

DOI: 10.5281/zenodo.17871905

# GREEN ORGANIZATIONAL CULTURE AND SUSTAINABLE PERFORMANCE: EXAMINING ROLE OF SUSTAINABLE LEADERSHIP, GREEN INNOVATION. ENVIRONMENTAL COMMITMENT AND ECO- EFFICIENCY

Vimala Venugopal Muthuswamy<sup>1\*</sup>, Amirtha Azhagirisamy<sup>2</sup>

<sup>1</sup>Department of Management, School of Business, King Faisal University, Al-Ahsa 31982, Saudi Arabia.

Email: [fmuthuswamy@kfu.edu.sa](mailto:fmuthuswamy@kfu.edu.sa)

<sup>2</sup>Assistant Professor, Department of Management Science, Sri Krishna Arts and Science College, Kuniyamuthur, Coimbatore - 641008, Tamilnadu, South India. EMAIL: [amirthaa@skasc.ac.in](mailto:amirthaa@skasc.ac.in)

Received: 17/07/2025

Accepted: 10/10/2025

Corresponding Author: Vimala Venugopal Muthuswamy

([fmuthuswamy@kfu.edu.sa](mailto:fmuthuswamy@kfu.edu.sa))

## ABSTRACT

*Purpose: Green Behavior and Sustainable Performance are important for organizations seeking operational efficiency and long-term competitiveness. This study examined factors that are crucial to achieving sustainable performance. Therefore, the purpose of the present research was to examine the effect of Green Innovation, Sustainable Leadership, and Eco-Efficiency on Sustainable Performance. This research also aimed to assess the mediating effect of organizational culture and the moderating role of environmental commitment. Design/ method/ approach: Cross-sectional approach was adopted in the study for data collection. Respondents of the study were employees working in the organization. Questionnaire was developed using a Likert scale to collect data from respondents. Purposive sampling was used, and gathered data was analyzed through AMOS statistical tool. Findings: The findings of the study revealed that Green Innovation, Sustainable Leadership, and Eco-Efficiency have a positive effect on green organizational culture. Moreover, green organizational culture has a direct effect on Sustainable Performance. Mediating effect of green organizational culture was confirmed statistically. Results also confirmed the moderating role of environmental commitment. Originality: Present study is among the very few ones that highlight the moderating effect of environmental commitment and the mediating role of green organizational culture in one framework.*

---

**KEYWORDS:** Green Innovation, Sustainable Leadership, Eco-Efficiency, Sustainable Performance, Environmental Commitment.

---

## 1. INTRODUCTION

Sustainable performance is vital for the organizations as it helps in keeping balance between social well-being and environmental responsibility. Indeed, it helps in strengthening long-term competitiveness of the organization. Therefore, since the last few decades, organizations have changed their corporate strategy and focused on the integration of sustainable resource management in their strategies. Presently, sustainability is one of the main factors of organizational business strategy. This integration requires a major shift in organizational performance in terms of environmental, social, and economic aspects as organizations need to pay more attention to responsibility and values. Sustainability needs to transform commitment and organizational mindset into the inclusion of stakeholders (Kumar, Kumar, Chaudhuri, Chatterjee, & Vrontis, 2025). This application is very important in the management of the organization. Organizations need to put effort so they can contribute to social effect of industrial activity, minimize the environmental effect caused by industry, and reduce collateral consequences of industrial activity. Organizational growth is ensured through sustainable performance without negatively affecting organizational long-term stability (Sapta, Sudja, Landra, & Rustiarini, 2021). Moreover, by keeping balance between all resources through sustainable performance, organizations can maintain their competitive advantage.

In the past, most organizations developed their strategies on the basis of economic practices such as return on investment, productivity, and turnover. Sustainable performance requires organizational ability, through market presence and governance practices, to positively impact the ecosystem by minimizing effects on natural resources and reducing all types of pollution (Adnan, Younas, Khan, & Haseeb, 2023). Sustainable performance also targets economic development by focusing on paying respect to suppliers, paying fair salaries, and distributing profits to the employees in the form of dividends. On the other hand, society is also given preference by sustainable performance through employment creation and supporting the local population. Indeed, it is the responsibility of every organization to put extra effort into harmonizing their environmental, social, and economic factors leading to sustainable performance (Sahibzada, Aslam, Muavia, Shujahat, & Rafi-ul-Shan, 2025).

Studies mentioned that organizational culture is one of the major causes affecting the environment. Organizational practices are one of the major causes of global waste, resource usage, and pollution. Green

organizational culture refers to the organizational ethical frameworks and strategies that give priority to environmental sustainability in the organizational decision-making process, practices, and values (Tanveer, ud Din, Khan, Almurad, & Hasnin, 2025). Green organizational commitment reflects collective commitment by management and employees for the integration of environmentally friendly principles in operations. Green organizational culture focuses on the efficiency of resources for the development of sustainable products. The main aim of green organizational culture is the regulation of the environment, stakeholder engagement, and enhancement of innovation. This concept emphasizes long-term competitive advantage through the integration of organizational identity into sustainability (Li, Gao, Li, & Xing, 2025). Green organizational culture aligns organizational objectives, encourages green initiatives, and shapes employee behavior toward broader ecological and societal concerns. It is very important to focus on adopting green culture at the organizational level as organizational challenges are increasing and there is a need to respond to climate change by reducing environmental footprint.

Green innovation represents sustainable supply chain practices, energy-efficient processes, and eco-friendly design. It is based on innovation that minimizes resource consumption, pollution, and waste. Green innovation is adopted by organizations as a response to pressure increased by stakeholders to protect the environment (Shahzad, Qu, Rehman, & Zafar, 2022). On the other hand, green innovation is also considered a strategic approach to create environmental and economic value simultaneously. By fostering sustainability and creativity, green innovation focuses on problem-solving capability to achieve long-term competitive advantage along with contributing to environmental well-being. Additionally, green innovation is based on organizational learning that encourages engagement of employees (Silvério, Fernandes, & Maran, 2025). Moreover, it is important to align organizational objectives with sustainable development goals. Green innovation is vital to get insight into the way organizations can balance between environmental responsibility and profitability.

In the context of organizational management, the factor of sustainable leadership is an important concept that focuses on value creation on a long-term basis through the integration of environmental, social, and economic considerations in leadership practices. The priority of sustainable leadership is responsible resource management, stakeholder

management, and ethical decision-making with the purpose of ensuring societal well-being and organizational resilience (Mandal & Pal 2025). Leaders who adopt sustainable approaches are inspired by the culture of sustainability. They want to promote green practices and encourage innovation at all levels of organizations. The strategic vision of sustainable leaders is to balance social responsibility and profitability, which makes them important elements of sustainable performance (Suieubayeva et al., 2025). In this age where we are facing a number of environmental challenges, sustainable leadership is important for success in the organization.

