THE IMPACT OF GREEN TRANSFORMATIONAL LEADERSHIP ON GREEN WORK ENGAGEMENT: EXAMINING THE MEDIATING ROLE OF GREEN ORGANIZATIONAL CLIMATE

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Abstract:
This study aims to understand how green transformational leadership (GTL) affects green work engagement (GWE) and green organization climate (GOC) and ultimately leads to positive outcomes for the organization and planet, by examining the relationship between green transformational leadership (GTL), green organizational climate (GOC) and green work engagement (GWE). Using data from 303 participants, structural equation modeling (SEM) and bootstrapping techniques were used to test the direct and mediating effects. The result showed the GTL had a positive effect on GWE and GOC, while GOC directly improved GWE. Furthermore, GOC partially moderated the relationship between GTL and GWE, highlighting the important role of working in a safe environment in developing leadership. By combining leadership and emotional support, the study highlights the importance of transformational leaders and supportive climate in encouraging employee engagement in green projects

Key Words: Green Transformational Leadership, Green Work Engagement (GWE), Green Organization Climate (GOC).

1. Introduction:

Climate change is a crucial global issue, raising a severe threat to humanity. Many scientists noted that its foundation lies in environmental changes. (Younis & Hussain, 2023). Currently, environmental issues have a adverse effect at the international level. The proactive efforts are required at the individual, organizational, and societal levels to address this issue. Many researchers explore technologies such as renewable energy, recycling, and carbon reduction to mitigate ecological damage. (Suliman et al., 2023).

In this context, organizations must minimize their activities which have negative impact on the environment. Employee behavior plays a critical role in achieving these goals and remain competitive in the global world. (Younis & Hussain 2023). Organizational culture plays significant role in forming human resource management systems and influencing employees' attitudes and behaviors and green organizational culture foster employees' environmentally responsible actions. (Liu & Wang,2024). One aspect of Green Organisational Climate (GOC) reflects the employees' shared perceptions of their organisation's commitment to environmental sustainability values and practices. (Chan et al., 2014; Norton et al., 2017).

The leaders play an important role to achieve these goals, in operating green practices and encouraging employees to actively engage in environmentally friendly behaviors. Green transformational leadership" is defined as "behaviors of leaders who motivate employees to achieve environmental goals and inspires them to exceed expectations in achieving environmental performance. (Chen et al., 2014).

Employees with have a high level of green work engagement will strive hard to achieve the company's goals, so that they can contribute to implementation of environmentally friendly programs and ultimately affect employee performance to increase. It can be concluded that

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green work engagement can affect green employee engagement. In this research, Green work engagement is considered to be influenced by green transformational leadership. (Chen, 2011).

Although GOC is examined as a variable with a significant impact on organizational activities and substantially influences corporate environmental practices (Chan et al., 2014; Norton et al., 2017) but the relationship between the GTL, GWE and GOC has not been analyzed earlier. According to social information processing (SIP) theory, individuals' cognition and behaviors are regulated by their interpretation of situational information, with perceptions and interpretations of their social environment being selective. (Liu & Wang,2024).

In the organizational context, green transformational leadership is an important element which recognizes the environmental issues, in addition to activates modern strategies that are concerned with developing performance and increasing productivity. Some studies therefore recommend additional research on mediating factors between green transformational leadership and green work engagement, including organizational climate. (Suliman et al., 2023).

Green organizational climate is one of the potential mediating factors, which represents the employees' insights towards the organization's commitment to environmental sustainability. A supportive GOC emphasizes the values promoted by green transformational leaders, empowering employees to engage in green practices. By examining the mediating role of GOC, this study seeks to provide a deeper understanding of how GTL fosters GWE. (Chen et al., 2014). There were some recent research studies which have established a significant association between GTL, the environmental performance of enterprises, and green work engagement. (Sobaih,2022).

However, there is limited research regarding the association of the factors mentioned above and there is no previous research exploring the relationship between green transformational leadership and green work engagement in the educational sector. This research aims to bridge the gap regarding the significance of GTL in supporting the green climate of an organization as well as green work engagement. It also examines how green organizational climate mediate the relationship between GTL and GWE in the educational sector.

