# ECO-TECH WORK ENVIRONMENT THROUGH THE LENS OF MILLENNIAL HOSPITALITY EMPLOYEES: A MIXED-METHOD APPROACH

**Amit DATTA,** Professor
Hotel Management, TAPMI School of Business, Faculty of Management, Commerce & Arts, Manipal University Jaipur
India.
E-mail: amitdatta.amit@gmail.com

**Parul CHOUDHARY,** Assistant Professor
*(Corresponding Author)*
TAPMI School of Business, Faculty of Management, Commerce & Arts, Manipal University Jaipur
India
E-mail: feminaparul@gmail.com

**Anuj KUMAR**
Faculty of Management Studies, Marwadi University Research Centre, Marwadi University, Rajkot, Gujarat
India
E-mail: profanuj15@gmail.com

**Abstract**

*Purpose* – With the millennial generation making up a large share of the workforce in the hospitality sector, it is important to determine their views on emerging technologies and sustainable practices that affect their job-experiences.
*Methodology/Design/Approach* – This study adopts mixed-method approach to examine the factors of eco-tech hospitality work environment as perceived by millennial employees via detailed synthesis of literature with citation analysis-based literature review. Responses of 462 millennial employees of high-end hotels in India were collected by convenience sampling method. CFA established four-dimensional millennials' hospitality eco-tech work environment construct. Further, ANOVA determined that differences occur among millennial employees of different groups of gender, job levels, and operation departments about eco-tech hospitality environment.
*Findings* – This study provides insight into the existing knowledge related to evolving eco-tech hospitality culture, and the findings would be useful for the hotel's HR to develop millennial employee-centric eco-tech work environment. Implications of the findings, as well as limitations and directions for future studies, have been deliberated.
*Originality of the research* – This study is the first to establish an eco-tech work environment measure of the hospitality industry. It also draws attention to the group of millennial hospitality employees who influence the eco-tech work environment.
**Keywords** Culture and Climate; Eco-tech; Hospitality; Millennial; Sustainability; SDGs; Work Environment

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## INTRODUCTION

Travel & tourism is one of the largest sectors contributing 10.4% of global GDP and 10.6% of all jobs across the world. In India, it is one of the largest industries contributing more than 247 billion dollars to country's GDP creating jobs directly and indirectly and is ranked 7th in the world for its contribution (Choudhary & Datta, 2024) . The industry's strong growth requires suitably trained employees who can contribute to the development of the industry and the millennials will be one of the largest groups for the hospitality workforce(Pham et al., 2018). Hospitality is a fast- growing industry and an important part of the tourism industry (Golubovskaya et al., 2017; Seal, 2018).

Millennials are a cohort of generations born from the early years 1977-1982 to the late years 1994-2003 (Gursoy et al., 2008; Puri & Datta, 2023). Twenge et al., (2010) encompassed birth years beginning from 1982 for their study of millennials in the Indian hospitality sense. They are also referred to as Y-generation, Echo-Boomers, Internet Generation, Generation-Y or Generation next (Barron et al., 2007). Twenge et al., (2010) claimed that during the millennial upbringing, the global socio-geopolitical situation was very different from other decades, culminating in this group's distinct characteristics. This geneneration also experienced a large distribution of communication and social –networking tools during their foundational years (Abualigah et al., 2023).

Millennials opt for job autonomy and prefer to do things in their own manner. They are also self-assertive and wish to have freedom in their jobs (Datta & Singh, 2017; Vui-Yee & Paggy, 2018). As compared to earlier generations, the millennials are confident about themselves open for new experiment have hands-on to new global practices and technologies and are ambitious regarding their careers (Maxwell et al., 2010). Islam et al., (2020) pointed out that the millennial cohort values morality, loyalty, ready to fight for ideals that they think are real, sociable, and values family-life over work-life. They trust teamwork and believe in doing work in group coordination. Millennials are brand-focused and foresees the reputation of the organization than the cost and rewards (Datta, 2020). Young et al., (2013) concluded that correctly identifying the characteristics and working mentality of this generation is critical for the sector because their reflection of the total manpower is consistently increasing (Josiam et al., 2010)

The eighth Sustainable Development Goal (SDG-8) emphasizes that creative technological embeddedness in the workplace can lead to increased economic productivity in the labour-intensive sectors. An eco-tech perceived work environment (eco-tech PWE) integrates ecological principles with technological adeptness to provide an environmentally friendly, efficient, and sustainable workplace (Ahmed et al., 2024; Karatepe et al., 2022). This strategy prioritises the reduction of environmental harm

while simultaneously maximising production and well-being. Prominent characteristics encompass energy-efficient structures, sometimes accompanied by LEED certification, that employ natural light, solar panels, and green roofs to curtail energy usage. Intelligent technologies, such as Internet of Things (IoT) devices and energy management systems, enhance the efficiency of resource utilisation and provide pleasant interior conditions (Kong et al., 2023). The workspaces are specifically crafted using sustainable materials and ergonomic furnishings to optimise employee comfort and minimise health concerns (Pellegrini et al., 2018; Sharma et al., 2024). Indoor plants and green areas are integrated to enhance air quality and offer psychological advantages, promoting a sense of connection with the natural world (Dahl, 2022)

Organisations with Eco-tech sensitive work environment frequently facilitate modern and sustainable options for employees like remote work and employ digital collaboration technologies, therefore diminishing the need for transportation and the resulting carbon emissions (Acharya & Datta, 2023b; Avery & Moser, 2023). Though hospitality has a few limitations to work facilities like work from home but they do establish rules that promote the use of public transit, cycling, or carpooling for employees who go to work (Chi et al., 2020). These methods not only promote environmental sustainability but also recruit and retain personnel who prioritise corporate social responsibility. Eco-tech work settings achieve a harmonic balance between human demands and environmental stewardship by combining ecological knowledge with technical innovation (Zaid & Yaqub, 2024).