Environmental efficiency is a concept of strategic management that focuses on delivering services and goods with minimum consumption of resources and minimum environmental impact. It shows the integration of ecological responsibility and economic performance (Caprian, Birca, & Trushkina, 2023). Eco-efficiency encourages organizations to improve operational efficiency, reduce waste, and optimize the usage of energy. Through the promotion of activities that lead to environmental sustainability and reduction of cost, organizations gain competitive advantage through eco-efficiency practices as they address the challenges of resource depletion and climate change. Firms that focus on eco-efficiency improve operational efficiency, develop long-term resilience, gain trust of stakeholders, and enhance corporate image (Handoyo, 2024).

In the context of sustainable performance, the factor of environmental commitment is very important as it reflects the expectations of individuals and organizations to adopt environmental practices. Basically, environmental commitment is the dedication of an organization on a long-term basis toward reducing ecological footprints, protecting natural resources, and promoting sustainable behavior (Junejo, Ramish, Qureshi, & Salahuddin, 2025). The main focus of environmental commitment is to improve organizational reputation, leading to competitive advantage through alignment of societal expectations and organizational values. Environmental commitment is important to develop trust of stakeholders, reach green innovation and develop pro-environmental behavior among employees. Thus, aim of the present research is to explore the effect of green organizational culture, green innovation, sustainable leadership and eco-efficiency on sustainable performance along with moderation of environmental commitment.

## 2. LITERATURE REVIEW

### 2.1. Green Organizational Culture (GOC) And Sustainable Performance (SP)

Literature has discussed SP as long term alignment between social well-being and ecological wellbeing leading to organizational success. SP is also the interaction between social performance, economic performance and environmental performance (Iqbal, Ahmad, & Halim, 2021). It reflects the organizational ability to increase shareholder value and achieve business goals keeping in view the social and environmental responsibility. There are several factors that measure the SP of organization. These factors include social and environmental factors as mentioned in studies of Yadegaridehkordi, Foroughi, Iranmanesh, Nilashi, and Ghobakhloo (2023) and Farchi, Touzi, Farchi, and Mousrij (2021). Some of the studies have termed these factors as main pillars of sustainability.

Researchers mentioned that green culture is the collective belief regarding environment-friendly production style and ecological production shared by members of organizations (Shahriari, Tajmir Riahi, Azizan, & Rasti-Barzoki, 2023). Studies have defined GOC as shared knowledge, habits, beliefs and values among organizational members that shed light on their thoughts regarding environmental care (Siswanti & Muafi, 2022). Organizational decision makers can connect their financial and environmental objectives to strategically aligning environmental efforts. It is responsibility of top management to communicate environmental objectives with functional and operational staff. Their goal should be to integrate these objectives into daily responsibilities. Moreover, environmentally concerned personnel of the organization get motivated to act ecologically responsible way through the message by the top management. Collaborative efforts can be conducted by peer pressure with purpose to achieve organizational goals towards environment (Siswanti & Muafi, 2022). The focus of collaborative efforts is on sustainability of environment by improving performance and decreasing organizational waste. It should be priority of the team to improve activities on regular basis in a way that excessive waste and harmful emissions should be reduced during process of manufacturing.

Employees must be given authority to make independent decisions to find and address practices that can damage environment. In other words, employees should have freedom to select operations that are using organizational components excessively and can take proactive action for the establishment of recycling programs with purpose of reducing waste. Empowerment of employees can be shown to

improve employees' concern regarding environment so it may have favorable impact on the performance of organization. On these aspects, organizations can make green culture within the organization by making collective effort. The key factors that impact the GOC include employee's agency, participation of colleagues, trustworthy communication and leadership attention. SP of the organization is improved through GOC as it promotes supporting environmental responsibility, encouraging resource efficiency and eco-friendly values (Fatoki, 2021). It develops long term sustainability by developing alignment between organizational goals and green practices. The study by Wagan and Sidra (2025) revealed that GOC has positive significant effect on SP.

**Hence, we hypothesize that:**

**H1:** Green Organizational Culture significantly affects Sustainable Performance.

## **2.2. Green Innovation (GI) And Green Organizational Culture**

GI in literature is discussed as creative solution to maximize sustainability and minimize negative environmental effects. It is based on the development of new business models, services, processes and technologies that are environmentally friendly rather than replacing them. GI is based on wide spectrum ranging from circular economy models, sustainable agricultural practices with purpose of minimizing waste and technology of renewable energy (Ebrahimi & Mirbargkar, 2017). These innovations have regularly shown their ability to handle degradation of environment, reduce missions and resource depletion. It is marketing solution or organizational change that minimizes usage of natural resources and release of toxic or harmful substances in the production process (Schiederig, Tietze, and Herstatt (2012). The main focus of GI is on sustainable processes, practices and technologies that can create innovation friendly environment within the organization. In such environment, GI is accepted throughout the organization. In turn, the effect of GI on environmental performance is enhanced.

GOC is positively influenced by GI as it embeds sustainability into organizational behaviors, routines and core values. When green technology is adopted by the organization, a workplace culture is created that gives priority to environmental responsibility. These innovations show commitment of the organization towards sustainability and employees are also encouraged to take actions and change their attitude towards green goals. As green initiatives of the organization expand, employees are also aware

of impact of these practices on environment. It leads to shared sustainable belief and stronger environmental norms. GI also improves problem solving, creativity and learning focusing on improvement of environment. Overall, GI helps employees in adoption of green habits. With the passage of time, organizational environment is transformed in the way that teams are motivated to achieve green goals, promote environmental accountability, and support sustainability efforts on regular basis. Ultimately, GI plays the role of catalysts that reinforce and shape GOC and ensure sustainability. The research of (Sahoo, Kumar, & Upadhyay, 2023) demonstrated that GI has positive effect on GOC leading to environmental sustainability. Studies by Arslan Arshad, Yaqub, Hassan, and Khan (2024) also discussed similar outcomes in their findings.

**Therefore, we postulate that:**

**H2:** Green Innovation significantly affects Green Organizational Culture.

## **2.3. Sustainable Leadership and Green Organizational Culture**

Studies have referred to sustainable leadership as type of leadership that integrates economic, social and environmental consideration into operational and strategic decision making. Such leadership has focus on ethical responsibility, stakeholder inclusivity and visionary approach to saving environment (McCann & Holt, 2010). Studies have used terms like sustainability-oriented leadership, green leadership and eco-friendly leadership as the substitute of sustainable leadership. Sustainable leadership practices are based on ethical considerations, long term vision and participative decision-making emphasizing on socially responsible decision making, employee well-being and innovative culture. Sustainable leadership keep in view the impact of organizational practices on society and environment. They always try to adopt balanced approach to achieve optimum performance. Sustainable leaders are actively engaged in all stakeholders with purpose to find out challenges related to sustainability, lead transformation of culture at organizational level and develop adaptive strategies (Malik & Mehmood, 2022). Competitive advantage is gained by the organizations that are practicing sustainable leadership by long term value creation, cost reduction, improved stakeholders' relationships and innovation. Leaders who opt sustainable leadership focus on embeddedness of sustainable values into decision making process, policies and organizational

systems (Di Fabio & Peiró, 2018).