1.1 Research Questions
RQ1:
How does green transformational leadership influence green work engagement?
RQ2:
How does green transformational leadership influence green organizational climate?
RQ3:
How does green organizational climate intermediate the relationship between green transformational leadership and green organizational climate

1.2 Significance of the Study
Climate change is a global challenge posing a severe threat to humanity. The study emphasizes the role of organizations and leaders, fostering environmentally responsible behaviors. (Younis & Hussain, 2023). It highlights how organizational culture, particularly through a Green Organizational Climate (GOC), and leadership styles such as Green Transformational Leadership (GTL), can drive employee engagement in sustainable practices. (Chan et al., 2014; Norton et al., 2017). Collectively, these elements enable organizations to promote and sustain pro-environmental behaviors across all levels. (Chen et

al., 2014). This study particularly focuses on the educational sector, to understand how educational institutions can act as catalysts for environmental change. By examining the mediating role of GOC in the relationship between GTL and Green Work Engagement (GWE), this research fills a significant knowledge gap, especially in understanding the mechanisms that connect leadership practices to employee behaviors in green initiatives. (Chen et al., 2014). It not only contributes to the theoretical understanding of GOC and GWE but also provides practical implications for developing strategies to embed sustainability in organizational practices, particularly within educational institutions, which are uniquely positioned to influence future generations.

2. Literature Review:

2.1 Social Information Processing Theory

Based on social information processing theory (SIP; Salancik & Pfeffer, 1978) this study examines the influence of shared leadership on creative team performance. Social information processing theory (SIP) explains the social information of employees in working environments has a convenient effect on their attitudes, emotions, and behaviors (Salancik & Pfeffer, 1978). Social media in the workplace can be divided into two categories: messages from individuals,such as managers and colleagues, and messages from the environment, such as events. Specific or cultural (Bhave et al., 2010).

Drawing on SIP theory (Salancik & Pfeffer, 1978), we argue that partners in collaborativeadership obtain social information from the group environment through leader-follower discussions. Through these interactions, members can exchange information, develop shared understandings, and shape behaviors (Anderson & West, 1998; Campion et al., 1993). Since a fundamental aspect of shared leadership involves the importance of identifying the expertise of others through collaborative interactions to build upon the ideas of others (Hoch, 2013), team members who operate in such contexts retrieve social information that indicates that innovation is encouraged, supported, and rewarded, thereby fostering a climate for innovation.

SIP theory (Salancik & Pfeffer, 1978) was used to examine that how mindful leadershipinfluences employee environmental efficacy. Through different procedure first by appointing supervisor on employees in the workplace, that supervisor had the power to delegate tasks and engage in day-to-day routine works and interactions.

These interactions are important points for employees to interpret social media messages. Aware leaders show openness to change, ensure that employees understand environmental change, and show commitment to environmental protection (Zheng et al., 2022; Thanh, 2019).This sharing procedure and understanding motivate employees' alignments with organizational environment initiatives (Haldorai et al., 2023).

This encourages their passion for environmental issues. It is also associated with mindful leadership, caring about team members' concerns and situations, building employee trust, and strengthening leaders and the company. (Wibowo & Paramita,2022); (Rupprecht et al., 2019). When employees feel that he have full support by their organization, they are more open to messages related to environmental control and sustainability (Aboramadan et al.,2021; Zheng et al.,2022). Disseminating this information encourages employees to gain a broader perspective while strengthening their commitment to the environment by making them aware of the importance of caring for the environment and connecting with the natural environment. (Wibowo & Paramita,2022; Choong et al.,2019).

2.2 Green Transformational Leadership

Transformational leaders may encourage its followers to take the initiative to accomplish their objectives (Bass, 2000). Green transformational leadership is defined by Chen and Chang (2013) as the trait of a leader who inspires and support his colleagues to achieve environmental goals and surpass the expectations from an environmental perspective. GTL plays an important part in developing and practicing policies that help green human resource management (GHRM) to integrate the positive strategies enabling to achieve green performances in the firm. (Jia et al., 2018). GTL underlines distinct requirements of the employees, motivating them to produce and practice GHRM policies to inspires and empower their followers. Therefore, we expect that GTL has a meaningful role in aiding positive GHRM practices, such as training and development, recruitment and selection, and performance-based incentive, all of which align with GTL to achieve the desired goals of firms, successfully. (Zhu et al., 2005). Green transformational leadership focus on the the specific needs of individual subordinates, offer guidance and supports them, and infuses a sense of belonging (Mittal and Dhar, 2015). Intellectual stimulation can improve the cognitive abilities of his followers' and motivate them to generate problems, conduct research, and develop solutions, making followers more dynamic and productive (Mansoor et al, 2021).

