TOWARDS SUSTAINABLE WORKPLACES: GREEN ATMOSPHERICS' INFLUENCE ON EMPLOYEE WELL-BEING MEDIATED BY WORK STRESS

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Abstract

Urbanization has intensified the scarcity of green spaces and heightened psychological pressures in modern workplaces, underscoring the need for effective strategies to enhance employee well-being. This study investigates the influence of Green Spaces, Green Ambient Conditions, and Outdoor Green Environment on Employee Well-being, with Work Stress as a mediating variable. Using Covariance-Based Structural Equation Modelling (CB-SEM), data were collected from 315 office workers in Indonesia's top 10 cities according to the 2024 Universitas Indonesia (UI) GreenCityMetric, reflecting high environmental sustainability. Results show Green Spaces have the strongest direct positive effect on Employee Well-being, while Green Ambient Conditions also contribute significantly. Outdoor Green Environment, however, does not directly affect well-being. Work Stress emerges as a key mediator, partially mediating the effect of Green Ambient Conditions and fully mediating the effect of Outdoor Green Environment on Employee Well-being. These findings highlight that fostering employee well-being requires a holistic approach, optimizing green spaces, enhancing ambient conditions, providing access to external green environments, and managing work stress, to create healthier, more sustainable workplaces.

Keywords: Green Atmospherics, Employee Well-being, Work Stress, Green City, Indonesia

INTRODUCTION

Rapid urbanization stands as a defining global phenomenon of the past decades, presenting both opportunities for development and challenges for urban sustainability. One pressing issue is the reduction of green spaces amid escalating psychological pressures faced by urban populations (Zhang, Ye, Yang, & Gao, 2024; Schaupp et al., 2024). In Indonesia, this phenomenon is particularly acute, with over 56% of the population residing on Java Island, which comprises only 7% of the nation's land area, highlighting severe spatial imbalance and underscoring deficiencies in sustainable urban planning (Badan Pusat Statistik, 2024; Schaupp et al., 2024). Such demographic concentrations strain infrastructure and degrade the quality of life, notably impacting mental and physical health outcomes (Huang, Qi, Li, Dong, & van den Bosch, 2021).

Table 1. Urban Population Growth 2019-2023

Year	Proportion of Urban Population	Urban Population
2019	55,3%	149,7 mio.
2020	56,7%	153,5 mio.
2021	57,6%	156,4 mio.
2022	58,5%	159,3 mio.
2023	59,3%	162,1 mio.

Source: bps.go.id

The deterioration of urban environmental quality, especially the loss of green spaces, has profound consequences on community well-being (Lyshol & Johansen, 2024). Urban green elements serve not merely as physical assets but as critical restorative interventions that alleviate stress, enhance mental health, and improve physical conditions (van den Bosch & Ode Sang, 2017). This restorative capacity extends to office workers in urban contexts, where specific green space attributes such as layered landscapes, archetypal natural elements, and tranquil settings—promote relaxation and mindfulness as evidenced by neural activity patterns (Olszewska-Guizzo, Sia, Fogel, & Ho, 2022). Thus, green spaces fulfill dual ecological and psychological roles vital for sustaining employee health and efficacy (Zhang et al., 2024; Pietilä et al. 2015).

Within workplaces, integrating green atmospherics, comprising green spaces, ambient conditions, and outdoor green environments, emerges as a potent strategy to foster more comfortable, restorative atmospheres that mitigate work stress and boost employee well-being (Goel, Singla, Arora, & Mittal, 2024; Han, Lee, & Koo, 2021). Given that modern urban offices are often enclosed and disconnected from nature, employees frequently experience elevated work stress, undermining overall well-being (Schaupp et al., 2024). The introduction of green elements, such as interior vegetation and accessible green open spaces, not only reduces stress but also enhances focus and job satisfaction (Goel et al., 2024; Huang et al., 2021; Mulya, 2024).

Work stress remains a persistent barrier to productivity and health, and acts as a critical mediator between green atmospherics and employee well-being (Lyshol & Johansen, 2024; Goel et al., 2024). The biophilic design approach, incorporating natural light, organic materials, and vegetation, demonstrates empirical benefits including increased productivity

and decreased absenteeism (Kellert & Calabrese, 2015; Zhang et al., 2024). This design philosophy aligns with human innate tendencies to connect with nature, fostering emotional balance and cognitive focus in professional settings.

As urban populations continue to surge, the imperative grows for organizations to design sustainable workspaces that holistically support productivity and employee health (Zhang et al., 2024). This research aims to examine how the integration of green atmospherics can strategically reduce work stress, thereby enhancing employee well-being, a contribution that bridges theoretical understanding and practical application in organizational contexts (Goel et al., 2024; Han et al., 2021). Operationalizing green atmospherics within offices draws on sustainability frameworks like the UI GreenCityMetric, which assesses urban sustainability through categories including spatial planning, water governance, and energy management (Kanelli, Vardaka, Malesios, Katima, & Kalantzi, 2024).