On the other hand, GOC shows collective behaviors, assumptions and values within the organization to promote responsibilities towards environment. Organizational culture has broader impact on strategic priorities; the focus of GOC is on environmental sustainability as shared value in operations of organizations (Altassan, 2023). Organizational culture is significantly affected by the sustainable leader by adopting environmentally friendly practices and embedding them in daily practices, values and decision-making process. Leaders who adopt sustainability often inspire employees to support GI, promote resource efficiency, and adopt eco-friendly behavior (Sueubayeva et al., 2025). By this continuous engagement, ethical conduct and clear vision, an environmentally friendly culture is created by sustainable leaders where employees share environmental goals, support these goals and embed them in organizational routines. Sustainable leadership strengthens commitment to encourage collective action, sustainability and ensures adoption of green values to become important part of organizational identity. Studies have discussed the mechanism by which different factors of sustainable leadership including foundational practices such as ethical stewardship and vision setting and high level practices such as stakeholder engagement and innovation encouragement and high level practices such as stakeholder engagement and key performance drivers impacts the GI culture (Kareem & Kummitha, 2025). Similarly, the study by Gerard, McMillan, and D'Annunzio-Green (2017) found significant effect of sustainable leadership on green organizational culture.

Thus, we propose that:

**H3:** Sustainable Leadership significantly affects Green Organizational Culture.

#### **2.4. Eco-Efficiency and Green Organizational Culture**

Studies have referred to eco-efficiency as way to deliver services and goods to meet the needs of humans and improve quality of life while reducing impact of goods on environment and natural resources (D'Anna & Cascini, 2016). Organizations can achieve eco-efficiency by delivering goods with competitive prices and services that can satisfy human needs in a way that environment is not degraded throughout the life cycle. The concept of eco-efficiency is used by organizations to keep balance between economic performance and environmental impact with the help of

competitiveness, growth and innovation. This can be achieved by organizations by altering consumption and business practices. The basic theme of eco-efficiency is to develop a win-win strategy to make financial gain by doing less damage to the environment. Environment can get benefit from the eco-design (Rüdele, Wolf, & Ramsauer, 2024). Whereas, it can give opportunities to the organizations to attract customers who are environmentally friendly, contribute positively to the environment and increase competitiveness of the market (Wang, Chen, Chen, Wang, & Liu, 2024).

Eco-efficiency focuses on continuous innovation as organization always look for environmental friendly methods and greener technology to improve productivity (Y. Zhang, Mao, Jiao, Shuai, & Zhang, 2021). This mindset of innovation strengthens focus of culture towards environment. Also, financial and operational benefits of eco-efficiency including enhanced performance, and reduced cost ensures long term commitment and reinforce support of management towards green initiatives (Mahmood et al., 2025). With the embeddedness of these eco-efficient practices within the organization, it impacts the routines, behaviors and attitude of the employees. Ultimately developing string environmental culture where management and employees perceive sustainability as vital factor for the success and identity of organizations (Passetti & Tenucci, 2016). Employees are encouraged to adopt environmentally friendly practices with adoption of such practices. It also shapes collective norms and values that support green initiatives. Studies pointed out that eco-efficiency improvement sometimes needs managerial commitment, monitoring and process changes to follow green routines and norms. Incorporation of eco-friendly practices into daily operations can effect culture of the organization (Tran, 2023). Studies highlight the way eco-design promotes organizational culture to value sustainability which leads to the development of green processes. The research by Swathi and Johnpaul (2025) showed that eco-efficiency has positive influence on sustainable work culture.

**H4:** Eco-Efficiency significantly affects Green Organizational Culture.

#### **2.5. Green Organizational Culture as Mediating Variable**

It is ensured by SP that innovative environmental practices are embedded in employee behavior and organizational routines. When organizations adopt different kinds of GIs such as renewable production processes, waste reduction processes and eco-

friendly technologies. Alone, these efforts are not sufficient to reach at the level of SP (Fang, Shi, Gao, & Li, 2022). Effectiveness of these is mainly dependent on organizational culture that supports green practices and encourages employees to refine, adopt and internalize innovative practices.

In presence of GOC, shared environmental values are fostered, commitment towards ecological goals is strengthened and proactive behavior among employees is nurtured. All these factors enhance resource conservation and operational efficiency. Organizations need to shape attitude of employees and align processes of organization with sustainable objectives. Thus, GOC plays the role of pathways connecting GI with SP. The research by (Abadiyah, Eliyana, & Sridadi, 2020); Aggarwal and Agarwala (2023) revealed mediating effect of GOC in their studies.

Hence,

**H5:** Green Organizational Culture is a significant mediating variable between Green Innovation and Sustainable Performance.

Studies discussed that sustainable leaders emphasize on long term strategic thinking, ethical choices and environmental responsibility. Still, meaningful outcomes can be achieved by these leaders when they are diffused within firm. It is ensured through GOC that employees support sustainability, adopt eco-friendly practices and internalize environmental values (Mandhyan & Sybol, 2025). Reinforcement of such culture strengthens the implementation of environmental strategies to promote shared norms and shows collective participation to achieve sustainable goals.

Resource conservation and operational effectiveness is enhanced through this alignment. Moreover, environmental performance is also improved with the help of such alignment. Therefore, GOC plays the mediating function between sustainable leadership and SP. The research by Imran and Jingzu (2022) revealed mediating effect of GOC in their study, Thereby,

**H6:** Green Organizational Culture is a significant mediating variable between Sustainable Leadership and Sustainable Performance.

The focus of eco-efficiency is on improvement of operational effectiveness, conservation of resources and reduction of waste. Thus, achievement of green outcomes can be ensured only by these initiatives (Sala-Garrido, Mocholi-Arce, Maziotis, & Molinos-Senante, 2024). The success of these initiatives is dependent on environmentally friendly practices in daily routines that are greatly enforced through the presence of GOC. When employees who are working

together share environmentally friendly behaviors, values and beliefs, eco-efficiency measures are regularly improved, consistently implemented and rapidly implemented (Tirno, Islam, & Happy, 2023).

GOC improves the environmental efficient processes through promotion of optimum usage of resources, fostering long-term operational resilience and reducing environmental impacts. Thus, GOC has the ability to play as important mediating variable that can alter efficiency initiatives into measurable and higher SP. Moreover, Aggarwal and Agarwala (2023) discussed mediating role of GOC in their study So, we assume that

**H7:** Green Organizational Culture is a significant mediating variable between Eco-Efficiency and Sustainable Performance.