2.3 Green Work Engagement

Green Work Engagement is described as a positive, meaningful, and motivational attitude, which is characterized by vigor, dedication, and absorption (Schaufeli et al, 2017). Vigor refers to the characteristics such as high levels of energy, resilience, determination and persistence in the face of challenges. Dedication involves feelings of inspiration, value, enthusiasm and sense of challenging and Absorption signifies full concentration on a task (Schaufeli et al, 2017). Engagement is a positive mindset where a person goes beyond their basic responsibilities, enhancing their level of ownership and enlightening the organization's overall goals (Dajani, 2015). It represents the degree to which employees are cognitively, emotionally, and physically connected to their work. Based on this, Green work engagement (GWE) can be discussed as the energy and enthusiasm employee's devoted to environmentally friendly tasks and their level of absorption in environmentally conscious work (Aboramadan, 2020).

2.4 Green Organizational Climate

Organizations that have a strong reputation and are recognized for serving the community (John et al., 2019) intends to boost employees pride and self-esteem (Kim e al., 2020). According to this theoretical perspective, a green vision in the form of a Green Organizational Climate GOC would be deemed appealing to employees because green practices can enhance the status and image of the organization (Raza et al., 2021), which escalates the employee's pride. Consequently, this enhances their identification with the organization (Raza et al., 2021). GOC not only promotes green practices and policies of the organization but also highlights the core values and ethics that are of vital importance in their organization (Khan et al., 2019). Such a climate can aid an organization to build a positive image and internal reputation, which makes its employees feel proud to be associated with the organization (Teng et al., 2020). In turn, often employees engage in voluntary initiatives to preserve this climate, thereby they attempt to maintain their identity and the organization's reputation (Teng et al., 2020). As (Dumont et al. , 2017) highlighted, when an organization actively encourages its employees to adapt the environmentally supportive practices through its GHRM practices, it develops an effective change in the form of a GOC within the organization.

2.5 Green Transformational Leadership and Green Work Engagement

Overall, work engagement has been recognized as significant facilitator in many research studies (Salama et al., 2022; Hung et al., 2021). An employee's level of eagerness for their work is often considered to be a key reason in determining their productivity (Salama et al., 2022). Regarding the environmental concerns, employees may not always be expected to be creative and resourceful; in certain instances, they are required to adhere the institutional regulations and procedures that have been established to set certain workplace behaviours.

Their participation in green initiatives largely depends on the perceived social and economic resources and support within the workplace (Ababneh et al., 2021). In the context of transformational leaders and environmental engagement, such leaders not only deliberate their environmental values but they also communicate their environmental vision to their teams and take appropriate actions to address any environmental issues (Graves and Sarkis, 2018). Leadership practices has been observed to contribute towards employee engagement at workplaces (Gill et al. 2023) It has also been found that when organisations priortize the green activities, transformational leaders support to inspire their employees to contribute in more green ideas and activities (Jia et al., 2018). Based on the above arguments, we can conclude that the leader's engagement towards environmental initiatives can foster positive feelings among the employees and motivate them in the organisation's green activities. Thus, we propose the following hypothesis:

H1: Green transformational leadership has a significant, positive impact on green work engagement

2.6 Green Transformational Leadership and Green Organizational Climate

It is perceived that the green transformational leadership will provide more green support to the members of the organization. This perception can lead to increased organizational citizenship behavior toward the environment (Jo & Joo, 2011). Employees who demonstrate higher levels of organizational citizenship behavior are more likely to exercise self-control beyond expectations and make extra efforts to achieve environmental goals (Daily et al., 2009). This will help to create a better environmental foundation and support conditions for green product innovations. On the other hand, green transformational leadership by emphasizing on encouraging environmental protection measures, not only promote the cooperative spirit and coordinated behavior among employees but also effectively enhance the organizational citizenship behavior toward the environment. (Montani et al.,2005). The research indicates that this relationship will be stronger when employees are highly engaged in the organization and receive support for extensive innovation from supervisors. (Montani et al.,2005).