Table 2. UI GreenCityMetric 2024 Rankings

No.	Cities	Score	SPI*	ECC*	WWM*	WGV*	AM*	GOV*
1	Kediri / East Java	**7.570**	1.275	1.297,5	1.260	1.087,5	1.325	1.325
2	Madiun / East Java	**7.540**	1.292,5	1.260	1.262,5	1.062,5	1.250	1.412,5
3	Blitar / East Java	**7.120**	1.172,5	1.322,5	1.137,5	1.112,5	1.137,5	1.237,5
4	Semarang / Central Java	**6.795**	1.450	1.055	1.015	987,5	1.125	1.162,5
5	Wonogiri Reg./ Central Java	**6.562,5**	1.362,5	1.337,5	937,5	962,5	1.012,5	1.050
6	Pariaman / West Sumatera	**6.395**	1.247,5	1.072,5	862,5	1.100	1.037,5	1.075
7	Banjarbaru / South Borneo	**6.370**	972,5	1.147,5	1.100	1.000	1.012,5	1.137,5
8	Salatiga / Central Java	**6.310**	1.112,5	1.125	1.157,5	925	947,5	1.037,5
9	Medan / North Sumatera	**6.252,5**	997,5	1.172,5	920	937,5	937,5	1.387,5
10	Jambi / Jambi	**6.195**	1.180	1.060	1.150	837,5	942,5	1.025

Source: greenmetric.ui.ac.id/city (Processed 2025)

*SPI: Spatial Planning and Infrastructure, ECC: Energy and Climate Change, WMM: Waste and Wastewater Management, WGV: Water Governance, AM: Access and Mobility, GOV: Governance

These principles, demonstrated in Indonesian cities such as Kediri and Madiun, offer scalable lessons for workplaces seeking to cultivate greener, healthier environments (Huang et al., 2021). Adopting such governance-based sustainability ensures green elements are

embedded comprehensively, enhancing mental and physical well-being alongside organizational productivity (Goel et al., 2024).

Importantly, green atmospherics must be embedded within broader human resource strategies to ensure lasting impact. Concepts drawn from Green Human Resource Management (GHRM), including green training and reward systems, promote sustainable employee engagement with environmental practices and reinforce green workplace climates (Sabokro, Masud, & Kayedian, 2021). While this study primarily focuses on the environmental-psychological relationships, understanding GHRM underscores the systemic supports needed for effective sustainability integration.

Work stress's mediating role is central to understanding the nuanced impacts of green atmospherics. Excessive workplace pressures can diminish employee well-being regardless of supportive surroundings (Lyshol & Johansen, 2024). Green atmospherics-based interventions, supported by GHRM frameworks, offer dual benefits: reducing stress while enhancing productivity and health, thereby constituting a strategic investment in workforce sustainability (Sabokro et al., 2021; Zhang et al., 2024).

By focusing on office workers in environmentally progressive cities identified by UI GreenCityMetric, this research aims to elucidate optimal green atmospherics factors in mitigating work stress and enhancing well-being. The objectives are to (1) identify the influence of green atmospherics on employee well-being, (2) analyze work stress mediation effects, and (3) determine the most impactful green atmospherics factor for employee well-being. Ultimately, this investigation seeks to inform the design of humane, productive, and sustainable workplaces grounded in evidence-based environmental psychology and organizational sustainability principles.

REVIEW OF LITERATURE

Biophilia as a Foundation of Green Workplaces

Integrating natural elements within workplace environments, as guided by biophilia theory (Wilson, 1984), has become a pivotal strategy for promoting employee well-being and alleviating work stress. Biophilia theory asserts that humans possess an innate affinity for nature, which can be harnessed to improve mental and physical health within indoor settings (Elantary, 2024; Yildirim, Gocer, Globa, & Brambilla, 2023). This framework underpins the psychological and physiological benefits derived from exposure to green spaces, particularly through the implementation of biophilic design.

Current research consistently demonstrates that incorporating natural elements, such as indoor plants, natural lighting, and organic materials, substantially enhances employee psychological well-being (Elantary, 2024; Yildirim et al., 2024; Shaikh & Sava-Segal, 2024). Empirical evidence shows measurable reductions in cortisol levels, heart rate, and blood pressure, with environments rich in greenery correlating with improved mood and diminished stress (Elbertse & Steenbekkers, 2023). Furthermore, access to natural light and nature views not only improves cognitive performance but also boosts job satisfaction and productivity. Biophilic design contributes to attention restoration and facilitates recovery from mental fatigue, which is critical in contemporary, high-demand office settings (Zhang et al., 2024; Suresh, Kumar, & Singh, 2023).

Both indoor and outdoor green spaces play vital roles: indoor greenery enhances air quality and reduces noise, fostering calming atmospheres, while outdoor areas offer sites for recreation, socialization, and psychological restoration (Charisi, Zafeiroudi, Trigonis, Tsartsapakis, & Kouthouris, 2025; Brossoit, Crain, Leslie, Fisher, & Eakman, 2023). Nature-based interventions are linked to reduced anxiety and depression, greater creativity, and heightened job satisfaction. The thoughtful integration of natural materials and biophilic design principles ultimately cultivates healthier, more engaged, and resilient workforces Alipour & Khoramian (2023).

Attention Restoration Theory

Attention Restoration Theory (ART), developed by Kaplan (1995), provides a fundamental framework for understanding how natural environments facilitate cognitive recovery from mental fatigue and directed attention depletion. The theory establishes that prolonged cognitive effort in demanding work environments leads to directed attention fatigue, which can be effectively restored through exposure to restorative environments that possess four essential characteristics (Kaplan, 1995). These four components, being away, fascination, extent, and compatibility, work synergistically to enable psychological and cognitive restoration in individuals experiencing mental exhaustion from intensive work demands.

