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Impact of Sustainable Workplace Environment on Employee Well-Being: Mediating Role of Work Engagement and Moderating Role of Psychological Safety

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ABSTRACT

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Keywords

Sustainable Workplace Environment; Work Engagement; Employee Well-being; Psychological Safety; Job Demands-Resources Model.

The study explores how a sustainable workplace environment can influence the well-being of the employees, while assessing the mediating effect of work engagement and the moderating effect of psychological safety. The data from the cross-sectional, self-report questionnaire was collected from 244 full-time employees in Textile and IT sectors and analysed using IBM SPSS and PROCESS macro for mediation and moderation testing. Analysis indicated that the sustainable workplace environment was significantly and positively associated with employee well-being ($\beta = .726$, $p < .001$) and work engagement ($\beta = .658$, $p < .001$), whereas work engagement was significantly and positively associated with well-being ($\beta = .397$, $p < .001$). The sustainable environment of the workplace was found to significantly and partially mediate the relationship between well-being and work engagement (indirect effect = .202, 95% CI [.130, .279]); the direct effect was still significant. This hypothesis was not supported as psychological safety did not significantly moderate the sustainable workplace environment and work engagement ($B = .017$, $p = .257$). These results provide partial support for a partial mediation model, in which a supportive workplace environment has a direct positive impact on employee well-being, as well as an indirect impact via work engagement; they also suggest that psychological safety is a distinct resource that is not simply a reflection of the relationship between workplace environment and work engagement.



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Introduction

The economic, social and technological transformations, such as the process of digitization, remote working, and automation, are changing the nature of workplaces and impacting the satisfaction, health and well-being of employees (Dumitriu et al., 2025). According to Dumitriu et al. (2025), the psychological health and engagement of employees are recognized as key factors in achieving a healthy working environment, which in turn contributes to their personal and professional satisfaction. Positive working environments have also been correlated to enhanced organizational commitment and task performance ability, leading to better task performance (Zhenjing et al., 2022).

Much of this work views the workplace conditions in isolation, focusing on either physical factors or managerial support or organizational climate separately, without considering them as a system (Dumitriu et al., 2025). In the physical dimension, specifically, lighting, temperature, indoor air quality and noise levels have been proven to directly influence productivity and mental health, with poor lighting linked to eye strain and concentration difficulties, and excess noise linked to higher levels of stress and poor teamwork (Dumitriu et al., 2025). Employees are known to be at high risk of musculoskeletal disorders interfering with productivity when working from nonergonomic workstations, and green/biophilic office design has been shown to positively influence employees' self-reported health and wellbeing (Haqi et al., 2023; Lei et al., 2022). This evidence has led to the concept of the sustainable workplace environment, in this sense defined as the intentional design of ergonomics, indoor air quality, light, green workspace design and workplace comfort, to protect and promote employee health and performance.

Another strand of research associated with positive workplace factors and work engagement. It has been found that a sustainable work environment positively and significantly predicted work engagement, job satisfaction and employee retention, with the relationship between the sustainable work environment and employee retention being mediated by work engagement and job satisfaction (Padmavathi 2023). Singlelly, workplace environment factors have been shown

to significantly predict employee's achievement striving ability, which is conceptually close to engagement (Zhenjing et al., 2022).

The third strand of research is the link between work engagement and well-being outcomes. Work engagement, which is often defined as high levels of vigor, dedication and absorption, has been shown to be negatively correlated with ill-health and positively correlated with life satisfaction and job performance compared to workaholism (which has been found to be negatively correlated with both; Shimazu & Schaufeli, 2009). A study on Romanian teachers has revealed that work engagement is linked to the employees' positivity ratio (number of positive emotions divided by the number of negative emotions) and that work engagement in turn positively relates to psychological well-being, including autonomy, personal growth, self-acceptance, positive relations with others, environmental mastery, and purpose in life, as measured by the scales of the JDI (Rusu & Colomeischi, 2020). All this work suggests that inducing a sustainable workplace environment is unlikely to have a single, direct impact on the employee's well-being, but rather is passed along, at least in part, through how engaged the employee is with his or her work.

Another aspect to consider is that a particular workplace condition or engagement opportunity may not have the same response from different employees. In this study, psychological safety is conceptualized as feelings of being safe to express and use one's authentic self at work without fear of negative consequences (Kahn, 1990, as cited in Albrecht et al., 2023), which has been shown to have a strong positive direct effect on employee engagement (Albrecht et al., 2023), and is also treated as a boundary condition in which it influences the relationship between favorable environmental resources to engagement and well-being outcomes. None of the literature reviewed actually investigates the moderating role of psychological safety as a moderator between workplace environment and engagement, and there is no empirical evidence to support this as a moderator, so it is considered as a theoretical extension.

In most cases, the assumption is that these

investments will yield healthier and more engaged employees, and they have been a part of workplace redesign, ergonomic furniture and enhancements to the indoor environment. However, when intrinsic aspects of the job and the employees' general attitudes toward their jobs are taken into account, the direct influence of the physical and social work environment on employee well-being is relatively small, with the influence of the physical and social work environment on the employees' attitudes toward their jobs being mediated through these intervening psychological factors (Dumitriu et al., 2025). While a number of studies have examined the role of psychological states as a mediator between the environment and engagement (Dumitriu et al., 2025; Padmavathi, 2023; Rusu & Colomeischi, 2020; Shimazu & Schaufeli, 2009), most have focused on either the environment – engagement relationship (Padmavathi, 2023; Zhenjing et al., 2022) or the relationship between engagement and well-being (Rusu & Colomeischi, 2020; Shimazu & Schaufeli, 2009), and none have tested the complete mediated pathway in one model, testing psychological safety's specific role as a moderator of the sustainable workplace environment – engagement relationship (Albrecht et al., 2023). Therefore, a study is needed to explore, in one integrated model, how and whether employee well-being is influenced by the dimensions of a sustainable workplace environment (ergonomics, IAQ, lighting, green workspace design, and workplace comfort); whether work engagement (in terms of vigor, dedication, and absorption) acts as a mediator between the sustainable workplace environment and employee well-being; and whether the relationship between the sustainable workplace environment and work engagement.

Literature Review

To review the literature related to the study variables, the researchers used nine open, peer-reviewed publications: Dumitriu et al. (2025), Zhenjing et al. (2022), Padmavathi (2023), Shimazu and Schaufeli (2009), Rusu and Colomeischi (2020), Albrecht et al. (2023), Haqi et al. (2023), Zhang et al. (2022) and Lei et al. (2022).