A green organizational atmosphere refers to the collective perception formed through the implementation of sustainable development policies within the organization. It reflects employees' shared views on the organization's environmental management policies, practices, and processes (Zientara & Zamojska, 2016). Such an atmosphere develops through interactive learning, where individuals infer information from their surroundings via social interactions, leading to a consensus on organizational practices and policies (Schneider, 1998). The creation of this atmosphere largely depends on the behavior of senior managers and how they communicate and interpret the policy framework to employees (Kuenzi & Schminke, 2009). Based on this, the following hypothesis is proposed:

H2: Green transformational leadership has a significant, positive impact on green Organizational Climate

2.7 Green Work Engagement and Green Organizational Climate

As previously stated, inclusive leadership in green contexts, was identified as a key factor of employees' work engagement (Choi et al., 2015; Cenkci et al., 2021). Work engagement is strongly related to leaders who delivers attention, care, and encouragement to employees

(Bao et al., 2022). On the other side, prior research has shown a significant and positive correlation between work engagement and employees' green organization. (Byaruhanga & Otuma ,2016; Priskila et al., 2021).

These findings suggest that engaged employees have a better tendency to get involved in discretionary behaviors because they are intrinsically motivated and have a genuine driven to contribute to the organizational success. Their high levels of vigor and passion make them more enthusiastic to invest their time and effort in voluntary activities that enhance the organization's well-being and effectiveness. (Zaabi et al., 2016; Zhang et al ., 2017 ; Farid et al ., 2019).

Accordingly, employees' positive perception of inclusive leadership is estimated to be associated with a higher levels of work engagement, which, in turn, is likely to have a noteworthy impact on promotion of green organizational behavior. (Trivedi,2004). Based on the above findings, it can be concluded that higher perceived green inclusive leadership leads to enhanced green work engagement, which, consequently, contributes to development of Green Organizational Climate. Hence, we suggested the following.

H3: Green Organizational Climate has a significant, positive impact on Green work engagement

2.8 Mediating Role of Green Organizational Climate

In order for organizations and employees to be environmentally- friendly it is essential to establish a suitable climate. The concept of a green organizational climate (GOC) has been introduced in the organizational behavior literature to address the challenge of cultivating an environment that encourages green-oriented employee behaviors (Erbaşı, 2023). Organizations are increasingly encouraged to adopt and implement green policies and practices in order to boost their environmental performance (Xiao et al., 2020). This has given rise to the emergence of various management concepts that focus on the organizational policies that contribute to the environment and direct employee behaviors. On this basis, the concept of green organizational climate has emerged with the assumption that organizational climate influences the behavior of employees towards the environment. Erbaşı, 2023),

A Green Organizational Climate GOC not only promotes green practices and policies of the organization but also highlights the values and ethics that are of vital importance in the organization (Khan et al. 2019). Employees often feel pride when they are associated with sustainable organizations, as these organizations are considered competent, responsible, and dedicated to serving the environment which enhances their reputation and status (Jones et al., 2014). The core assumption in this research is that employees' perceptions of green work climate mediate the positive relationship between their understanding of sustainability policies and their green organizational behaviors. Similarly, (Norton et al., 2015) illustrates that the environmental sustainability is the main objective of the organization. It is possible to achieve through the green organizational behavior of employees. Therefore, the green organizational climate is considered essential to demonstrate the green organizational behavior.

An effective Green Organizational Climate GOC develops a positive image of the organization, ensuring employees that their green efforts will be valued and appreciated by the organization (Saeed et al. 2019). The congruence between the goals of the organization and its employees is enhanced when employees develop the positive perception of a GOC and foster strong green values and beliefs, (Ashforth and Mael 1989).