The "being away" component refers to the psychological and physical distance from attention-demanding environments, allowing individuals to mentally detach from work-related stressors (Kaplan & Kaplan, 1989). "Fascination" involves effortless attention capture by inherently interesting environmental elements, such as natural movements, sounds, or visual patterns that engage attention without requiring cognitive effort (Kaplan, 1995). "Extent" encompasses the sense of environmental richness and scope that provides sufficient engagement to constitute a genuine restorative experience, while "compatibility" ensures alignment between individual intentions and environmental demands (Kaplan & Kaplan, 1989).

Research demonstrates that workplace environments incorporating natural elements effectively leverage ART principles to enhance employee well-being and reduce work stress (Gaekwad, Moslehian, & Roös, 2023). Green spaces and natural environments provide optimal conditions for attention restoration by offering soft fascination through natural elements, enabling mental recovery without additional cognitive demands (van den Bosch & Ode Sang, 2017). The application of ART in organizational contexts supports the implementation of green atmospherics as strategic interventions for maintaining employee cognitive health and preventing burnout in demanding work environments (Han et al., 2021).

Stimuli-Organism-Response (S-O-R) Framework

The Stimulus-Organism-Response (S-O-R) theory, developed by Mehrabian & Russell (1974) in "An Approach to Environmental Psychology," provides a comprehensive conceptual framework for understanding how external environments influence individuals' internal states, subsequently triggering specific behavioral responses. This paradigm proposes that internal feelings or behaviors are caused by external environmental stimuli, where stimulus processing can occur consciously or unconsciously (Hochreiter, Benedetto, & Loesch, 2023). Rooted in neo-behaviorist approaches, the S-O-R model recognizes the mediating role of cognitive and emotional processes between environmental stimuli and behavioral responses. Unlike traditional stimulus-response models that ignore internal

processes, S-O-R acknowledges that environmental stimuli do not directly determine behavior but are first processed through individual cognitive and affective systems (Houston & Rothschild, 1977). Key Components: (1) Stimulus encompasses external environmental factors including social aspects, cultural codes, and various quality perceptions that stimulate individuals and influence their internal states (Winkel, Saegert, & Evans, 2009); (2) Organism involves internal psychological and emotional responses through three dimensions: pleasure, arousal, and dominance (Mehrabian & Russell, 1974). This includes cognitive aspects such as perception, interpretation, and evaluation, serving as emotional mediators between stimulus and behavioral response (Bigne, Andreu, Perez, & Ruiz, 2020; Jang & Namkung, 2009); and (3) Response represents the final outcome, categorized into approach behaviors (positive responses encouraging engagement) and avoidance behaviors (negative responses promoting withdrawal), measured through automatic behavioral tendencies in workplace contexts (Degner, Steep, Schmidt, & Steinicke, 2021).

Green Atmospherics and Employee Well-being

Green atmospherics encapsulate a holistic approach to integrating natural elements into workplace environments to foster employee comfort, health, and psychological well-being. This concept extends beyond mere decorative greenery, encompassing all aspects of sustainable workplace design, ranging from natural ventilation systems, daylighting strategies, and air quality enhancements, to the presence of lush vegetation and sensory-enriching elements (Han & Hyun, 2019; Goel et al., 2024). Empirical studies underscore the multi-faceted benefit of green atmospherics: not only do such interventions contribute directly to employee well-being and morale, but they also indirectly support workplace outcomes by mitigating work stress, which frequently serves as a critical negative mediator in the environment–well-being relationship.

Green ambient conditions form a core dimension of green atmospherics, comprising technological and natural interventions such as air purification, excellent ventilation, balanced humidity, comfortable thermal settings, and ample natural lighting (Bitner, 1992; Goel et al., 2024). High-quality ambient conditions positively affect the sensory comfort of occupants, resulting in reduced stress levels and greater job satisfaction (Goel et al., 2024; Bieak Kreidler & Joseph-mathews, 2009). Research further confirms that elements like clean air, natural fragrances, and optimal lighting have a calming, restorative influence, lowering physiological arousal and promoting emotional resilience (Han, Kiatkawsin, & Kim, 2019; Straub, 2022; Vaidhya, 2024).

Green spaces, whether indoor or outdoor, are foundational for sustainable work environments. Indoor green spaces, such as living plants, vertical gardens, and atrium greenery, not only improve air quality by absorbing pollutants but also provide psychological benefits, reducing cortisol and stress (Goel et al., 2024; Han et al., 2021; Bangwal, Suyal, & Kumar, 2022). Outdoor green spaces, office gardens, rooftop terraces, green pathways, offer venues for brief restorative breaks. Exposure to these environments, even as little as 20–30 minutes, can alleviate anxiety and boost subjective happiness, as explained by attention restoration theory (van den Bosch & Ode Sang, 2017). The biophilia hypothesis posits that humans possess an innate affinity for nature, and preference for environments rich in green elements is part of our evolutionary makeup—leading to improved mood, concentration, and workplace cohesion (Wilson, 1984; Han et al., 2021).