The Job Demands-Resources model is used as the main theory in this study, as it was explicitly used

as the theoretical basis for analyzing the relationship of job demands and resources in shaping employee well-being (Dumitriu et al., 2025). This model differentiates between job demands (the physical or psychological demands on the employees that need sustained effort to complete the tasks) and job resources (the components of the job that support the employees in achieving their work goals and stimulate personal growth) (Dumitriu et al., 2025). In this context, a sustainable work environment is a job resource and job resources like favourable physical conditions, autonomy and organizational support can mitigate the effects of job demands and help to keep employees well, and a good part of this relationship is mediated by intrinsic aspects of the work (Dumitriu et al., 2025).

This JD-R logic is also seen in research on the outcomes of engagements more specifically. The personal and organizational resources have been found to increase engagement, which, in turn, can serve as a resource to maintain psychological well-being: relationship between teachers' positivity ratio and their psychological well-being mediated by work engagement (Rusu & Colomeischi, 2020); relationship between workplace conditions and psychological resources of achievement striving ability and organizational commitment (Zhenjing et al., 2022). The relationship between WCE and JS has also been found to be a resource that transmits the impact of a sustainable work environment to retention outcomes (Padmavathi, 2023). Combined, the JD-R model offers a clear framework for considering the sustainable workplace environment as a resource for support of engagement which leads to support of well-being.

Kahn's theory of personal engagement states that there are three psychological conditions that employees must experience to be fully engaged in their work: meaningfulness, availability, and psychological safety—believing they can show and use their true selves without risk of negative consequences to self-image, status, or career (Kahn, 1990, as cited in Albrecht et al., 2023). Psychological safety was directly and significantly correlated with employee engagement, along with meaningfulness and self-efficacy, in a direct empirical test of this theory in the context of organizational change, accounting for 88% of variance in employee engagement

(Albrecht et al., 2023). Additionally, psychological safety was determined to fully mediate the connection between psychological safety and proactive work behavior (Albrecht et al., 2023). It is therefore placed in this study as a moderator of the relationship between environmental/organizational resources and work engagement, as this is considered a theoretical and empirical foundation for using psychological safety as a resource that affects the strength of the relationship between the environment/organizational resources and work engagement, rather than as a direct and independent predictor of work engagement.

A sustainable workplace environment is a conscious design and management of physical conditions for the benefit of employee health, comfort and productivity. It is operationalized in this study in five dimensions: Ergonomics is about the proper alignment of workstations, furniture and equipment with the employee's physical abilities, and it has been found that nonergonomic conditions can lead to a higher risk of musculoskeletal disorders and affect work productivity for office workers (Haqi et al., 2023). Ventilation, control of pollutants and ensuring proper level and intensity of light are primary factors that influence the cognitive performance, productivity and wellbeing of the occupants and hence are of interest to indoor air quality and lighting. (Zhang, Liu, Hu, & Yadav, 2022) Green workspace design relates to the use of nature and the biophilic aspects of the workplace; office workers who have been integrated into green buildings containing biophilic aspects of design have reported moderate ratings of their assessments of the design features for their health / wellbeing (Lei et al., 2022). Workplace comfort is related to the general physical aspects of the workplace, such as noise levels and the spatial layout, that influence the employees' subjective impression of the working environment. Together, these dimensions have been found to directly influence productivity and mental health, where adverse conditions in any of these can lead to a strain or even disengagement (Dumitriu et al., 2025).

The work engagement can be described as a positive, fulfilling, work-related state of mind, in which one is characterized by vigor, dedication and absorption (Shimazu & Schaufeli, 2009; Rusu

& Colomeischi, 2020). Engaged employees work hard because they enjoy it rather than because they are inner-driven, and, in contrast to workaholism, work engagement has been positively related to life satisfaction and job performance and negatively related to ill-health (Shimazu & Schaufeli, 2009).

Employee wellbeing is a multidimensional construct that represents both subjective wellbeing (overall satisfaction with life and emotional balance) and psychological wellbeing (personal growth, purpose and self-acceptance) (Dumitriu et al., 2025). Other dimensions in organizational research, which have been shown to be positively predicted by work engagement, include autonomy, positive relations with other people and environmental mastery (Rusu & Colomeischi, 2020).

Psychological safety is characterized as an individual's ability to show and use their true self at work without experiencing negative effects on their self-image, status or career, and to speak their mind, voice concerns, or take interpersonal risks without being sanctioned (Kahn, 1990, cited in Albrecht et al., 2023). Alongside meaningfulness and self-efficacy (Albrecht et al., 2023), psychological safety has been shown to have a significant positive direct relationship with employee engagement, and thus is treated here as a resource that can drive employees to mobilize other resources, including a positive physical environment.

Poor lights, heat, indoor air quality, and noise are other factors that impact productivity and mental health within the workplace, with poor lighting associated with eye strain and difficulties with concentration, and excessive noise associated with increased stress and lack of teamwork (Dumitriu et al., 2025). In a large survey-based study of Romanian employees, using structural equations modeling, the physical and social working environment was shown to have a statistically significant, although relatively weak, direct effect on the employee's well-being, with a more significant indirect effect through the impact of the intrinsic aspects of work and employees' general points of view regarding work (Dumitriu et al., 2025). The finding indicates that there is a direct pathway from a sustainable workplace to well-being, albeit small in magnitude, and

suggests that there is a missing link between these two variables, namely work engagement.

To support the above finding, a related study showed that a positive work environment also positively affected employees' achievement striving ability, which in turn influenced their organizational commitment, which eventually led to task performance (Zhenjing et al., 2022). This study focused on performance rather than on well-being explicitly, but there are close links between the constructs of 'achievement striving' and 'well-being' and the model of indirect effects that was studied here was found to operate in the workplace to a significant degree through psychological mediators.

In addition to the general literature on the workplace environment, there are dimension-specific studies that support the argument for considering the sustainable workplace environment to be multi-dimensional. An office workstation assessment using the Rapid Office Strain Assessment and Cornell Musculoskeletal Discomfort Questionnaire identified that most office workers with nonergonomic workstations were at high risk of developing musculoskeletal disorders and experienced muscle complaints in the neck, shoulders and back, which are all known to compromise work capacity (Haqi et al., 2023), providing evidence for ergonomics as a key factor in employee physical wellbeing and work capacity.