This alignment strengthens the identification of the employee within the organization and enhances the self-esteem of employees. They become more motivated to engage in behaviors to demonstrate support to the organization because identification reduces the disparity

between the organization and its employees' interests. (Naz et al. 2021). Therefore, we formulated the following hypothesis:

H4: Green Organizational Climate mediates the relationship between Green Transformational Leadership and Green work engagement
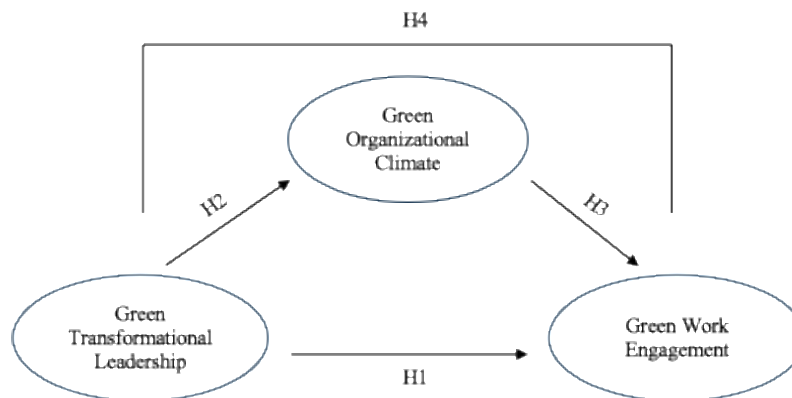
The above discussion is summarized in **Figure 1.**

Figure 1: Hypothesized Model

3. Methodology

The data was collected from employees in the education sector, specifically from universities and schools in Punjab, and analyzed using sing AMOS v23.0, a covariance-based SEM technique that uses the maximum likelihood approach. The measurement model was evaluated by examining the reliability of the indicators. Internal consistency reliability was assessed through Cronbach's alpha and composite reliability (CR), while convergent validity was determined using the Fornell-Larcker criteria. The structural model's validity was tested using path coefficients, T-values, confidence intervals, and beta values. After validating the model, the analysis and results of the hypothesis testing were presented.

3.1 Data Collection Instrument

Self-administrative questionnaire was modified by the prior researchers, who also employed quantitative and deductive methodologies. The constructs being studied were measured using trustworthy scales.

3.2 Data collection and Sampling

Both a printed version and a Google Form were utilized for the survey. To collect the data, the researcher conducted in-person visits to various Universities and Schools. For those who filed the google form the researcher explained the research objectives and the questionnaire content before questionnaire mailing which was accompanied by a cover letter. The respondents were asked to return the completed questionnaires within two weeks through mailing. After discarding incomplete or invalid responses, 303 surveys were selected from the 400 received, using a convenience sampling method.

3.3 Measurements of variables

The Likert scale used to rate the study's constructs ranged from 1 to 5, with 1 denoting strongly disagree and 5 denoting strongly agree. Six-item scale that was modified from a previous study by Chen & Chang (2013) was used to evaluate the GTL. A six-item Aboramdan-adapted scale was used to assess the GWE (2020). Norton, Zacher & Ashkanasy (2014) developed a six - item scale to assess the Green Work Climate Perceptions (GWCP).

3.4 The Measurement of the Constructs

The measurements of the constructs in this study are described in the following:

Green transformational leadership: We refer to (Chen and Chang, 2013) to measure green transformational leadership, and its measurement includes six items: (1) My leader provides a clear environmental vision for the followers to follow. (2) My leader inspires followers with environmental plans (3) My leader gets the employees to work together for the same environmental goals. (4) My leader encourages human resources to achieve environmental goals.(5) My leader acts by considering the environmental beliefs of the individuals. (6) My leader stimulates subordinates to think about green ideas

Green Work Engagement: We refer (Aboramadan, forthcoming) to measure green work engagement , and its measurement includes six items (1)My environmental- related tasks inspire me.(2) I am proud of the environmental work that I do.(3)I am immersed in my environmental work.(4) I am enthusiastic about my environmental tasks in my job.(5)I feel happy when I am working intensely on environmental tasks.(6) With environmental tasks at my job, I feel bursting with energy.