Outdoor green environment refers to the broader natural surroundings influencing employees' perceptions and well-being both inside and around office buildings. This encompasses features such as parks, forests, hills, lakes, and general environmental qualities like clean air and comfortable weather (Goel et al., 2024; Han & Hyun, 2019). These settings act as vital nature-based solutions, supporting relaxation, psychological restoration, and stress reduction. Measurable benefits include lower heart rates, blood pressure, and improvements in feelings of happiness and recovery from occupational strain (Charisi et al., 2025; Gilchrist, 2014; van den Bosch & Ode Sang, 2017; Vujcic et al., 2017).

Work Stress as a Mediator in Employee Well-being

Work stress is a pivotal psychological mechanism linking organizational factors to employee well-being. Defined as psychophysiological reactions to demands surpassing individual coping capacities, work stress negatively impacts mental health, physical well-being, and productivity (Jamal, 1990; Fortes-Ferreira et al., 2006). Modern office stressors, including workload, role ambiguity, insufficient support, and poor work-life balance, intensify these effects (Liao, Wang, & Wang, 2023). Critically, work stress acts as a mediator: environmental improvements, such as enhanced green atmospherics, can reduce work stress, thereby supporting well-being.

Empirical studies consistently identify work stress as a key mediator. Goel et al. (2024) demonstrated that green atmospherics significantly reduce work stress ($\beta = -0.395$, $p < 0.01$), which in turn improves well-being ($\beta = -0.214$, $p < 0.01$). Further, non-supportive environments marked by poor ventilation or lighting and high noise levels elevate stress and health risks (Bangwal et al., 2022). A lack of autonomy and recognition, as well as deficits in workplace spirituality, also increase stress and diminish well-being (Mahipalan & Sheena, 2019). Thus, integrating green HRM strategies and environmental interventions effectively mitigates work stress and enhances employee well-being (Sabokro et al., 2021; Goel et al., 2024).

RESEARCH METHOD

This study adopts a quantitative approach using covariance-based structural equation modeling (CB-SEM) with LISREL 8.8 to analyze data. CB-SEM is selected over variance-based techniques, such as PLS-SEM, due to its superior confirmatory power for theory testing and structural model validation (Hair et al., 2019; Byrne, 2016). The research focuses on 315 office workers from Indonesia's top 10 environmentally sustainable cities according to the 2024 UI GreenCityMetric, including Kediri, Madiun, Blitar, Semarang, Wonogiri, Pariaman, Banjarbaru, Salatiga, Medan, and Jambi. Respondents were purposively sampled based on criteria such as minimum one-year work experience and access to green workplace elements. Data were collected via structured Likert-scale questionnaires, pre-tested for validity and reliability.

CB-SEM offers several advantages, including the ability to rigorously confirm theoretical frameworks (Hair et al., 2017), robust evaluation of measurement models through comprehensive fit indices (e.g., chi-square, RMSEA, CFI, NFI) (Byrne, 2016), and precise estimation of reflective constructs based on classical test theory (Fornell & Larcker, 1981; Rigdon, Sarstedt, & Ringle, 2017). These methodological strengths make CB-SEM highly

appropriate for investigating the theoretically grounded relationships between green atmospherics, work stress, and employee well-being in sustainable workplace contexts.

Measurement Model Evaluation

The measurement model assessment follows established CB-SEM protocols, including convergent validity evaluation through standardized factor loadings (>0.5), average variance extracted (AVE >0.5), and construct reliability (CR >0.7) (Fornell & Larcker, 1981; Hair et al., 2019). Discriminant validity assessment utilizes the Fornell-Larcker criterion, comparing the square roots of AVE values with inter-construct correlations. These rigorous validity assessments ensure measurement model quality prior to structural model evaluation.

The analytical framework encompasses comprehensive model evaluation including absolute fit measures (RMSEA, SRMR), incremental fit measures (CFI, NFI, TLI), and parsimony fit measures (PNFI, PGFI). This multi-faceted evaluation approach provides a robust assessment of model adequacy, supporting confident interpretation of structural relationships and hypothesis testing results. The systematic CB-SEM approach ensures theoretical rigor while maintaining statistical precision in examining the complex relationships between environmental factors and employee outcomes in sustainable workplace contexts.

Research Hypothesis

The development of hypotheses in this study is anchored in three key theoretical frameworks: the Stimulus-Organism-Response (S-O-R) model, Biophilia Theory, and Attention Restoration Theory. The S-O-R model (Mehrabian & Russell, 1974) frames green atmospherics as environmental stimuli that influence internal psychological states, ultimately driving employee well-being outcomes (Goel et al., 2024). Biophilia Theory (Wilson, 1984) posits that humans have an inherent affinity for nature, evidenced by meta-analyses showing that contact with natural environments significantly reduces physiological stress (Gaekwad et al., 2023). Attention Restoration Theory (Kaplan, 1995) further explains how exposure to green elements replenishes depleted attention resources through restorative features like being away and fascination (Van den Bosch & Ode Sang, 2017).

Empirical evidence indicates that green spaces directly improve employee well-being and productivity via biophilic design (Jude et al., 2023; Goel et al., 2024). Green ambient conditions—such as air quality and natural lighting—foster stress reduction and productivity gains (Bitner, 1992; Han & Hyun, 2019). Outdoor green environments, by providing access to restorative landscapes, facilitate creativity and mental health improvements (Charisi et al., 2025; Han & Hyun, 2019). Based on this synthesis, hypotheses H1, H2, and H3 were formulated to examine the unique effects of each green atmospherics dimension.

