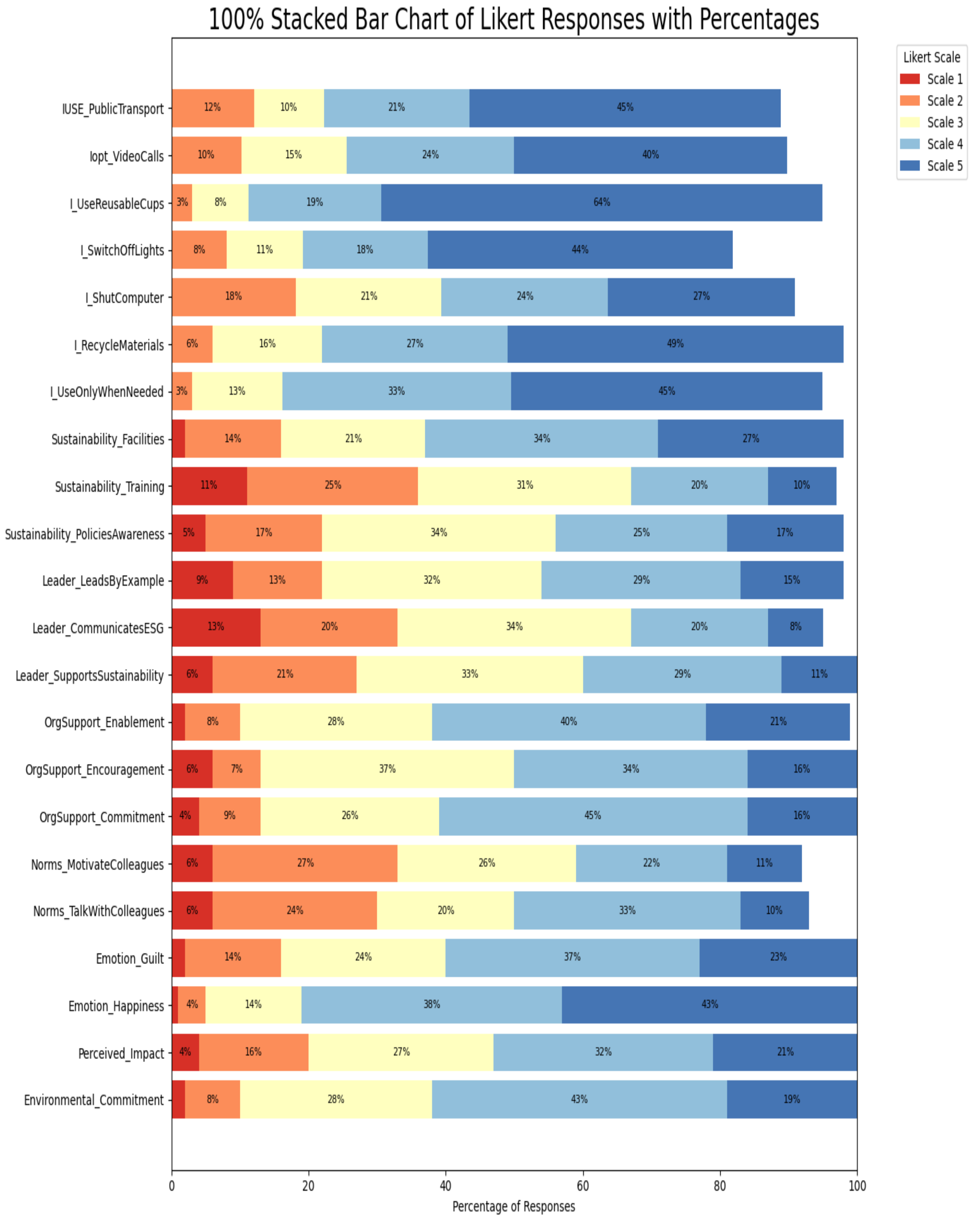

Figure 2 % Respondents per Linkert scale item (scale 1-5, from Strongly Disagree to Strongly Agree)

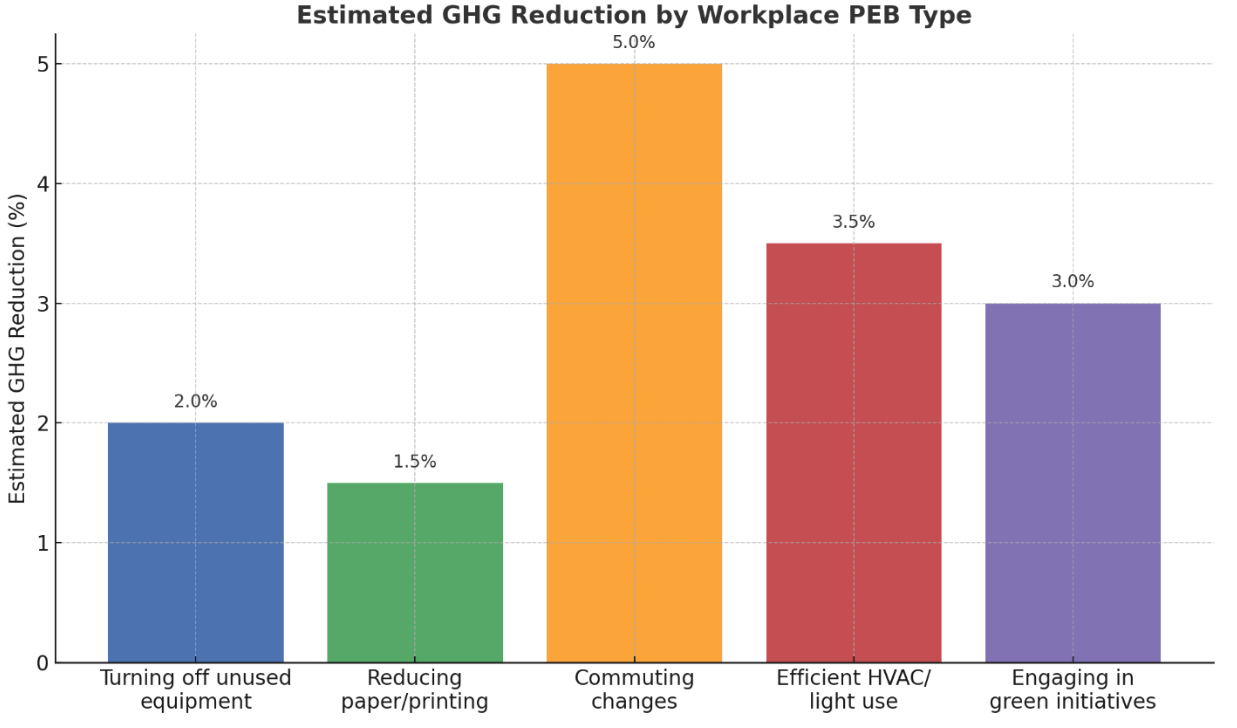

Figure 3 Approximate % estimations of GHG reduction by workplace PEB (Berger & Wyss, 2021; Lo et al., 2012; Ones & Dilchert, 2012; Stern, 2000b; United Nations Environment Program., 2019)