Indoor environmental quality factors, such as indoor air quality, thermal comfort and lighting comfort, are found to be closely related to occupants' health, wellbeing, cognitive function and productivity, and poor indoor environmental quality is linked to lower task performance (Zhang et al., 2022). This aligns with, and extends upon, the larger result that physical environmental factors such as lighting and air quality have a significant impact on employee mental health (Dumitriu et al., 2025).

A post-occupancy evaluation of two green certified office buildings with biophilic design revealed moderately high scores for the effect of biophilic features on employee health and wellbeing, and this impact appeared to differ by age and perceived health status of employees (Lei et al., 2022). In addition to the more global results on the physical work environment provided by

Dumitriu et al. (2025), this offers direct empirical evidence of the positive relationship between green workspace design and employee wellbeing as a separate facet of the sustainable workplace environment.

Evidence from the e-commerce industry indicates that the sustainable work environment has a positive and significant relationship with work engagement along with job satisfaction and employee retention (Padmavathi, 2023). In the same vein, the workplace environment factors have been shown to be significant predictors for employees' achievement-striving ability, which is conceptually related to engagement (Zhenjing et al., 2022). These studies collectively support the hypothesis that a healthy work environment positively impacts employees' attitudes toward their work.

In a study that contrasted workaholism with work engagement among Japanese employees, workaholism was positively related to ill-health and negatively to life satisfaction, whereas work engagement was negatively related to ill-health and positively to life satisfaction and job performance (Shimazu & Schaufeli, 2009). This is not a distinction that is made up, but rather it is a distinction that helps clear the way for the fact that it is not hard work that helps the employee, but engagement.

Other evidence comes from a study of Romanian teachers which showed that the three components of work engagement, vigor, dedication and absorption, were positively correlated with well-being across its six dimensions (autonomy, personal growth, self-acceptance, positive relations with others, environmental mastery, purpose in life) and that work engagement mediated the relationship between teachers' positivity ratio and well-being (Rusu & Colomeischi, 2020). This directly testifies to the engagement as a mediator between a psychological/environmental antecedent and well-being outcomes.

There has been direct empirical evidence regarding psychological safety as an antecedent of engagement, with Albrecht et al., (2023) testing Kahn's (1990) engagement theory during organizational change and finding that psychological safety significantly and positively influenced employee engagement, and that

employee engagement completely mediated the relationship between psychological safety and proactive work behavior. This validates the psychological safety as a resource for employee engagement (JD-R theory and Kahn's theory discussed above), as stated by Dumitriu et al., (2025); Albrecht et al., (2023).

However, it is important to note that the authors of Albrecht et al. (2023) did not provide evidence of psychological safety being a direct driver of engagement itself; rather, they merely served as a moderator between environmental resources and engagement. None of the sources in the literature reviewed test psychological safety as a moderator of the sustainable workplace environment-engagement relationship in particular. Moderating role as mentioned in Hypothesis 5 below are therefore a reasonable theoretical extension of the direct relationship between psychological safety and engagement that was confirmed in the present study (Albrecht et al., 2023) and the JD-R theory, which posits that resources are linked in a multiplicative manner that together shape outcomes (Dumitriu et al., 2025) rather than a direct relationship that has been tested in its own right is moderated by psychological safety.

2.1 Objectives of the Study

The purpose of this research is to investigate how a sustainable work place environment influences employee well-being, in addition to the role of work engagement as a mediator and the role of psychological safety as a moderator in this relationship. The particular aims are to:

- Review how a sustainable workplace environment (ergonomics, indoor air quality, light, design of green work environment, and comfort in the workplace) affect the well-being of the employees.
- Understand how the sustainable work environment impacts on work engagement (vigor, dedication, absorption).
- Examine the effect of work engagement on employee well-being.
- Decide if work engagement is the mediating mechanism between the sustainable workplace environment and employees' well-being.
- Assess if psychological safety is a moderating factor between the sustainable workplace environment and work engagement.

2.2 Significance of the Study

This study has theoretical, practical and academic importance. It contributes to the literature in several ways: it includes all of the above as a single mediated-moderation model, as opposed to these being studied as separate constructs; and it breaks down the workplace environment into specific, evidence-based dimensions: ergonomics (Haqi et al., 2023); indoor air quality and lighting (Zhang et al., 2022); and green workspace design (Lei et al., 2022). From a practical perspective, the results are likely to help human resource practitioners and facility managers prioritize workplace investments: if there is an intermediary relationship between workplace conditions, engagement, and various outcomes like well-being and retention, then an organization is more likely to match physical workplace enhancements with measures that will engage employees than to assume that investing in the workplace is enough. The study contributes to the existing literature on sustainable human resource management and workplace well-being, providing a basis for future research. The research will serve as a foundation for other researchers to build on, such as conducting tests on this model in other industries or cultural settings.

2.3 Research Questions

- What is the effect of the sustainable workplace environment on employee well-being?
- What is the effect of the sustainable workplace environment on work engagement?
- What is the effect of work engagement on employee well-being?
- Is the relationship between the sustainable workplace environment and employee well-being mediated by work engagement?
- Does psychological safety moderate the relationship between the sustainable workplace environment and work engagement?

2.4 Hypotheses

H0 (null): The sustainable workplace environment has no effect on employee well-being.

H1 (alternative): The sustainable workplace environment has an effect on employee well-being. H0 (null): The sustainable workplace environment has no effect on work engagement.

H1 (alternative): The sustainable workplace environment has an effect on work engagement. H0 (null): Work engagement has no effect on employee well-being.

H1 (alternative): Work engagement has an effect on employee well-being.

H0 (null): Work engagement does not mediate the relationship between the sustainable workplace environment and employee well-being.

H1 (alternative): Work engagement mediates the relationship between the sustainable workplace environment and employee well-being.

H0 (null): Psychological safety does not moderate the relationship between the sustainable workplace environment and work engagement.