- H1: Green spaces have a significant positive influence on employee well-being.
- H2: Green ambient conditions have a significant positive influence on employee well-being.
- H3: Outdoor green environment has a significant positive influence on employee well-being.

Work stress functions as a crucial mediator linking green atmospherics dimensions with employee well-being outcomes. Defined as psychophysiological responses to job demands exceeding adaptive capacity (Jamal, 1990; Fortes-Ferreira et al., 2006), work stress

significantly reduces employee well-being (β = -0.214, p < 0.01) in hospitality contexts (Goel et al., 2024).

- H4: Work stress has a significant negative influence on employee well-being.

Green spaces reduce work stress through attention restoration mechanisms, with employees in green-accessible environments reporting 39% fewer anxiety-depression symptoms compared to those without access (Akpinar, Barbosa-Leiker, & Brooks, 2016).

- H5: Green spaces have a significant negative influence on work stress.

Green ambient conditions create physiologically comfortable work environments, reducing sensory burdens that trigger chronic stress, with natural lighting ≥300 lux decreasing mental fatigue by 34% (Han et al., 2019).

- H6: Green ambient conditions have a significant negative influence on work stress.

Outdoor green environments provide micro-restorative experiences during work breaks, with 20-30 minute exposure reducing anxiety symptoms through decreased heart rate and blood pressure (Van den Bosch & Sang, 2017).

- H7: Outdoor green environment has a significant negative influence on work stress.

The RESIDE project confirmed that every 10% increase in public green space area correlates with 6% higher mental well-being scores, with stress as the primary mediator (Wood, Hooper, Foster, & Bull, 2017).

- H5a: Green spaces have a negative influence on work stress, which subsequently mediates a positive influence on employee well-being.
- H6a: Green ambient conditions have a negative influence on work stress, which subsequently mediates a positive influence on employee well-being.
- H7a: Outdoor green environment has a negative influence on work stress, which subsequently mediates a positive influence on employee well-being.

Research Model

This research model describes the relationship between exogenous variables (Green Spaces, Green Ambient Conditions, and Outdoor Green Environment) to endogenous variables (Employee Well-being and Work Stress (mediator)). This model can be illustrated as follows:

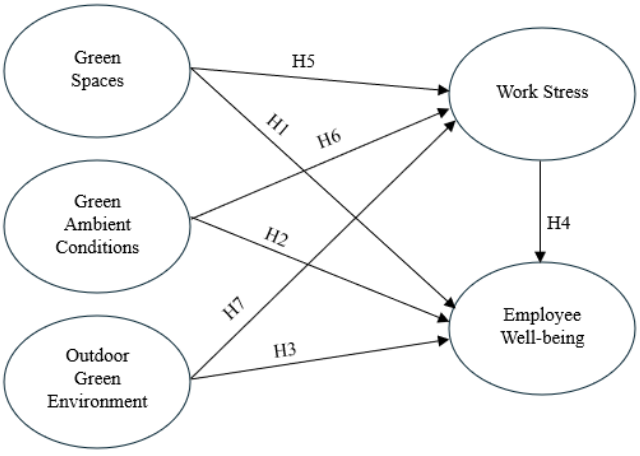

Figure 1. Conceptual Framework

The conceptual model of this study demonstrates the complex relationships between green atmospherics dimensions and employee well-being, with work stress serving as a

mediating variable. The model illustrates that three independent variables (Green Spaces, Green Ambient Conditions, and Outdoor Green Environment) have both direct relationships to Employee Well-being and indirect relationships through Work Stress as a mediator. This comprehensive framework will be tested using Covariance-Based Structural Equation Modeling (CB-SEM) to examine the simultaneous direct and mediation effects within a single integrated model.

RESULTS AND DISCUSSION

The following are the research results obtained from a structured questionnaire survey design to examine the relationships between green atmospherics elements, work stress, and employee well-being. The study was conducted across Indonesia's top 10 green cities according to UI GreenCityMetric 2024, providing a unique environmental sustainability context for the research. Data were collected from 315 office workers representing diverse demographic characteristics across various organizational sectors.

Table 3. Respondent Demographics

Description	Category	Count	Percentage
Gender	Male	185	58,73%
	Female	130	41,27%
Age	<25 years	28	8,89%
	25-35 years	184	58,41%
	35-45 years	65	20,63%
	>45 years	38	12,06%
Last Education	High School/Vocational Equivalent	49	15,56%
	Diploma 3	37	11,75%
	Bachelor Degree	181	57,46%
	Master Degree	47	14,92%
	Doctorate Degree	1	0,32%
City of Workplace	Kediri City	30	9,52%
	Madiun City	27	8,57%
	Blitar City	42	13,33%
	Semarang City	68	21,59%
	Wonogiri Regency	17	5,40%
	Pariaman City	10	3,17%
	Banjarbaru City	24	7,62%
	Salatiga City	19	6,03%
	Medan City	52	16,51%
	Jambi City	26	8,25%
Company Status	Government	161	51,11%
	Private	142	45,08%
	State-Owned Enterprise	12	3,81%
Job Level in Company	Director / Head of Office	6	1,90%
	Division Head / Department Head	12	3,81%
	Manager / Section Head	28	8,89%