## ***2.6. Environmental Commitment as Moderating Variable***

Studies have discussed environmental commitment as long-term orientation and psychological attachment towards natural world (Xing, Liu, Wang, Shen, & Zhu, 2019). Researchers have reported that improvement of customers commitment to environment can promote green practices of the organization (Sun, Tian, Wang, & Su, 2022). Scholars have demonstrated that organizational commitment towards environment may have positive influence on green outcome that fosters higher levels of SP. Past studies show that in presence of strong organizational commitment, organizational performance towards environment is improved (Berberoglu, 2018). When a firm shows deep commitment towards environment, it will adopt environmentally friendly process that utilizes resources in efficient way and minimizes organizational waste. In other words, long-term sustainability is supported. In presence of such commitment, organization gains stakeholders confidence, operational effectiveness and organizational reputation.

Environmental commitment of the organization may play the role as moderator between organizational culture and SP as it shapes the level to which green values of culture are translated into measurable results. Organizations having high environmental commitment can reinforce environmentally friendly behavior. It also ensures strong green cultures lead to sustainable operational strategies, reduced ecological impact and resource utilization. This organizational commitment aligns the operations of organization with enhanced stakeholders' engagement, motivated employees and sustainability goals. As a moderating variable,

environmental commitment has positive influence on GOC that enables sustainable initiative to efficiently contribute to ecological responsibility and overall performance. Study by and Abbas et al. (2022) have determined Environmental Commitment as significant moderators.

**H8:** Environmental Commitment acts as a moderator between Green Organizational Culture and SP.

At this stage, proposed framework of the study is developed showing antecedents of SP in Figure 1.

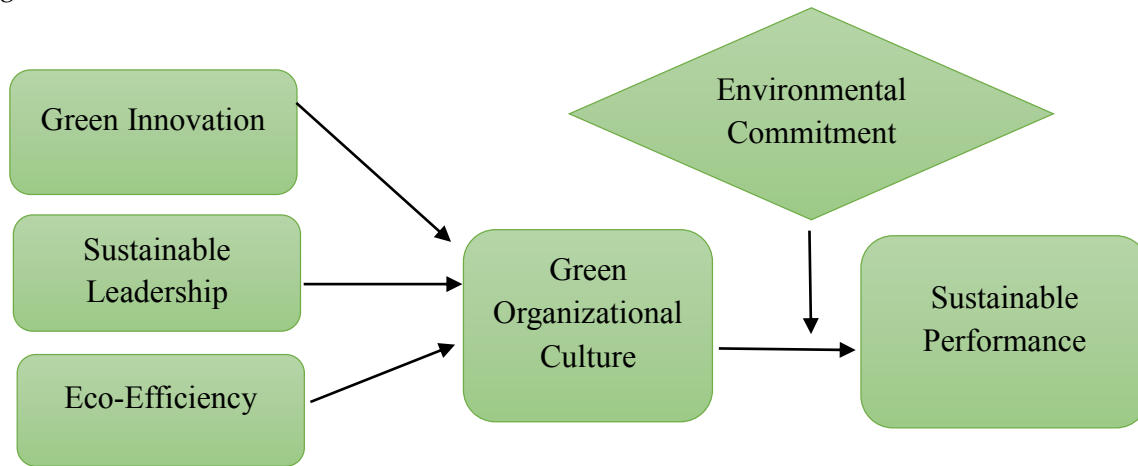


Figure 1: Theoretical Framework.

### 3. METHODOLOGY

To understand the impact of GI, eco-efficiency and sustainable leadership, with the mediation of GOC and the moderation of organizational commitment, researchers used quantitative research design. Cross sectional approach was used for the collection of data. Survey instrument was used to collect the responses of the respondents. The employees of organization were the target population. Researchers selected the sample using purposive sampling technique.

For the collection of data researchers used email and WhatsApp using google forms. Researcher assured the respondents that the magnanimity of the data will be maintained, and the data collection is only for academic purposes. Total 250 responses were received by the respondents. Researchers recorded the sources like via email or other source responses received.

#### 3.1. Measurement

For the collection of the data a well-designed tool was used by the researchers, all instruments had good reliability and validity. All scales were used in the prior studies having high reliability and validity scores. For the measurement of GI researcher used

the scale by Ebrahimi and Mirbargkar (2017) taken as services innovation and measured by five items scale. Eco-efficiency measured by 3 items scale used by Passeti and Tenucci (2016). Sustainable leadership measured by 4 items scale used by Di Fabio and Peiró (2018). GOC measured by six items used by Shahriari et al. (2023). SP measured by 4 items scale used by Iqbal et al. (2021). Environmental commitment measured by six items scale used by Xing et al. (2019).

After the collection of data researcher performed the data cleaning methodology, missing values analysis, test-retest reliability and split half technique was used and found 214 usable responses for the final analysis.

#### 3.2. Respondent Demographics

As a strong and justifiable analysis of the hypothesized model, it is important to initially analyse the demographics of the respondents. 25.7% of respondents were 18 years to 29 years old. 31.3% were 30 years to 41 years old. 27.6% respondents were 42 to 53 years old and 15.4% were above 54 years. 55.1% respondents were male while 44.9% were female. 45.8% were undergraduates, 40.6% were graduates and 13.6% were postgraduates. (Table#1).

Table 1: Demographic Characteristics.

Variable	Class	F	%age
Age			
	18-29	55	25.7%
	30-41	67	31.3%
	42-53	59	27.6%



	Above 54	33	15.4%
Gender	Male	118	55.1%
	Female	96	44.9%
Education	Undergraduate	98	45.8%
	Graduate	87	40.6%
	Post Graduate	29	13.6%

### 3.3. Confirmatory Factor Analysis

For the evaluation of the factor loadings and the confirmation of the items of the latent variables, confirmatory factor analysis was conducted using AMOS and six latent factors were examined (See **Figure#2**). To analyse the goodness of fit values of CFI, GFI, TLI, AGFI and NFI were examined. One factor model and the six factor model was compared

(**Table 2**) According to the criterion of Anderson and Gerbing (1988) one factor model shows the low or weak model health as compared to six factor model (Anderson & Gerbing, 1988). Six factor model shows a good fit model having values of GFI, TLI, CFI, AGFI greater than 0.90 and the RMSEA less than 0.03 (See **Table#2**)

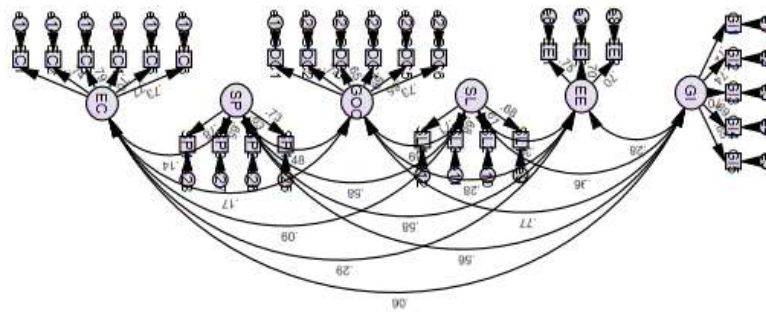


Figure 2: Confirmatory Factor Analysis.