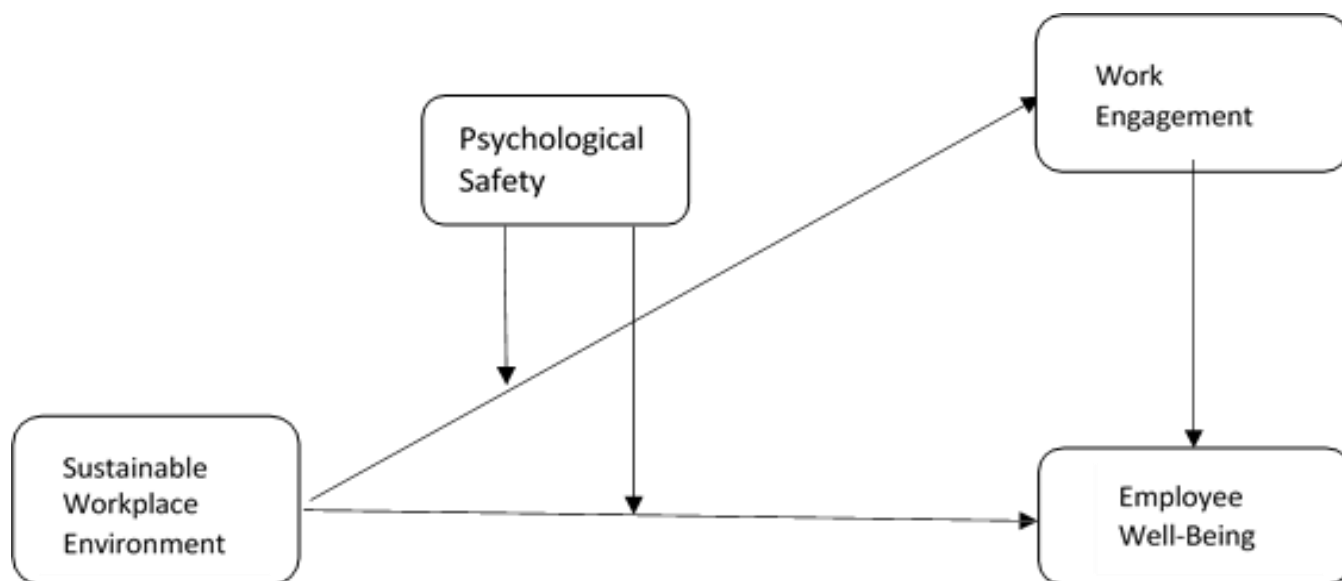
H1 (alternative): Psychological safety moderates the relationship between the sustainable workplace environment and work engagement, such that the relationship is stronger when psychological safety is high.

H0 (null): Psychological Safety does not moderate the indirect effect of Sustainable Workplace Environment on Employee Well-Being through Work Engagement (moderated mediation), in such a way that that the indirect effect is stronger at higher levels of Psychological Safety.

H1 (alternative): Psychological Safety moderates the indirect effect of Sustainable Workplace Environment on Employee Well-Being through Work Engagement (moderated mediation), in such a way that that the indirect effect is stronger at higher levels of Psychological Safety.

2.5 Conceptual Framework

Figure 1: *Conceptual Framework — Sustainable Workplace Environment, Work Engagement, Employee Well-Being, and Psychological Safety*



Research Methodology

3.1 Methods

A quantitative research method will be used, using a structured, self-reporting questionnaire to gather numerical data on employees' insights of their workplace environment, engagement, well-being, and psychological safety.

3.2 Research Design

This research is cross-sectional research with the descriptive type of research, which data was

obtained simultaneously from employees of selected organizations. The research design captures the proposed moderated-mediation model, and is suitable for examining the model, but it does not provide for strong causal interpretation, which is addressed further under Limitations and Delimitations.

3.3 Population

The purpose of this research is to address the population of full-time employees with physical workplace conditions (such as air quality, lighting,

ergonomics, indoor and green design) directly experienced as part of their daily work. Staff at operational, supervisory and managerial level who have held their position for at least six months will be eligible – ensuring sufficient exposure to the physical and social workplace environment being measured.

3.4 Sampling Technique

It is recommended to use a multi-stage sampling method. Purposive sampling will be used to select organizations at the initial stage, to provide enough variance in the independent variable, namely sustainable or green workplace design features, in organizations that have implemented or are implementing them. In participating organizations, simple random or convenience sampling will be used, depending on the constraints of the organization. The minimum sample size will be determined by Krejcie and Morgan's (1970) sample size table and/or an a priori power analysis (e.g., G*Power) for the planned structural equation model and will be equal to or greater than 300-400 usable responses, which is typical for survey-based organizational research (200+ for SEM, with larger samples preferred for moderated-mediation models).

3.5 Data Collection Instrument

A structured and self-reporting questionnaire will be used to collect data in the online (web-based survey) format to ensure maximum responses and to ensure convenience. The questionnaire will contain the following five sections: (1) Demographic and organizational information, (2) items that represent a sustainable workplace environment, (3) items that represent work engagement, (4) items that represent employee well-being, and (5) items that represent psychological safety. All substantive items are going to be assessed using a five-point Likert scale ranging from 'Strongly Disagree' to 'Strongly Agree'.

3.6 Ethical Considerations

- All participants will sign informed consent

forms before any data is collected and the purpose, voluntary nature, and right to withdraw from the study without penalty will be communicated to the participants.

- Participants' anonymity and confidentiality will be respected; no data will be gathered that could identify a participant, and no data will be reported individually.
- Research ethics approval will be obtained from institutional/university level before the data collection and permission will be secured from the gatekeeper of the participating organization.
- Data will be kept securely and only read by the research team and will only be used for research purposes as described.
- The study will follow guidelines for research on human subjects (such as the Respect, Beneficence and Justice principles) and conflicts of interest will be declared and addressed.

Results

4.1 The reliability of the Measurement Instrument

Each of the four study scales was examined separately for internal consistency with Cronbach's alpha, as each scale reflects a different construct based on a different concept. Reliability was found to differ from scale to scale as listed in Table 1. It was found that the employee well-being scale (4 items) had good internal consistency ($\alpha = .805$) and the psychological safety scale (3 items) had acceptable internal consistency ($\alpha = .770$) both had scores above the typical criterion of .70 (Nunnally, 1978). The work engagement scale (3 items) had an alpha of .658, which is just below the .70 rating on the commonly used descriptive scale for Cronbach's alpha (George and Mallery, 2003) and the sustainable workplace environment scale (5 items) had an alpha of .615, also below the .70 rating on the commonly used descriptive scale for Cronbach's alpha (George and Mallery, 2003).

Table 1 Reliability Statistics by Scale

			Cronbach's Alpha		
Scale	Items	N			Interpretation
Sustainable Workplace Environment (SWE)	5 (SWE1–SWE5)	244	.615		Questionable
	3 (WE6–WE8)				
Work Engagement (WE)		244	.658		Questionable
	4 (EW9–EW12)				
Employee Well-Being (EW)		244	.805		Good
	3 (PS13–PS15)				
Psychological Safety (PS)		244	.770		Acceptable

Note. Interpretation bands follow George and Mallery (2003): $\alpha \geq .90$ excellent, $\geq .80$ good, $\geq .70$ acceptable, $\geq .60$ questionable, $\geq .50$ poor, $< .50$ unacceptable. All 244 cases were included with no missing data (100% valid) for each scale.