Green Organizational Climate: We refer (Norton et al.,2014) to measure green organziational climate, and its measurement includes six items (1) Our company is interested in supporting environmental causes. (2) Our company is worried about its environmental impact. (3)Our company believes it is important to protect the environment. (4) In our company, employees try to minimize harm to the environment. (5) In our company, employees are concerned about acting in environmentally friendly ways. (6) In our company, employees care about the environment

4. Data Analysis

The descriptive statistics, correlation, validities, and measurement model

The structural equation modeling (SEM) is used to test hypotheses using analysis of moment structures (AMOS 23) and statistical package for social sciences (SPSS 23). A bootstrapping method was used to test the mediation impact of direct and indirect paths with 10,000 samples and 95% confidence intervals. Table 1 shows the respondents' demographic, out of the 303 respondents 108 are male (35.6%) and 195 are female (64.4%) respondents. A majority of respondents (n = 126; 41.6%) hold graduate degrees, while the remaining have undergraduate degrees (n = 42; 13.9%), master's degrees (n = 56; 18.5%), or higher education (n = 79; 26.1%). The majority of the respondents are between the ages of 20 and 29 (n = 97; 32%) and between the ages of 30 and 39 (n = 160; 52%). Over half (n = 163; 53.8%) of respondents have between five and ten years of work experience; the rest have one to five years (n = 71; 23.4%) or more than ten years (n = 69; 22.8%).

Table I. Demographics of research sample (N = 303).

Gender	Male	Female		
	35.6%	64.4%		
Age	20-29	30-39	>39	
	32%	52%	16%	
Educational Level	Undergraduate	Graduate	Masters	PhD
	13.9%	41.6%	18.5%	26.1%
Years of Experience	1 – 5	5 – 10	>10	
	23.4%	53.8%	22.8%	

The descriptive statistics, reliability and correlations displayed in Table II. There is Cronbach's alpha ≥ 0.70 for all scales, which confirm their internal consistency (Fornell & Larcker, 1981; Nunnally & Bernstein, 1994). As stated in Tabachnick and Fidell (2013), there is no evidence of multicollinearity concerning the data because the correlation among variables is below 0.70 (Tabachnick & Fidell, 2013). The Harman single-factor test (Podsakoff et al., 2012) do not demonstrate any common bias among research variables. This study shows that the scale items loaded into a latent variable that accounts for 44.85% of the variance, which is below the threshold of 50% (Mattila & Enz, 2002).

Table II. Variables: Mean, standard deviation, reliability, and correlation (r)

	1	2	3	4	5	6	7
1. Green transformational leadership	(.94)						
2. Green organizational climate	.49**	(.80)					
3. Green work engagement	.58**	.50**	(.91)				
4. Gender	.094	.191**	.035				
5. Age	-.035	-.038	.027	-.342**			
6. Experience	.030	.009	.075	-.301**	.069**		
7. Education	.070	.091	.061	-.045	.025	.097	
Mean	3.55	3.53	3.43	1.64	32.98	1.69	2.56
SD	.82	.80	.81	.47	7.60	.46	1.02
CR	.90	.90	.85	-	-	-	-
AVE	.61	.60	.50	-	-	-	-
√AVE	.78	.77	.70	-	-	-	-

"** p ≤ 0.01, *. p ≤ 0.05. We present Cronbach's alphas (α) in parentheses."
"Gender: 1 = male, 2 = female // Age: 1= 20-29, 2= 30-39, 3= 40-49, 4= 50-59, 5= 60 or above"
"Work experience (in years): 1= 1-5, 2= 6-10, 3= 11-15, 4= 16-20"
"Education level: 1 = Undergraduate, 2 = Graduate, 3 = Master, and 4 = M.Phil./Doctorate"
"SD=standard deviation, CR=composite reliability, AVE=average variance extracted"

It appears that green transformational leadership is positively associated with green organizational climate (r = -0.49, p ≤ 0.01) and green work engagement (r = 0.58, p ≤ 0.01). The green organizational climate is positively associated with employees' green work engagement (r = 0.50, p ≤ 0.01).

The data in Table III shows that the research variables meet the criteria for convergent validity: AVE ≥ 0.50, CR values > 0.7 (Fornell & Larcker, 1981), and discriminant validity since the AVE's square root value is greater than the correlation between the constructs (Zait & Bertea, 2011). It can be seen from Table III that the three-factor model fitted well ($\chi2$ = 342.374, df = 129, $\chi2$/df = 2.654, RMSEA = 0.074, NNFI = 0.94, CFI = 0.92).