Table 2: Model Fitness CFA.

	RMSEA	IFI	CFI	NFI	GFI	TLI	AGFI
Single factor	0.078	0.58	0.69	0.71	0.78	0.67	0.61
Five factors	0.002	0.96	0.97	0.91	0.90	0.96	0.88

It is observable by **Table 2** that six factor model is a best fit model having all values of the required model fit indices in a good range (Anderson & Gerbing, 1988).

### 3.4. Consistency And Loading of Factors

For the measurement of the factor loading the CFA performed using SEM in AMOS and researcher found that all the items of the related latent variables are greater than 0.50 (Hair Jr, Matthews, Matthews, & Sarstedt, 2017). Thus, retained by the researcher for further analysis.

Table 3: Loading of Factors, Validity and Reliability.

	Items	Loading	CR	AVE	$\alpha$
Green Innovation (GI)			0.83	0.50	0.81
	GI1	.717			
	GI2	.741			
	GI3	.695			
	GI4	.691			
Eco-Efficiency (EE)	GI5	.652			
			0.76	0.51	0.75
	EE1	.752			
	EE2	.698			
Sustainable Leadership (SL)	EE3	.704			
			0.81	0.52	0.87
	SL1	.676			
	SL2	.712			
	SL3	.785			
	SL4	.708			



Green organization Culture (GOC)			0.86	0.50	0.79
	GOC1	.665			
	GOC2	.737			
	GOC3	.645			
	GOC4	.790			
	GOC5	.654			
	GOC6	.732			
Environmental commitment (EC)			0.88	0.56	0.83
	EC1	.745			
	EC2	.739			
	EC3	.786			
	EC4	.698			
	EC5	.773			
	EC6	.731			
Sustainable Performance (SP)			0.81	0.51	0.78
	SP1	.730			
	SP2	.684			
	SP3	.649			
	SP4	.782			

**Table 3** demonstrates that all the items of the latent variables have the loadings greater than 0.60 standard criteria defined by Kline (1998) that is sufficient values to retain the items. The reliability of the construct ranges from 0.76 to 0.88 (Nunnally, 1978). While the AVE (Average variance extracted) is higher than 0.50 that is also sufficient for the further analysis (Kline, 1998) values of AVEs ranges from 0.50 to 0.56. The reliability index calculated by Cronbach's alpha is also greater than 0.70. it can be seen that all the items have factor loading above 0.60 that is a sufficient and efficient standard to retain the item and to use in further analysis (Kline, 1998).

As per standard defined by According to the standard defined by Fornell and Larcker (1981), convergent validity will be maintained when the values of AVEs are greater than 0.50. Thus, the convergent validity convergent validity well-kept.

For the testing of discriminant validity Fornell and Larcker (1981) standard is that the values of squared correlations must be less than the values of AVEs at the diagonal. For testing the discriminant validity, the values of AVEs taken at the diagonal while the values of squared correlations taken below diagonal (**Table 4**).

**Table 4: Discriminant Validity.**

	i.	ii.	iii.	iv.	v.	vi.
Green Innovation	<b>0.50</b>					
Eco-Efficiency	0.39	<b>0.51</b>				
Sustainable Leadership	0.36	0.31	<b>0.52</b>			
Green Organizational Culture	0.24	0.40	0.27	<b>0.50</b>		
Environmental Commitment	0.28	0.32	0.29	0.29	<b>0.56</b>	
Sustainable Performance	0.35	0.36	0.40	0.30	0.34	<b>0.51</b>

**Table 4** demonstrates that the discriminant validity maintained because the values of the AVEs at the diagonal are higher than the values of squared correlations and the standard criteria defined by Fornell and Larcker (1981) maintained.

### 3.5. Testing of Model

For quantitative testing the hypothesis researcher used AMOS. Hypothesized model was tested and implications were analysed.

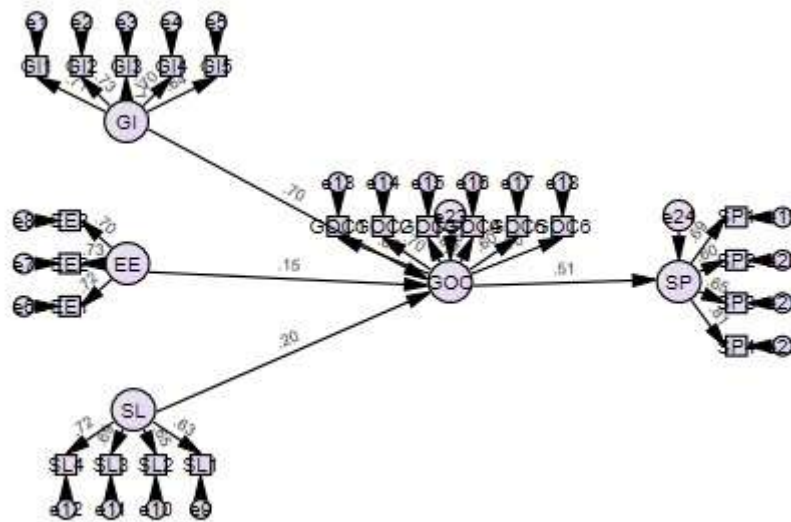


Figure 3: Structural Equation Modeling (Hypothesized Model Test).

Table 5: Results of Direct and Indirect Hypothesis.

Hypothesis	Effect
GI----->GOC	0.70**
EE----->GOC	0.15*
SL----->GOC	0.20**
GOC----->SP	0.51**
GI*GOC----->SP	0.357**
EE*GOC----->SP	0.076*
SL*GOC----->SP	0.102*

\*Significant At P<0.05 \*\*Significance At P<0.01

From **Figure 3** and **Table 5**, we can see that GI positively significantly affects the GOC with magnitude 0.70 and the significance at 1%. Eco-efficiency positively significantly affects the GOC with effect 0.15 and the significance at 5%. Sustainable leadership positively affects the GOC with magnitude 0.20 and the significance at 1%. GOC positively significantly effects the SP with effect 0.51 and the significance at 1%.

As long as the indirect mediational effect is concerned, according to model test, GOC positively significantly mediates the link between GI and the SP of the firm with effect 0.357 and significance at 1%.

Similarly, GOC positively mediates the link between Eco-efficiency and SP with effect 0.076 and the significance at 5%. GOC positively significantly mediates the link between sustainable leadership and the SP of the firm with magnitude 0.102 and significant at 5%.

### 3.6. Moderation of Environmental Commitment

The moderation of environmental commitment tested using the model 1 of process macro developed by Hayes (ref)

Table 6: Moderation of Environmental Commitment.