The lower alpha values found for the scales of the sustainable workplace environment and work engagement should be taken with a pinch of salt but are not uncommon for short scales. Cronbach's alpha tends to be sensitive to the number of items on a scale, and scales with three to five items tend to yield lower alpha values, but they are just as likely to be good as longer scales with many items, especially when the individual items are reasonably well-constructed, as was the case here (Tavakol & Dennick, 2011). However, the sustainable workplace environment scale in particular has a score that is below the level that is generally acceptable for research use, and this should be taken into account as a limitation in the interpretation of the results obtained when using this scale in future. An item-level review or scale

refinement should be considered.

4.2 Descriptive Statistics

Table 2 shows the descriptive statistics for the four primary study variables: sustainable workplace environment (SWE), work engagement (WE), employee well-being (EW), and psychological safety (PS). The ranges of all variables were within acceptable limits and the number of samples in each was 244.

Descriptive statistics are given for the demographic variables in Table 3. Participants had a mean age of 31.33 years ($SD = 6.48$). The majority of the sample had low levels of job position ($M = 3.22$, $SD = 0.91$) and organizational tenure ($M = 4.14$, $SD = 1.39$).

Table 3: Descriptive Statistics of Demographic Variables

Variable	N	Min	Max	M	SD
Age	241	17	56	31.33	6.48
Gender	243	1	2	1.78	0.42
Current Job Level	244	1	5	3.22	0.91
Organizational Tenure	243	1	6	4.14	1.39
Green Effect	244	1	2	1.45	0.50

4.3 Correlation Analysis

In this study, Pearson product-moment correlation coefficients were used to investigate the bivariate relationships between the four study variables before conducting regression, mediation and

moderation analyses. Table 4 indicates that all variables were significantly and positively correlated to each other ($p < .001$ in all cases) ranging from moderate to high ($r = .658$ to $.785$). The strongest link was with psychological safety

($r = .785$), and the weakest link (but still considerable) was with work engagement ($r = .658$) with the rest in between. These findings justify the planned regression, mediation, and

moderation analyses and confirm the theoretical assumption of the meaningful interrelationship of the four constructs.

Table 4: Pearson Correlations Among Study Variables (N = 244)

Variable	1	2	3	4
1. SWE	—			
2. WE	.658**	—		
3. EW	.726**	.684**	—	
4. PS	.660**	.708**	.785**	—

Note. ** $p < .001$ (two-tailed).

4.4 Regression Analysis

To test Hypotheses 1 to 3, a series of regression analyses were performed. A series of regression analyses was performed to test Hypotheses 1–3 which proposed that the sustainable workplace environment significantly predicts employee well-being (H1), that the sustainable workplace environment significantly predicts work engagement (H2) and that work engagement significantly predicts employee well-being (H3, tested jointly with H1 in a multiple regression model with the sustainable workplace environment).

Sustainable Workplace Environment Predicting Employee Well-Being (H1)

Simple linear regression was done between sustainable workplace environment as the predictor and employee well-being as the outcome. The overall model was statistically significant, $F(1, 242) = 269.33$, $p < .001$, with 52.7% of the variance in employee well-being accounted for by the model ($R^2 = .527$, adjusted $R^2 = .525$). The sustainable workplace environment significantly and positively predicted employee well-being, $B = 0.838$, $SE = 0.037$, $\beta = .726$, $t(242) = 16.41$, $p < .001$. These results support Hypothesis 1.

Table 5: Simple Regression: Sustainable Workplace Environment Predicting Employee Well-Being

Predictor	B	SE	β	t	p
(Constant)	4.425	0.613		7.22	< .001
SWE	0.838	0.037	.726	16.41	< .001

Note. $R^2 = .527$, Adjusted $R^2 = .525$, $F(1, 242) = 269.33$, $p < .001$.

4.4.2 Sustainable Workplace Environment Predicting Work Engagement (H2)

A second simple linear regression was run with the sustainable workplace environment as the predictor and work engagement as the outcome. The model was statistically significant, $F(1, 242)$

$= 184.63$, $p < .001$, and explained approximately 43.3% of the variance in work engagement ($R^2 = .433$, adjusted $R^2 = .430$). The sustainable workplace environment significantly and positively predicted work engagement, $B = 0.398$, $SE = 0.029$, $\beta = .658$, $t(242) = 13.59$, $p < .001$. These results are in favor of Hypothesis 2.

Table 6: Simple Regression: Sustainable Workplace Environment Predicting Work Engagement

Predictor	B	SE	β	t	p
(Constant)	4.718	0.657		7.18	< .001
SWE	0.398	0.029	.658	13.59	< .001

Note. $R^2 = .433$, Adjusted $R^2 = .430$, $F(1, 242) = 184.63$, $p < .001$.

4.4.3 Sustainable Workplace Environment and Work Engagement Predicting Employee Well-Being (H3)

Having sustainable workplace environment and work engagement as simultaneous predictors of employee well-being, a multiple regression was performed. This overall model was statistically significant ($F(2,241) = 181.97$, $p < .001$), and accounted for about 60.2% of the variance in employee well-being ($R^2 = .602$, adjusted $R^2 = .598$), a significant improvement in explained

variance when compared to the simple regression model mentioned above. Both predictors made statistically significant, independent contributions: the sustainable workplace environment, $B = 0.411$, $SE = 0.046$, $\beta = .487$, $t(241) = 9.02$, $p < .001$, and work engagement, $B = 0.507$, $SE = 0.075$, $\beta = .397$, $t(241) = 6.73$, $p < .001$. The results provide support to the hypothesis 3 that work engagement significantly predicts employee well-being even when the environment of the workplace is controlled for.

Table 7: Multiple Regression: SWE and WE Predicting Employee Well-Being

Predictor	B	SE	β	t	p
(Constant)	2.031	0.849		2.39	.018
SWE	0.411	0.046	.487	9.02	< .001
WE	0.507	0.075	.397	6.73	< .001

Note. $R^2 = .602$, Adjusted $R^2 = .598$, $F(2, 241) = 181.97$, $p < .001$.

4.5 Mediation Analysis (H4)

Hypothesis 4 was that there was a significant mediational effect of work engagement between the sustainable workplace environment and employee well-being. The hypothesis was tested with Model 4 of the PROCESS macro for SPSS (Hayes, 2022), where the independent variable (X) is the sustainable workplace environment, the mediator variable (M) is work engagement, and the dependent variable (Y) is employee well-being. A total of 5000 re-sample runs was used for bootstrapping to obtain 95% bias-corrected confidence intervals for the indirect effect.