Description	Category	Count	Percentage
	Supervisor / Subsection Head	23	7,30%
	Executor / Staff	229	72,70%
	Functional	17	5,40%

Table 3. Respondent Demographics (Continue)

Description	Category	Count	Percentage
Company Industry	Government Administration	136	43,17%
	Trade	36	11,43%
	Education	56	17,78%
	Processing	31	9,84%
	Finance	14	4,44%
	Health	14	4,44%
	Construction	1	0,32%
	Accommodation Provision	3	0,95%
	Agriculture and Livestock	2	0,63%
	Other Services	4	1,27%
	Information and Communication	1	0,32%
	Real Estate	1	0,32%
	Transportation and Warehousing	7	2,22%
	Environmental Management	1	0,32%
	Corporate Services	8	2,54%
Work Duration Range	1 - 2 years	44	13,97%
	2 - 5 years	94	29,84%
	5 - 10 years	76	24,13%
	10 - 15 years	45	14,29%
	>15 years	56	17,78%

Source: Data Processed (2025)

The sample distribution across cities was relatively balanced, with Semarang contributing the largest proportion (68 respondents, 21.59%), followed by Medan (52 respondents, 16.51%) and Blitar (42 respondents, 13.33%). Other cities including Kediri, Madiun, Jambi, Banjarbaru, Salatiga, Wonogiri, and Pariaman provided additional respondents, ensuring geographical representativeness across Indonesia's green cities. The demographic profile showed gender balance with 58.73% male and 41.27% female respondents, predominantly aged 25-35 years (58.41%) with bachelor's degree education (57.46%).

Data analysis employed Covariance-Based Structural Equation Modeling (CB-SEM) to examine the measurement model and test the hypothesized relationships. The analysis followed a two-step approach, first evaluating the measurement model for construct validity and reliability, then testing the structural model for hypothesis verification. The mediation effects were examined using bootstrapping procedures to generate confidence intervals for indirect effects.

Descriptive Statistics and Demographics

The demographic analysis of the 315 respondents highlights several key characteristics relevant to this study. Males comprised 58.73% and females 41.27%,

providing a balanced gender perspective and allowing for nuanced insights into differences in perceptions of green atmospherics in the workplace. Most respondents were from the productive 25–35 year age group (58.41%), followed by those aged 35–45 years (20.63%), indicating representation of young professionals likely experiencing high work demands and stress, thus making their perceptions especially pertinent.

Educationally, the majority held a bachelor's degree (57.46%), suggesting respondents possessed sufficient knowledge to provide informed views on workplace green interventions. The presence of varying educational levels further enriches the research's interpretative depth. Institutionally, over half (51.11%) were employees in government institutions, with the remainder primarily from the private sector (45.08%). Most participants worked in government administration (43.17%), education (17.78%), or trade (11.43%). This diverse demographic profile—spanning gender, age, education, sector, and industry—ensures representativeness and strengthens the generalizability of findings concerning green atmospherics and employee well-being in urban Indonesian offices.

Measurement Model Evaluation

The initial stage of Structural Equation Modeling (SEM) involves conducting measurement model analysis, wherein each indicator and variable undergoes comprehensive validity and reliability testing. Validity assessment is performed through examination of Standardized Loading Factor (SLF) values for each indicator, with an indicator considered appropriate for measuring a variable when SLF ≥ 0.5, while reliability evaluation employs Construct Reliability (CR) values to determine measurement instrument consistency, requiring CR ≥ 0.7 for acceptable reliability standards. Although meeting CR criteria establishes instrument reliability, an additional parameter, Average Variance Extracted (AVE), serves as an indicator of discriminant validity, providing further validation of the measurement model's robustness (Hair, Black, Babin, & Anderson, 2019).

Table 4. Reliability and Validity - CR and AVE

Constructs	Item(s)	Constructs Reliability (CR)	Average Variance Extracted (AVE)	Valid / Invalid	Reliable / Unreliable
GS	7	0,92	0,61	Valid	Reliable
GAC	6	0,94	0,62	Valid	Reliable
OGE	4	0,85	0,58	Valid	Reliable
WS	5	0,92	0,66	Valid	Reliable
EWB	5	0,86	0,48	Valid	Reliable

Source: Data Processed (2025)

The measurement model evaluation demonstrates robust construct reliability and convergent validity across all research variables through Construct Reliability (CR) and Average Variance Extracted (AVE) assessments. Green Spaces exhibited excellent psychometric properties with CR = 0.92 and AVE = 0.61, indicating high internal consistency and convergent validity, as more than 50% of indicator variance was explained by the latent construct. This supports the theoretical internalization of workplace green spaces as positive experiences, aligning with biophilia theory and environmental psychology principles (Wilson, 1984; Kellert & Calabrese, 2015; Han et al., 2021).

Green Ambient Conditions demonstrated superior measurement quality with CR = 0.94 and AVE = 0.62, representing the highest reliability among all constructs. Outdoor Green Environment achieved satisfactory reliability (CR = 0.85) and convergent validity (AVE = 0.58), meeting the minimum thresholds of CR > 0.7 and AVE > 0.5. Work Stress exhibited exceptional measurement properties with CR = 0.92 and AVE = 0.66, providing strong foundation for its mediating role in the Stimulus-Organism-Response framework.