Independent variable	Dependent Variable	Moderator	Effect	LLCI	ULCI
GOC	Sustainable Performance	Low Value of EC	0.139	0.0186	0.4487
		High Value of EC	0.368	0.1934	0.6586

Environmental commitment positively significantly moderates the effect of GOC and SP. At low values of moderator, the effect 0.139 while at the high level of moderator the effect increased to 0.368. To examine the significance, the direction of LLCI and ULCI examined. The direction of LLCI and ULCI

is same having no zero in between. Thus, environmental commitment positively significantly moderates the effect of GOC and SP.

## 4. DISCUSSION

Organizations that achieve sustainable

performance gain competitive advantage and can survive long term in the competitive environment. Therefore, this study explored the factors that can help organizations in developing sustainable performance. The results demonstrated that green organizational culture has a positive influence on sustainable performance. These findings emphasize the importance of shared environmental values within the organization. When green organizational culture is aligned with environmental responsibilities, employees willingly adopt environmentally friendly practices. They also participate in resource conservation efforts and support initiatives of long-term sustainability. Green thinking is embedded among employees in such culture that strengthen operational processes enhancing sustainable performance.

Green organizational culture reduces waste, encourages responsible usage of resources, and fosters innovation. All these factors contribute to improved sustainable performance. Furthermore, green behavior and norms reinforce commitment among employees regarding the environment and ensure the organization gives priority to sustainability. They also need to ensure that sustainability is not a temporary initiative. As organizational culture is rooted in organizational values, organizations experience lower environmental risk and higher efficiency. Therefore, they develop better alignment with expectations of environmental sustainability. Indeed, the results of the present study show green organizational culture has positive effect on sustainable performance as revealed in the research of (Wagan and Sidra (2025).

Findings also revealed that green innovation has significant impact on green organizational culture as mentioned in the study of Arslan Arshad, Yaqub, Hassan, and Khan (2024). These findings emphasize that innovative environmental practices are important to shape collective behavior and values. When green innovation is introduced by the organization in the form of eco-friendly production processes, waste reduction systems and energy efficient technologies, they develop environment where employees act and think sustainably. Innovative initiatives taken by the organization signals commitment to the environmental responsibility that later strengthen green organizational culture through environmental conscious behavior. As green innovation is adopted by the employees in their daily routines, employees develop sense of ownership towards sustainable goals that reinforce green organizational culture. Process and technological based innovation is

ensured in such culture that is supported by environmental and norms awareness. Furthermore, green innovation provides practical systems and tools that helps to practice green values on regular basis making green organizational culture more effective and visible. Thus, results of the study ensure green innovation play the role of catalyst that enhance green organizational culture.

Results demonstrate that sustainable leadership has positive effect on green organizational culture. In past, Gerard, McMillan, and D'Annunzio-Green (2017) also discussed similar results in their findings. These findings show that directions and behaviors provided by organizational leaders play an important role in shaping employees' opinions toward environmental responsibility. When sustainable leadership in the organization prioritizes responsible usage of resources and long-term thinking, employees perceive that sustainability is the organization's priority. Through daily decision-making, communication, and actions, leaders send consistent signals about the importance of green values. These signals gradually influence employees' attitudes and strengthen green organizational culture.

Learning about environmental issues, open discussion, and teamwork are encouraged by sustainable leadership. An environment where employees feel comfortable with sustainable efforts is developed through sustainable leadership. In such an environment, sustainable leadership also gives employees confidence regarding eco-friendly ideas and provides support for green projects. As employees follow and observe the practices of leaders toward the environment, green organizational culture becomes more visible and stronger. So, the results of the present study show that sustainable leadership is an important force to develop green organizational culture.

Statistical outcomes also point out that eco-efficiency has significant effect on green organizational culture Swathi and Johnpaul (2025). These findings highlight the way improvements in the practical environment alter employee attitudes. When organizations adopt eco-efficient strategies in the form of managing resources, improving energy usage, and reducing waste, employees observe these changes in their daily work. This result emphasizes eco-efficiency, which helps employees understand that sustainability should be an organizational priority. Results show that eco-efficiency is an important part of organizational operations on a regular basis; therefore, employees appreciate these environmentally friendly efforts that create cleaner

surroundings, reduce cost, and make processes smoother. Employees adopt green habits in their work practices as a result of positive experiences, which build strong green organizational culture. When employees see different benefits of eco-efficiency, they become motivated to support activities that are beneficial for the environment. With the passage of time, eco-efficiency plays the role of an important driver that impacts employees' collaboration, actions, and thinking. Organizations develop green organizational culture with the support of eco-efficiency.

The results of the present research show the mediating role of green organizational culture between green innovation and sustainable performance, highlighting the significance of culture in gaining meaningful outcomes. Green innovation introduces environmental processes and technologies; however, the full impact of these innovations cannot be achieved unless employees use them in their daily routines. In the presence of green organizational culture, employees are encouraged to continuously improve sustainable practices, apply environmentally friendly ideas, and give value to sustainable practices. This important reinforcement enables organizations to transform green innovation into reduced environmental impact, operational efficiency, and long-term sustainable performance.

Results also support the mediating role of green organizational culture between sustainable leadership and sustainable performance. Employees are encouraged to prioritize environmentally friendly goals and environmentally responsible behavior by sustainable leadership. In the presence of these leadership practices, green organizational culture helps translate sustainable leadership values into workplace interactions and daily routines. Employees are motivated by cultural reinforcement to take part in sustainable activities and apply environmentally friendly practices on a regular basis. As the attitude of employees is shaped by sustainable leadership, green organizational culture influences their behavior. The combined influence of these two leads toward sustainable performance. Therefore, green organizational culture becomes an important link between sustainable leadership and sustainable performance.

Additionally, findings also show the mediation effect of green organizational culture between eco-efficiency and sustainable performance. When eco-efficiency is improved by the organization through wise usage of resources, saving energy, and reducing waste, these efforts create positive changes in the

organization. However, sustainable performance is achieved from these improvements when employees follow and support the same ideas. In green organizational culture, employees understand the importance of eco-efficiency, which encourages the application of eco-efficient practices in daily tasks. As these behaviors are adopted by employees, the impact of eco-efficiency becomes more effective and consistent. With the support of organizational culture, eco-efficiency contributes to sustainable performance indirectly through green organizational culture. These mediating results are supported by Aggarwal and Agarwala (2023) in past studies.

The statistical outcomes show a significant moderating effect of environmental commitment on the path between green organizational culture and sustainable performance. When organizations show strong environmental commitment, the influence of green organizational culture on sustainable performance also becomes strong. This is because organizations with higher environmental commitment provide eco-friendly actions on a regular basis. It also encourages employees to support sustainability and follow green values. With an increase in environmental commitment, green organizational culture develops in a way that shifts employee behavior toward environmentally friendly activities. On the other hand, in the presence of weak environmental commitment, green organizational culture may not have its full impact on sustainable performance. Thus, environmental commitment has the ability to sharpen or weaken the relationship between green organizational culture and sustainable performance. The study of Abbas et al. (2022), highlighted moderating effect of organizational commitment in their studies supporting result of present research.