The sustainable workplace environment significantly predicted work engagement (path a), $B = 0.398$, $SE = 0.029$, $t = 13.59$, $p < .001$. When the sustainable workplace environment (path b)

was controlled, work engagement was a significant predictor of employee well-being, $B = 0.507$, $SE = 0.075$, $t = 6.73$, $p < .001$. The effect of the sustainable workplace environment on the employee's well-being was partially mediated, as the direct effect was statistically significant after controlling for the mediator ($B = 0.411$, $SE = 0.046$, $t = 9.02$, $p < .001$). The indirect effect of the sustainable workplace environment on employee well-being via employee engagement was $B = 0.202$, Boot $SE = 0.038$, 95% CI [0.130, 0.279]. The indirect effect was statistically significant as the bootstrapped confidence interval did not include zero, thus supporting Hypothesis 4: the relationship between the sustainable workplace environment and employee well-being is mediated in part by work engagement.

Table 8: Mediation Analysis: Work Engagement as Mediator Between SWE and EW

Path	B	SE / BootSE	t	95% CI	p
a: SWE $\rightarrow$ WE	0.398	0.029	13.59	[0.341, 0.456]	< .001
b: WE $\rightarrow$ EW	0.507	0.075	6.73	[0.359, 0.656]	< .001
c': Direct effect (SWE $\rightarrow$ EW)	0.411	0.046	9.02	[0.322, 0.501]	< .001

ab: Indirect effect (SWE → WE → EW)	0.202	0.038	—	[0.130, 0.279]	sig. (CI excludes 0)
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Note. Bootstrap sample size = 5,000; CI = bias-corrected bootstrap confidence interval. c' = direct effect of X on Y controlling for M.

4.6 Moderation Analysis (H5)

Hypothesis 5 suggested that psychological safety will significantly moderate the relationship between the sustainable workplace environment and work engagement, and that this relationship will be stronger with a high level of psychological safety. The above hypothesis was tested using model 1 of the PROCESS macro (Hayes, 2022) where the independent variable (X) was the sustainable workplace environment, the moderator (W) was psychological safety, and the dependent variable (Y) was work engagement.

The overall model was statistically significant, $R^2 = .568$, $F(3, 240) = 105.10$, $p < .001$. The interaction between the sustainable workplace environment and psychological safety was not statistically significant, however, $B = 0.017$, $SE = 0.015$, $t = 1.14$, $p = .257$, 95% CI [-0.012, 0.046]. The change in R^2 attributable to the interaction was negligible ($\Delta R^2 = .002$, $F(1, 240) = 1.29$, $p = .257$). This result is inconsistent with Hypothesis 5: In this sample, the relationship between the sustainable workplace environment and work engagement was not significantly moderated by psychological safety.

Table 9: Moderation Analysis: Psychological Safety Moderating SWE → Work Engagement

Predictor	B	SE	t	p	95% CI
(Constant)	8.090	4.072	1.99	.048	[0.069, 16.112]
SWE	-0.019	0.200	-0.10	.923	[-0.413, 0.374]
PS	0.057	0.311	0.18	.854	[-0.555, 0.669]
SWE × PS (interaction)	0.017	0.015	1.14	.257	[-0.012, 0.046]

Note. $R^2 = .568$, $F(3, 240) = 105.10$, $p < .001$. Interaction R^2 change = .002, $F(1, 240) = 1.29$, $p = .257$ (not significant).

The same moderation model was also tested using employee well-being as the outcome variable ($Y = EW$), instead of work engagement, to see if the direct relationship between the sustainable workplace environment and employee well-being was directly moderated by psychological safety. The overall model was statistically significant, $R^2 = .695$, $F(3, 240) = 181.91$, $p < .001$, but the interaction term was again not statistically

significant, $B = 0.024$, $SE = 0.017$, $t = 1.39$, $p = .167$, 95% CI [-0.010, 0.058], $\Delta R^2 = .002$, $F(1, 240) = 1.92$, $p = .167$.

This additional finding extends the finding that psychological safety was not found to significantly moderate the pathways explored in the present study.

Table 10: Supplementary Moderation Analysis: Psychological Safety Moderating SWE → Employee Well-Being

Predictor	B	SE	t	p	95% CI
(Constant)	9.098	4.780	1.90	.058	[-0.319, 18.514]
SWE	-0.009	0.234	-0.04	.970	[-0.471, 0.453]
PS	0.134	0.365	0.37	.714	[-0.585, 0.852]
SWE × PS (interaction)	0.024	0.017	1.39	.167	[-0.010, 0.058]

Note. $R^2 = .695$, $F(3, 240) = 181.91$, $p < .001$. Interaction R^2 change = .002, $F(1, 240) = 1.92$, $p = .167$ (not significant).

In addition to the formal hypotheses, the sample

was divided into two industry groups: Textile ($n =$

137) and Information Technology (IT; $n = 107$), for the purposes of a supplementary comparison of the four study variables between industry groups. Independent samples t-tests were used for each variable; and a one-way multivariate analysis of variance (MANOVA) was performed to test for a multivariate difference between the two groups across all four variables simultaneously.

4.7 Independent Samples t-Tests

The equal variance assumption was rejected for all four variables for both industry groups with the Levene's test at $p < .001$ for each variable, so the Welch-corrected t and degrees of freedom are reported throughout. The scores for employees in the Textile industry were significantly higher than in IT industry on all four variables except psychological safety which yielded a non-

significant score difference.

For the sustainable workplace environment, Textile employees ($M = 22.69$, $SD = 2.56$) scored significantly higher than IT employees ($M = 21.81$, $SD = 1.69$), $t(236.14) = 3.22$, $p = .001$, $d = 0.40$. For work engagement, Textile employees ($M = 13.80$, $SD = 1.57$) scored significantly higher than IT employees ($M = 13.35$, $SD = 1.01$), $t(234.21) = 2.76$, $p = .006$, $d = 0.34$. For employee well-being, Textile employees ($M = 18.55$, $SD = 2.23$) scored significantly higher than IT employees ($M = 17.54$, $SD = 1.18$), $t(215.84) = 4.56$, $p < .001$, $d = 0.55$. For psychological safety, Textile employees ($M = 13.69$, $SD = 2.02$) and IT employees ($M = 13.52$, $SD = 0.91$) did not differ significantly, $t(198.97) = 0.88$, $p = .382$, $d = 0.10$.