Employee Well-being initially presented challenges with CR = 0.88 but inadequate AVE = 0.34, failing to meet minimum validity criteria. Following best practices in scale development (Fornell & Larcker, 1981), indicators EWB1 and EWB2 were eliminated due to standardized loading factors below 0.50 (Kline, 2016). The refined model achieved improved reliability (CR = 0.86) and marginally acceptable convergent validity (AVE = 0.48), which remains acceptable in SEM practice when CR exceeds 0.7 (Fornell & Larcker, 1981). Overall, the measurement models demonstrate sufficient reliability and validity for robust structural analysis.

Structural Model Evaluation

The evaluation of structural equation models requires comprehensive assessment of multiple fit indices to determine model adequacy. The current model demonstrates mixed fit results with some indices indicating acceptable fit while others suggest areas for improvement.

Table 5. Model Fit Assessment

Fit Indices	Values	Criteria/Cutoff	Interpretation
Absolute Fit			
Chi-Square (χ^2)	885.49 (p=0.00)	p > 0.05 (ideal)	Marginal fit (sensitive to N & complexity)
RMSEA	0.078	≤ 0.05 (good fit)	Good fit
90% CI RMSEA	0.072-0.084	≤ 0.08 (good fit)	Good fit
SRMR	0.057	≤ 0.08 (good fit)	Good fit
RMR	0.049	≤ 0.08 (good fit)	Good fit
GFI	0.82	≥ 0.90 (good fit)	Marginal fit
AGFI	0.79	≥ 0.90 (good fit)	Marginal fit
Incremental Fit			
NFI	0.95	≥ 0.90 (good fit)	Good fit
NNFI/TLI	0.96	≥ 0.90 (good fit)	Good fit
CFI	0.97	≥ 0.90 (good fit)	Good fit
IFI	0.97	≥ 0.90 (good fit)	Good fit
RFI	0.95	≥ 0.90 (good fit)	Good fit
Parsimony Fit			
PNFI	0.85	≥ 0.50 (good fit)	Good fit
PGFI	0.68	≥ 0.50 (good fit)	Good fit

Source: Data Processed (2025)

Path Analysis of Green Atmospheric Elements on Employee Well-being

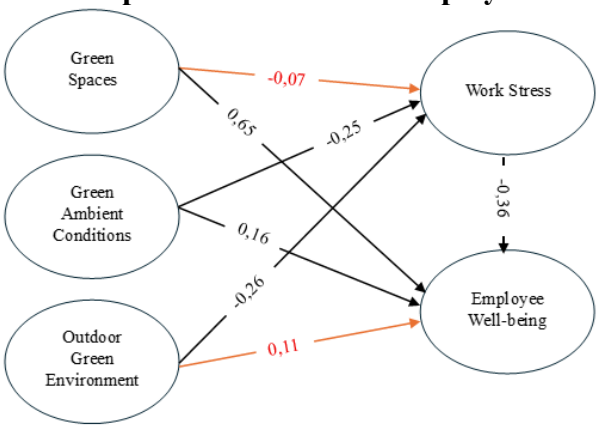

Figure 2. CB-SEM Structural Model Results

Regarding hypothesis testing for the direct relationship between variables, it is carried out by looking at the t-value of each relationship. The summary of the hypothesis test results for direct relationships is shown in Table 6.

Table 6. Direct Relationships Between Variables

Hypotheses	Cosntruct	T-Value	Path Coeficient	Significancy	Status
H1	GS →EWB	3,19	0,65	Significant	Supported
H2	GAC → EWB	1,65	0,16	Significant	Supported
H3	OGE → EWB	1,16	0,11	No	Rejected
H4	WS → EWB	-4,47	-0,36	Significant	Supported
H5	GS → WS	-0,74	-0,07	No	Rejected
H6	GAC → WS	-2,26	-0,25	Significant	Supported
H7	OGE → WS	-2,34	-0,26	Significant	Supported

Source: Data Processed (2025)

The structural equation modeling analysis reveals a mixed pattern of hypothesis support that provides valuable insights into the relationships between green atmospherics dimensions, work stress, and employee well-being. H1 and H2 demonstrate significant positive effects of green spaces (β = 0.65, t = 3.19) and green ambient conditions (β = 0.16, t = 1.65) on employee well-being, with green spaces showing substantially stronger impact, confirming the direct restorative benefits of workplace vegetation and optimal environmental conditions. H3 is rejected, indicating that outdoor green environment does not significantly influence employee well-being directly (β = 0.11, t = 1.16), suggesting that external green elements may require mediation mechanisms to affect employee outcomes. H4 confirms the significant negative relationship between work stress and employee well-being (β = -0.36, t = -4.47), validating the theoretical foundation of stress as a critical determinant of workplace well-being. Regarding stress reduction pathways, H5 is rejected, revealing that green spaces do not significantly reduce work stress directly (β = -0.07, t = -0.74), while H6 and H7 are supported, demonstrating that green ambient conditions (β = -0.25, t = -2.96) and outdoor green environment (β = -0.26, t = -2.34) effectively reduce work stress. These findings

suggest that while green spaces directly enhance well-being, ambient conditions and outdoor environments primarily operate through stress reduction mechanisms, indicating differentiated pathways through which green atmospherics influence employee outcomes.