## 5. THEORETICAL AND MANAGERIAL CONTRIBUTION

In this section, managerial and theoretical contribution will be highlighted. From theoretical lens, present study deepens understanding of the way green organizational culture work as key factor among eco-efficiency, sustainable leadership and green innovation with purpose to develop sustainable performance. This research also highlights the moderation effect of environmental commitment showing strong commitment towards environment will amplify effect of green culture on sustainable performance. Results of the present study extend current literature by showing the way contextual and cultural factors shape sustainable performance.

From managerial point of view, this study is important as it shows the importance of green organizational culture for organizations. Managers need to develop supportive policies, communication and training. The top management of organizations should promote green innovation and eco-efficiency to develop sustainable behavior. In the end, these findings shed light on the importance of environmental commitment to develop sustainable performance. Results of these studies can be used by policymakers for strategy development in order to protect our environment.

## 6. LIMITATIONS

This section will highlight few limitations of this study. Present research discussed mediating effect of green organizational culture. It is recommended to use it as independent variable in future studies. Moreover, there is only one moderator on the second half of the proposed model. It is recommended that future studies may use another moderator like employee satisfaction on the second half of the

framework. Also, this study used five-point Likert scale for data collection from respondents. It is proposed to develop questionnaire in seven-point Likert scale format for data collection purpose as seven Likert format will give more options to respondents to record their response.

Furthermore, this study used cross-sectional research design for methodology. Future studies may use longitudinal research design at this stage. Based on R square values, it is recommended that future studies may use technological based variables for the impact on sustainable performance. In the end, AMOS was used for the analysis of purpose. It is recommended that upcoming studies may use LISREL for the analysis purpose.

## 7. FUNDING

This work was supported by the Deanship of Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia [Grant Number KFU254479].

## REFERENCES

- Abadiyah, R., Eliyana, A., & Sridadi, A. R. (2020). Motivation, leadership, supply chain management toward employee green behavior with organizational culture as a mediator variable. *International Journal of Supply Chain Management*, 9(3), 981-989.
- Abbas, A., Chengang, Y., Zhuo, S., Bilal, Manzoor, S., Ullah, I., & Mughal, Y. H. (2022). Role of responsible leadership for organizational citizenship behavior for the environment in light of psychological ownership and employee environmental commitment: A moderated mediation model. *Frontiers in Psychology*, 12, 756570.
- Adnan, M., Younas, H., Khan, J., & Haseeb, A. (2023). Impact of sustainability practices on organizational performance: Mediating role of economic performance. *International Journal of contemporary issues in social sciences*, 2(4), 1191-1200.
- Aggarwal, P., & Agarwala, T. (2023). Relationship of green human resource management with environmental performance: mediating effect of green organizational culture. *Benchmarking: An International Journal*, 30(7), 2351-2376.
- Altassan, M. A. (2023). Understanding the Role of Green Organization Culture and Innovation between Green HRM Practices and Environmental Performance of SMEs in Saudi Arabia. *Pakistan Journal of Life & Social Sciences*, 21(2).
- Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological bulletin*, 103(3), 411.
- Arslan Arshad, H., Yaqub, K., Hassan, A., & Khan, U. (2024). The Green Revolution: How Green Innovation And Green Organizational Culture coverage to drive Sustainable Business Success. *Remittances Review*, 9(3), 931-955.
- Berberoglu, A. (2018). Impact of organizational climate on organizational commitment and perceived organizational performance: empirical evidence from public hospitals. *BMC health services research*, 18(1), 399.
- Caprian, I., Birca, I., & Trushkina, N. (2023). Eco-efficiency as a philosophy of modern business in the conditions of global transformations. *Three Seas Economic Journal*(1), 1-10.
- D'Anna, W., & Cascini, G. (2016). Adding quality of life to design for Eco-Efficiency. *Journal of Cleaner Production*, 112, 3211-3221.
- Di Fabio, A., & Peiró, J. M. (2018). Human Capital Sustainability Leadership to promote sustainable development and healthy organizations: A new scale. *Sustainability*, 10(7), 2413.
- Ebrahimi, P., & Mirbargkar, S. M. (2017). Green entrepreneurship and green innovation for SME development in market turbulence. *Eurasian Business Review*, 7(2), 203-228.
- Fang, L., Shi, S., Gao, J., & Li, X. (2022). The mediating role of green innovation and green culture in the relationship between green human resource management and environmental performance. *Plos one*, 17(9), e0274820.
- Farchi, C., Touzi, B., Farchi, F., & Mousrij, A. (2021). Sustainable performance assessment: A systematic literature review. *Journal of Sustainable Development of Transport and Logistics*, 6(2), 124-142.
- Fatoki, O. (2021). Sustainable leadership and sustainable performance of hospitality firms in South Africa. *Entrepreneurship and Sustainability Issues*, 8(4), 610.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Gerard, L., McMillan, J., & D'Annunzio-Green, N. (2017). Conceptualising sustainable leadership. *Industrial and commercial training*, 49(3), 116-126.
- Hair Jr, J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: updated guidelines on which method to use. *International Journal of Multivariate Data Analysis*, 1(2), 107-123.
- Handoyo, S. (2024). The determinants of resource efficiency and its implications for emission reduction performance. *Social sciences & humanities open*, 10, 101155.
- Imran, M., & Jingzu, G. (2022). Green organizational culture, organizational performance, green innovation, environmental performance: A mediation-moderation model. *Journal of Asia-Pacific Business*, 23(2), 161-182.
- Iqbal, Q., Ahmad, N. H., & Halim, H. A. (2021). Insights on entrepreneurial bricolage and frugal innovation for sustainable performance. *Business Strategy & Development*, 4(3), 237-245.
- Junejo, I., Ramish, M. S., Qureshi, M. B., & Salahuddin, S. (2025). MEDIATING ROLE OF ENVIRONMENTAL