Table 11: Independent Samples t-Test Results by Industry (Textile vs. IT)

Variable	Textile M (SD)	IT M (SD)	t	df	p	Cohen's d
SWE	22.69 (2.56)	21.81 (1.69)	3.22	236.14	.001	0.40
WE	13.80 (1.57)	13.35 (1.01)	2.76	234.21	.006	0.34
EW	18.55 (2.23)	17.54 (1.18)	4.56	215.84	< .001	0.55
PS	13.69 (2.02)	13.52 (0.91)	0.88	198.97	.382	0.10

Note. Welch-corrected t and df reported due to significant Levene's test for equality of variances ($p < .001$) for all four variables. Cohen's d computed using the unpooled (Glass-type unequal-variance) standardizer is not shown; values reported use the standard pooled standardizer.

4.7.2 Multivariate Analysis of Variance (MANOVA)

A one-way MANOVA analysis was used with industry (Textile vs. IT) as the independent variable and sustainable workplace environment, work engagement, employee well-being, and psychological safety were entered into the model simultaneously as dependent variables. The multivariate test was statistically significant, Wilks' $\Lambda = .860$, $F(4, 239) = 9.74$, $p < .001$, Pillai's Trace = .140, $F(4, 239) = 9.74$, $p < .001$, suggesting an overall difference across the combination of four outcome variables was

statistically significant due to industry group membership.

Follow-up univariate tests (Table 13) showed that industry significantly predicted the sustainable workplace environment, $F(1, 242) = 9.44$, $p = .002$, partial $\eta^2 = .038$; work engagement, $F(1, 242) = 6.88$, $p = .009$, partial $\eta^2 = .028$; and employee well-being, $F(1, 242) = 18.09$, $p < .001$, partial $\eta^2 = .070$. Industry did not significantly predict psychological safety, $F(1, 242) = 0.65$, $p = .421$, partial $\eta^2 = .003$. The univariate results are consistent with and confirm the independent samples t-test results presented in Section 4.8.1.

Table 12: MANOVA Multivariate Tests for the Effect of Industry

Test	Value	F	Hypothesis df	Error df	p
Pillai's Trace	.140	9.74	4	239	< .001
Wilks' Lambda	.860	9.74	4	239	< .001
Hotelling's Trace	.163	9.74	4	239	< .001
Roy's Largest Root	.163	9.74	4	239	< .001

Table 13: MANOVA Univariate Tests (Between-Subjects Effects) for the Effect of Industry

Dependent Variable	SS	df	MS	F	p	Partial η^2
SWE	46.56	1	46.56	9.44	.002	.038
WE	12.55	1	12.55	6.88	.009	.028
EW	61.61	1	61.61	18.09	< .001	.070
PS	1.74	1	1.74	0.65	.421	.003

Discussion

This chapter interprets and discusses the findings from Chapter Four based on the hypotheses of this study and the literature reviewed from Chapter Two. The chapter is structured by presenting each hypothesis, and then a discussion of the additional industry-comparison results, theoretical and practical implications, limitations of the study, and concluding remarks.

The significant and strong positive association between the sustainable workplace environment and employee well-being ($\beta = .726$, $p < .001$), accounting for more than 50% of the variance in well-being scores, is supportive of the large existing literature that links physical and organizational workplace conditions to employee health and well-being outcomes. This finding is consistent with the study of Dumitriu et al. (2025), which revealed that the physical and social work environment, such as light, temperature, indoor air quality, and noise, have a significant impact on employee mental health and well-being as well as the study of Zhenjing et al. (2022), which revealed that a positive work environment improves an employee's psychological resources, which in turn improves their performance-related outcomes. Interestingly, the Effect Size for the present study ($R^2 = .527$) was much higher than the relatively low direct effect found by Dumitriu et al. (2025) in their sample, which indicates that the physical and organizational dimensions of the workplace environment (ergonomics, indoor air quality,

lighting, green workspace design, and the comfort of the workplace) may have a stronger direct influence on employee well-being in the studied sample than in others.

The sustainable workplace environment was also found to have a significant and positive effect on work engagement ($\beta = .658$, $p < .001$), supporting Hypothesis 2, which directly corroborates the work of Padmavathi (2023) who established that sustainable workplace environment positively and significantly predicts work engagement, job satisfaction, and employee retention. This is also consistent with the work of Zhenjing et al. (2022) who revealed that positive work conditions (positive situational factors) reinforced employees' ability to strive to achieve, which is conceptually close to engagement. This finding is in line with the Job Demands Resources model on which this study is based and supports the view that the sustainable workplace environment is a job resource that fuels work engagement through vigor, dedication, and absorption.

Work engagement also significantly predicted employee well-being even when the sustainable workplace environment was controlled for ($\beta = .397$, $p < .001$) and the model's explained variance increased from 52.7% to 60.2% when work engagement was added to the model. This result is consistent with Shimazu and Schaufeli (2009), who showed that work engagement is positively linked to life satisfaction and negatively linked to ill-health, and with Rusu and Colomeischi (2020),

who demonstrated that work engagement positively predicts the psychological well-being across its dimensions. Combined with findings from H1 and H2, this is further evidence that work engagement is not simply a reflection of a positive work-related context, but rather actively promotes employee well-being in and of itself.

A mediation analysis also provided strong support for Hypothesis 4: When the sustainable workplace environment was the predictor, the employee well-being was the outcome, and work engagement was the mediator, there was a significant indirect effect of the predictor on the outcome through the mediator ($ab = .202$, 95% CI [.130, .279]), and a significant direct effect of the predictor on the outcome, controlling for the mediator ($c' = .411$, $p < .001$). The direct effect was still large, which meant that the mediation observed was partial and not complete, suggesting that the sustainable workplace environment has an indirect effect on employee well-being through the mediation of work engagement, in addition to the direct effect.

The pattern of partial mediation is relatively common across the studies cited in the literature examined for this study, but differed in the type of pattern (full mediation vs. partial mediation) found across the outcome across the studies. While Padmavathi (2023) found that work engagement and job satisfaction fully mediated between the sustainable work environment and employee retention, the current study revealed that only part of the relationship between the sustainable work environment and the well-being outcome was mediated by work engagement, suggesting that other aspects of the physical and organizational environment, such as the direct psychological or physiological effects of ergonomics, air quality, and lighting documented by Dumitriu et al. (2025), Haqi et al. (2023), and Zhang et al. (2022) may influence employee well-being independently of work engagement. Nevertheless, the important indirect pathway further supports the theoretical prediction based on the Job Demands-Resources model that a positive work context serves as a resource that facilitates engagement, which supports and sustains well-being through pathways involving engagement, as found by Rusu and Colomeischi (2020).