After analyzing the direct relationship hypothesis in this study, the next stage is to analyze the indirect relationship. In this study, there are three hypotheses that contain mediation/indirect relationships. The hypothesis of the mediation relationship is H5a, H6a, and H7a. Work Stress will be a mediator for the relationship between latent Green Spaces (H5a), Green Ambient Conditions (H6a), and Outdoor Green Environment (H7a) with the variable Employee well-being. Although the findings of the direct influence analysis suggest that the relationship between Outdoor Green Environment and Employee Well-being is not significant, a mediation analysis can be performed. According to Hayes (2018) and Zhao, Lynch, & Chen (2010), ascertaining the significance of indirect effects cannot be established solely based on whether every aspect of the relationship is substantial. Basically, the indirect effect is the result of the product of both relationships (IV-M and M-DV). Based on these arguments, hypothesis testing is still carried out for all relationships. The results of the calculation of indirect relationships are shown in the following table:

Table 7. Indirect Relationships Between Variables

Hypotheses	Constructs	Indirect Effect	Total Effect	Mediation Role	Result
H5a	GS→WS→EWB	0,0252	0,6752	None	Rejected
H6a	GAC→WS→EWB	0,09	0,25	Partial	Supported
H7a	OGE→WS→EWB	0,0936	0,2036	Full	Supported

Source: Data Processed (2025)

The mediation analysis reveals distinct patterns in how green atmospherics dimensions influence employee well-being through work stress pathways. H5a (Green Spaces → Work Stress → Employee Well-being) shows no significant mediation effect (indirect effect = 0.025), indicating that green spaces operate primarily through direct mechanisms rather than stress reduction pathways. This finding aligns with biophilia theory, suggesting that workplace vegetation directly enhances well-being through innate human-nature connections rather than requiring stress mediation. H6a (Green Ambient Conditions → Work Stress → Employee Well-being) demonstrates partial mediation (indirect effect = 0.09), where ambient conditions like air quality and lighting simultaneously reduce stress and directly improve well-being, creating dual pathways for positive outcomes. H7a (Outdoor Green Environment → Work Stress → Employee Well-being) exhibits full mediation (indirect effect = 0.094), indicating that outdoor green elements exclusively influence well-being through stress reduction mechanisms, consistent with attention restoration theory's emphasis on cognitive recovery processes. These differentiated mediation patterns suggest that organizational interventions should strategically combine direct well-being enhancers (green spaces) with stress-reducing elements (ambient conditions and outdoor environments) to maximize employee outcomes through complementary pathways.

This study underscores the critical role of green atmospherics in shaping employee well-being within urban office environments facing high productivity demands and complexity. Addressing three core research questions, the findings indicate that green spaces

and green ambient conditions significantly enhance employee well-being, while outdoor green environments show no direct effect. Specifically, the positive influence of green spaces (path coefficient = 0.65, t-value = 3.19, $p < 0.05$) supports biophilia theory, affirming that human-nature connections are fundamental psychological needs (Wilson, 1984). This is reinforced by Attention Restoration Theory, which highlights the restorative benefits of natural environments in improving mood and focus (Kaplan, 1995), and is corroborated by meta-analytical evidence showing physiological stress reduction (Gaekwad et al., 2023) and increased well-being and productivity through biophilic design (Jude et al., 2023).

Although green ambient conditions such as lighting, ventilation, and air quality demonstrate a consistent positive impact on well-being (path coefficient = 0.16, t-value = 1.65, $p < 0.05$), outdoor green environments do not exhibit significant direct effects (Kasaba, 2019). This suggests that environmental benefits are contingent upon both organizational culture and employee engagement with outdoor spaces.

Work stress emerges as a pivotal mediator, revealing that the pathway from green ambient conditions to employee well-being is partially mediated by stress reduction (indirect effect = 0.09), whereas outdoor green environment's positive influence is realized only through full mediation by reduced work stress (indirect effect = 0.0936) (Jamal, 1990; Fortes-Ferreira et al., 2006). These mediation patterns support the Stimulus-Organism-Response (S-O-R) framework, emphasizing that environmental stimuli must first alleviate internal stress to improve well-being (Mehrabian & Russell, 1974; Goel et al., 2024; Wood et al., 2017). Overall, these results highlight the necessity for organizations to prioritize integrated green workplace design, combining direct restorative elements and stress-reducing strategies to promote sustainable employee well-being.

CONCLUSION

This study reveals that green atmospherics, particularly green spaces and ambient conditions, significantly enhance employee well-being among office workers in Indonesia's leading green cities. Green spaces deliver the strongest direct benefits, while outdoor green environments promote well-being only through work stress reduction, highlighting the importance of psychological mediation. The findings support biophilia and attention restoration theories, emphasizing the need to balance green workplace design with effective stress management strategies. Practically, organizations should integrate green elements with supportive organizational cultures to maximize well-being and productivity gains. Methodologically, future research should expand to different city types, employ longitudinal and experimental designs, and examine additional mediators and moderators to strengthen causal understanding. Enhanced collaboration between green workplace initiatives and human resource management is essential for sustainable, evidence-based improvements in employee health and organizational performance.

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