- COMMITMENT BETWEEN SOLID WASTE MANAGEMENT BEHAVIOR AND SOCIAL PERFORMANCE: FEMALE EMPLOYEE PERSPECTIVE. *Kashf Journal of Multidisciplinary Research*, 2(03), 1-9.
- Kareem, M. A., & Kummitha, H. R. (2025). Impact of sustainable leadership practices on green innovation: the mediating role of green organisational culture. *Discover Sustainability*, 6(1), 1077.
- Kline, R. B. (1998). Software review: Software programs for structural equation modeling: Amos, EQS, and LISREL. *Journal of psychoeducational assessment*, 16(4), 343-364.
- Kumar, S., Kumar, V., Chaudhuri, R., Chatterjee, S., & Vrontis, D. (2025). AI capability and environmental sustainability performance: Moderating role of green knowledge management. *Technology in Society*, 81, 102870.
- li, J., Gao, Z., li, X., & Xing, B. (2025). Effect of green organizational culture on employee green organizational commitment: a moderated –mediated model of employee green self-efficacy and organizational identity. *Discover Sustainability*, 6(1), 223.
- Mahmood, S., Iqbal, A., El-kenawy, E.-S. M., Eid, M. M., Alhussan, A. A., & Khafaga, D. S. (2025). The impact of green technology innovation, pro-environmental behavior and eco-design on green new product success: examine the moderating role of green corporate image. *Environmental Research Communications*, 7(1), 015028.
- Malik, H., & Mehmood, M. (2022). Impact of authentic leadership, sustainable leadership on sustainable growth with mediating role of organizational learning. *Academic Journal of Social Sciences (AJSS)*, 6(1), 48-69.
- Mandal, V., & Pal, D. (2025). Sustainable leadership: Empowering green organizational citizenship behaviour through employee green value in the Indian healthcare sector. *Journal of Asia Business Studies*, 19(1), 79–102.
- Mandhyan, K., & Sybol, S. S. (2025). The Human Side of Sustainability: Environmental Leadership and Its Impact on Employee Growth. In *Prioritizing Employee Mental Health and Well-Being for Organizational Success* (pp. 127-160): IGI Global Scientific Publishing.
- McCann, J. T., & Holt, R. A. (2010). Defining sustainable leadership. *International Journal of Sustainable Strategic Management*, 2(2), 204–210.
- Nunnally, J. C. (1978). An overview of psychological measurement. *Clinical diagnosis of mental disorders: A handbook*, 97-146.
- Passetti, E., & Tenucci, A. (2016). Eco-efficiency measurement and the influence of organisational factors: evidence from large Italian companies. *Journal of Cleaner Production*, 122, 228-239.
- Rüdele, K., Wolf, M., & Ramsauer, C. (2024). Synergies and trade-offs between ecological and productivity-enhancing measures in industrial production—a systematic review. *Management of Environmental Quality: An International Journal*, 35(6), 1315-1353.
- Sahibzada, U. F., Aslam, N., Muavia, M., Shujahat, M., & Rafi-ul-Shan, P. M. (2025). Navigating digital waves: unveiling entrepreneurial leadership toward digital innovation and sustainable performance in the Chinese IT industry. *Journal of Enterprise Information Management*, 38(2), 474-501.
- Sahoo, S., Kumar, A., & Upadhyay, A. (2023). How do green knowledge management and green technology innovation impact corporate environmental performance? Understanding the role of green knowledge acquisition. *Business Strategy and the Environment*, 32(1), 551-569.
- Sala-Garrido, R., Mocholi-Arce, M., Maziotis, A., & Molinos-Senante, M. (2024). Eco-efficiency approach in sustainable waste management: An uncertainty analysis for Chile. *Environmental Science & Policy*, 160, 103859.
- Sapta, I. K. S., Sudja, I. N., Landra, I. N., & Rustiarini, N. W. (2021). Sustainability performance of organization: Mediating role of knowledge management. *Economies*, 9(3), 97.
- Shahriari, M., Tajmir Riahi, M., Azizan, O., & Rasti-Barzoki, M. (2023). The effect of green organizational culture on organizational commitment: The mediating role of job satisfaction. *Journal of Human Behavior in the Social Environment*, 33(2), 180-197.
- Shahzad, M., Qu, Y., Rehman, S. U., & Zafar, A. U. (2022). Adoption of green innovation technology to accelerate sustainable development among manufacturing industry. *Journal of Innovation & Knowledge*, 7(4), 100231.
- Schiederig, T., Tietze, F., & Herstatt, C. (2012). Green innovation in technology and innovation management: An exploratory literature review. *R&D Management*, 42(2), 180–192.
- Silvério, A., Fernandes, C. I., & Maran, T. K. (2025). Do green innovation strategies exist? Past, present and



- future trends in literature. *European Journal of Innovation Management*, 28(11), 154-186.
- Siswanti, Y., & Muafi, M. (2022). Ethical Leadership Style in Moderating the Influence of Green Organizational Culture on Green Innovative Behavior: SMEs Cases. *International Journal of Sustainable Development & Planning*, 17(4).
- Suieubayeva, S., Sánchez-García, E., Martínez-Falcó, J., Marco-Lajara, B., Sadenova, A., & Montalvo-Falcón, J. V. (2025). Green leaders and global change: Uncovering the drivers of corporate environmental sustainability. *Environmental Development*, 54, 101148.
- Sun, X., Tian, Z., Wang, J., & Su, W. (2022). The impact of environmental commitment on green purchase behavior in China. *International Journal of Environmental Research and public health*, 19(14), 8644.
- Swathi, A., & Johnpaul, M. (2025). Eco-friendly practices impact on organizational climate: Fostering a sustainable work culture. In *Green Management Approaches to Organizational Behavior* (pp. 145-174): IGI Global Scientific Publishing.
- Tanveer, M., ud Din, M., Khan, M. F., Almurad, H. M., & Hasnin, E. A. H. (2025). Unleashing the power of green HR: how embracing a green culture drives environmental sustainability. *Environmental and Sustainability Indicators*, 26, 100657.
- Tirno, R. R., Islam, N., & Happy, K. (2023). Green HRM and ecofriendly behavior of employees: Relevance of proecological climate and environmental knowledge. *Heliyon*, 9(4).
- Tran, N. K. H. (2023). Enhancing green brand equity through environmental reputation: The important of green brand image, green brand trust, and green brand loyalty. *Business Strategy & Development*, 6(4), 1006-1017.
- Wagan, S. M., & Sidra, S. (2025). Exploring the Impact of Green Organizational Culture and Entrepreneurial Orientation on Firm Performance: The Mediating Role of Green Business Models. *Journal of Entrepreneurship and Business Venturing*, 5(1).
- Wang, J., Chen, Z., Chen, T., Wang, W., & Liu, B. (2024). Empirical analysis of factors influencing industrial eco-efficiency in the Yellow River Basin from a social embeddedness perspective. *Heliyon*, 10(4).
- Xing, X., Liu, T., Wang, J., Shen, L., & Zhu, Y. (2019). Environmental regulation, environmental commitment, sustainability exploration/exploitation innovation, and firm sustainable development. *Sustainability*, 11(21), 6001.
- Yadegaridehkordi, E., Foroughi, B., Iranmanesh, M., Nilashi, M., & Ghobakhloo, M. (2023). Determinants of environmental, financial, and social sustainable performance of manufacturing SMEs in Malaysia. *Sustainable Production and Consumption*, 35, 129-140.
- Zhang, Y., Mao, Y., Jiao, L., Shuai, C., & Zhang, H. (2021). Eco-efficiency, eco-technology innovation and eco-well-being performance to improve global sustainable development. *Environmental Impact Assessment Review*, 89, 106580.