Psychological safety did not significantly moderate the link between the sustainable workplace environment and work engagement ($B = .017$, $p = .257$) nor significantly moderate the direct link between the sustainable workplace environment and employee well-being in the supplementary model tested ($B = .024$, $p = .167$). Thus, Hypothesis 5 was not substantiated.

As for this non-significant finding, bear in mind how Hypothesis 5 was initially formulated. The hypothesis – that psychological safety as a psychological workplace resource moderates the direct effects of physical and environmental workplace resources on engagement – was a theoretical extension of Albrecht et al.'s (2023) finding of a significant positive direct effect of psychological safety on engagement, but in the context of organizational change rather than in the context of the interaction between a physical or environmental workplace resource and engagement. The present results indicate that psychological safety, as theorized by Albrecht et al. (2023) may directly be an antecedent of engagement, but it does not necessarily have to reinforce or dampen the physical sustainable workplace environment-engagement link. A possible reason is that physical and psychosocial resources in this study work more independently than hypothesised: the physical resource may be good, but the psychosocial resource may not and vice versa—employees can become engaged in either case. This is an actual empirical finding that affirms, but does not prove, the theoretical extension presented in Chapter Two and is a verifiable addition of this study to the literature.

The same supplementary analysis revealed that scores for sustainable workplace environment, work engagement, and employee well-being were significantly higher for workers from the Textile industry than for workers from the IT industry with small to medium effect size ($d = 0.34$ to 0.55) with no significant difference found between the two industries on the psychological safety scale. The MANOVA confirmed a statistically significant overall multivariate difference between the two industries on all four variables taken together (Wilks' $\Lambda = .860$, $p < .001$); the univariate follow-up tests revealed that the effect of the variable employee well-being was the largest (partial $\eta^2 = .070$) and the effect of the psychological safety was the smallest and non-

significant (partial $\eta^2 = .003$).

These were not formally hypothesized within the context of the study as such, but were not directly predicted by the literature (found in Chapter Two) which did not compare industry sectors directly. What is generalized in this case is, however, broadly plausible: Textile-sector work in this case may be more physically defined, employ more on-site workplace conditions, and more salient to workers than to those in IT-sector work, which is more flexible or hybrid. Findings indicate that while psychological safety is significantly affected by industry sector, the difference appears small and insufficient to signal a distinct difference in the psychological safety of the work environment across industries. This suggests that interpersonal, psychosocial climate factors are more likely to be influenced by factors beyond the industry sector than by the industry sector itself, aligning with the notion that psychological safety is primarily a relational and not a physical-environment construct (Albrecht et al., 2023).

Implications

The results add to the Job Demands-Resources model, as a multidimensional sustainable workplace environment has a direct effect on the employee well-being as well as an indirect effect via work engagement in a single integrated model. The partial mediation pattern builds on the more complete mediation model described in neighboring studies (e.g., Padmavathi 2023) by indicating that the mediation role of engagement might vary by outcome predicted. The non-significance of psychological safety as a moderator also adds to theory as it suggests that not all psychosocial resources interact with all environmental resources, in the same manner as may be expected by the Job Demands-Resources logic; the interaction effects must be tested, and not assumed based on the presence of a significant direct effect somewhere else in the model.

The findings imply that when it comes to practitioners, investing in the physical and organisational aspects of the workplace, ergonomics, indoor air quality, lighting, green workspace design, and general comfort, provides a tangible, direct path to improving employee wellbeing, without any accompanying engagement-building efforts. Concurrently the substantial indirect effect via work engagement

suggests that, beyond investing in the environment, organizations have the potential to achieve further well-being outcomes by implementing practices that also foster work engagement, such as recognition initiatives, meaningful job design and skill application opportunities. Non-significant moderation by psychological safety indicates that organizations should not expect to see the effect that increasing psychological safety will have on the effectiveness of a well-designed physical environment to lead to increased engagement — in this sample, these factors seem to work independently of each other, rather than in tandem. The differences in the industry samples noted indicate that it may be possible for businesses in physically based industries like textiles to offer a more supportive workplace environment than businesses in IT, and IT-sector businesses in particular to rethink the physical and organizational aspects of their workplaces.

Limitations

A number of caveats must be taken into account when interpreting these results. First, the internal consistency of the sustainable workplace environment scale ($\alpha = .615$) and the work engagement scale ($\alpha = .658$) were questionable, with both scores being below the .70 threshold for conventional internal consistency. Results related to these two variables and the tests of the hypotheses (Hypothesis 1, 2, 4, 5) should be taken with a pinch of salt because measurement error in these scales could have weakened or otherwise confounded the actual relationships among variables; examination of each item should be considered or scale revision suggested before utilizing this instrument in future studies. Second, because of the cross sectional nature of the design, it is not possible to make causal inferences; the relationships observed are congruent with the hypothesized direction of the relationships, but they are also congruent with the reverse causal direction or other possible causal models and should be validated with longitudinal or experimental designs. Third, all measures were self-reported, which could lead to common method bias enhancing the observed relationships. Fourth, the sample was limited to just two industry sectors, Textile and IT which reduces generalizability of findings, the primary and the industry comparison. Finally, the nonsignificance

result for the moderation of psychological safety would have to be interpreted with caution because none of the published literature reviewed for this study tested this specific interaction; this may be due to a small and homogenous participant sample or to the use of a measure of psychological safety that was not validated specifically for this study.

Conclusion

This study examined the impact of a sustainable workplace environment on employee well-being, and the mediating role of work engagement and the moderating role of psychological safety in this relationship. Work engagement and employee well-being were significantly predicted by the sustainable workplace environment; work engagement partially mediated the relationships

between the sustainable workplace environment and employee well-being. There was no significant interaction between the sustainable workplace environment and work engagement through psychological safety. A supplementary analysis also showed that the scores were better for employees in the Textile industry compared to employees in the IT industry on the domains of Sustainable workplace environment, Work engagement, and Employee well-being, but not on the domain of psychological safety. As a whole, these findings confirm in part the theoretical model proposed in Chapter Two, while highlighting the specific boundary condition that is the non-significant moderating effect of psychological safety, which would provide a future path for research.

Conflict of Interest

The authors showed no conflict of interest.

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Data Availability Statement

Data are available from the corresponding author upon reasonable request.

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