Table III. Confirmatory factor analysis results

Models	$\chi2$	Df	Ratio $\chi2$ / df	CFI	NNFI	RMSEA
One-factor [a]	1248.239	134	9.315	0.687	0.643	0.166
Two-factors [b]	880.142	132	6.668	0.790	0.757	0.137
Three-factors [c]	342.374	129	2.654	0.940	0.929	0.074

a. GTL, GOC, and GWE all in one factor
b. GTL and GOC in one factor, and GWE in one factor

c. GTL in one factor, GOC in one factor, and GWE in one factor
"GTL=Green transformational leadership, GCO=Green organizational climate, GWE=Green work engagement"

Direct Effect Results

Table IV shows results on the impact of green transformation leadership on green work engagement, and green organizational climate, further, green organizational climate on green work engagement, which confirm hypotheses 1 to 3.

Table IV. The direct links results

Hypotheses	Results	Estimate	T-values	P
H1	GTL→GWE	.517	5.829	***
H2	GTL→ GOC	.753	7.788	***
H3	GOC→ GWE	.300	5.046	***

GTL=Green transformational leadership, GCO=Green organizational climate, GWE=Green work engagement"
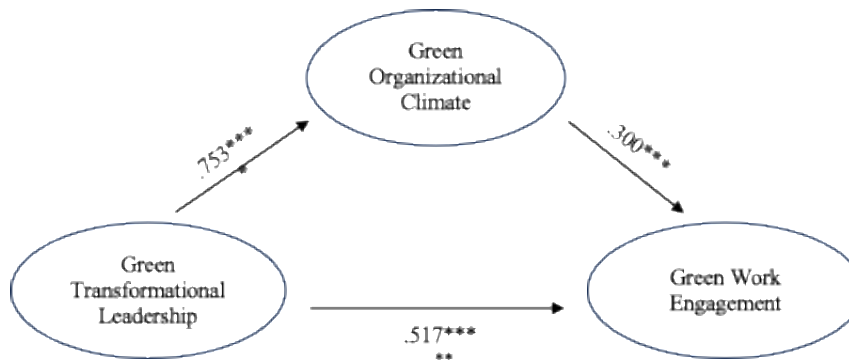

Figure 2:

Hypothesized Model Results

Indirect Effect Results

Table V shows results on the impact of mediations among research variables, which confirm hypotheses 4. The association between green transformational leadership and green work engagement is mediated by green organizational.

Table V. The mediation links results

Hypotheses	Results	Bootstrap BCa 95 % confidence intervals			
		Estimate	Lower	Upper	P
H4	GTL→GWE	.517	.310	.784	***
	GTL→GCO→GWE	.226	.133	.379	***

"BCa: bias-corrected and accelerated bootstrapping confidence intervals. Estimate based on 10,000 bootstrap samples".

"GTL=Green transformational leadership, GOC=Green organizational climate, GWE=Green work engagement"

5. Discussion and Conclusion

The findings of this study highlight the significance of the relationships among green transformational leadership (GTL), green organizational climate (GOC), and green work engagement (GWE), while focusing on the emerging literature on eco-friendly organizational practices. The results demonstrate that GTL has a direct and significant positive effect on both GOC (β=0.753, p$\leq$0.001) and GWE (β=0.517, p$\leq$0.001). This underlines the vital role of transformational leaders in promoting sustainable organizational environment and engaging employees in such environment. Furthermore, the current study supports the positive relation between the GOC and GWE (β=0.300, p$\leq$0.001), revealing the crucial role of an organization-wide green culture in encouraging employees to engage in green initiatives.

Further, a finding of this study is that GOC is mediating the positive relationship between GTL and GWE (β=0.226, 95% *CI* [0.133,0.379], p$\leq$0.001). This finding underscores that while transformational leaders directly motivate employees to engage in green activities, their influence is strengthened through developing the green organizational climate. These results support with current literature, which features the significance of leadership and organizational culture in influencing pro-environmental behaviors. The mediation effects were validated, ensuring the robustness of the findings by using bootstrapping with 10,000 samples.

The study also determines the reliability and validity of the measures used, with all scales presenting high internal consistency ($\alpha \geq 0.70$) and robust convergent and discriminant validity. Further, the confirmatory factor analysis results support the multidimensional nature of the constructs, as an excellent fit of the three-factor model ($\chi 2$/df=2.654, RMSEA=0.074, CFI=0.92). Moreover, the Harman's single-factor test validated the lack of common method bias, enhances the credibility of the findings.

5.1 Practical Implications

From the practical perspective, the findings highlight that organizations need to invest in leadership development focused on sustainable capabilities. Transformational leaders can act as agents of change by promoting environmentally friendly practices and creating a green workplace, thereby engaging employees. Additionally, organizations need to develop green practices and benefits to create a supportive environment that encourages employees to adopt positive behaviors. These findings suggest that leaders who adopt GTL can engage employees in green initiatives, thereby promoting corporate behaviors and practices.

Based on these results, organizations and boards of directors should prioritize supporting a green organization and encouraging employees to adopt green leadership. Management should integrate green values into the culture and ensure that environmental sustainability becomes an integral part of the corporate identity. By implementing green management strategies, companies can transform their operations from traditional resource-intensive processes to more efficient, sustainable production processes. Frozen and cleaner.

The study also highlights the importance of establishing specific policies and regulations that promote safety in organizations. These policies should include the development of green

technologies and practices to reduce the environmental impact of the industry. For example, supporting the adoption of green IT can help reduce the environmental impact of production processes, such as reducing energy consumption and waste generation.

Finally, organizations should consider how to strengthen the organization's green culture through rewards, recognition, and transparent communication of achievements. This way, businesses can continue to incorporate green practices into their operations and make a long-term commitment to environmental sustainability. And supporting a green safety organization to encourage employees to adopt environmentally friendly practices. These measures help support the transition to sustainable, green business practices, ultimately benefiting the organization and the planet.

5.2 Limitations and Future Recommendations

The present study has some noteworthy limitations that should be considered in future research. First, the demographic analysis illustrated that the females (64.4%) are the majority respondents, aged between 30–39 (52%), and years of work experience falls between 5–10 years. This implies that the sample is dominated by individuals with graduate and higher education degrees, which may limit the generalizability of the findings to less-educated populations.

Second, cross-sectional design was used in the study due to which it is not possible to infer causality. The future research should conduct longitudinal research design to examine the casual effect of green transformational leadership (GTL) and green organizational climate (GOC) on green work engagement (GWE).

Third, this study relies on self-reported measures that may be subject to bias, which may affect the validity of the results. Future research should consider including multiple data sources, such as supervisors or personnel raters, to reduce this bias and ensure consensus on a good relationship.

Fourth, although this study focused on work engagement as the main outcome, other important outcomes such as new work behaviors, mindset change, work commitment, and job satisfaction are also affected by GTL and GOC. Furthermore, future research could expand its scope to include these additional outcomes to provide a better understanding of green leadership and climate agency effects. What are employee attitudes and behaviors?

Fifth, the subject of our research is educational sectors in Punjab. Future research can verify and validate the findings of studies conducted in other specific sectors such as manufacturing or hospitality. It is also believed that the GOC indicator will be useful in sectors where green innovation is more prevalent. Futher, future researchers can add other cultural dimensions such as cultural support to models designed to examine issues that may influence people's actions.

Additionally, GOC is the only decision maker in this study who plays a negotiating role between GTL and GWE. Future studies could investigate other mechanisms (e.g., green commitment and green beliefs) that may mediate this relationship. Finally, data were collected through a self-administered questionnaire that allowed participants to respond honestly based on their own experiences. Future research could benefit from integrating more methods to obtain deeper insights.

5.3 Conclusion

The current study determines the significant role of the green transformational leadership (GTL) in fostering green work engagement (GWE), with green organizational climate (GOC) serving as a considerable mediator. The study highlights the importance of enlightening a green organizational climate that aligns with the environmentally responsible practices, through leadership practices that can considerably impact employee engagement. In the highly environmental consciousness era, the leadership must embrace green management

practices and integrate eco-friendly culture into the organization. By aiming green transformational leadership and developing a green organizational climate, organizations can bring valid change toward a more environmental conscious future, benefiting both the organization and the environment.

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