The work environment in an organization consists of physical and psycho-social components. Initially, though the physical environment was only considered, later studies by industrial psychologists state the role of psycho-social behavior as an emergence of organizational psychology (Datta & Jain, 2017). The researchers have identified that facilitative, positive eco-tech work environment improves the perception of the members about their workplace, boost their commitment at work and enhances productivity (Choo, 2016). Though some studies of the PWE have been carried out, it is obvious that it varies from one environment to another, but PWE can't be comprehensive and the examination of eco-tech PWE's effect on various situations will still remain unforeseen (Heymann, 2019). Therefore, from a research perspective, eco-tech PWE is a very exciting phenomenon. It can quickly be skewed, and differences can be detected over a brief period of time and it directly influences the behavioral outcomes of its associates and in turn affects the organizational performances (Castonguay et al., 2023).

Eco-tech workplaces encourage innovation and environmental responsibility by directing staff actions towards greater technology efficiency and sustainability. Staff members in these establishments receive ongoing education on how to incorporate eco-friendly practices into their work for the benefit of both the environment and guests (Holden et al., 2014; Osei et al., 2023). The hotel industry's staff members are the key to achieving sustainability goals through the adoption and promotion of eco-tech behaviors. This way, the institution can guarantee that it not only satisfies but also surpasses environmental regulations, all while offering outstanding service to customers (Barclay & Kang, 2019; Piramanayagam & Seal, 2020). With evolving business environment ethical and environmental standardization is a mandate for business operations in current times as stated in SDG-8 (Jian & Zhengjie, 2024). The term eco-tech PWE being a relatively new terminology with respect to sustainable business and research in hospitality and tourism domain is gaining interest from researchers and industries.

Given the shortage of manpower supply and the diverse technological and behavioral attributes current generation that constitutes the young hospitality workforce necessitate an examination of their perception of eco-tech work environment to enhance their performance and retention. The purpose of this study is to:

(I) Exploration of the literature to derive the eco-tech PWE concept and constructs
(II) Validation and establishment of the eco-tech PWE construct in hospitality context
(III) Determine the difference of eco-tech PWE among millennial hospitality employees

**Application of mixed-method approach**

Combining qualitative and quantitative data collection and/or analysis techniques within a single research study is known as mixed-method research. Zhao et al. (2025) proposed that the mixed-method approach requires the completion of critical stages to address the research gaps, after the topic to be researched is defined: stage I: theoretical research; stage II: practical research; and consolidating analytical insights between theoretical and practical gaps. In order achieve the above study objectives, a research strategy is recommended for the study's implementation, which comprises an in-depth analysis of the criticality related to each phase.

The literature available on the said subject is also highly segregated, the study further addresses the research gap in (stage I) by providing a consolidated understating and synthesis of the available literature to enhance a clear overview of research conducted on the eco-tech PWE for future studies. Stage II of research aims to validate and investigate the variables that determine the perception of millennial hospitality workforce in an upscale segment about their hotel's eco-tech PWE.

Figure 1: **Research approach**

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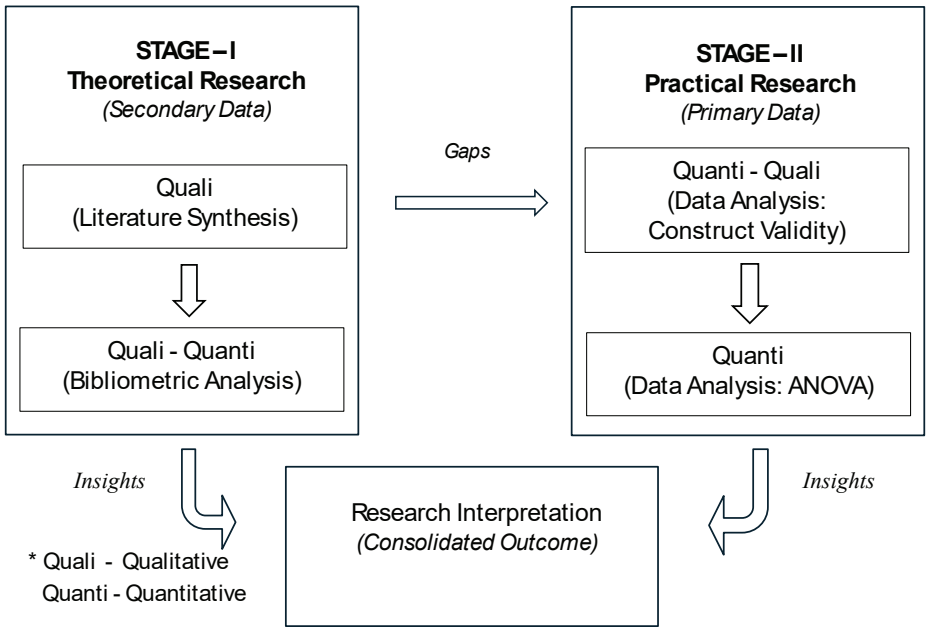



## 1. STAGE I: SYNTHESIS OF LITERATURE

The work environment is a vital factor for an organization while determining the performance of the entire team. The theory of organizational empowerment discusses the role of management to generate an effective work environment by providing appropriate opportunities and necessary resources to complete a job. In order to be a great organization, the work environment has to be effective for all stakeholders (Barclay & Kang, 2019). Litwin & Stringer, (1968) evolved the concept of PWE or organizational climate and thereafter it has been adopted in many studies. In order to comprehend the extensive research on eco-tech PWE in hospitality sector, this study employs a systematic synthesis of the published literature to compile and organize the diverse pool of knowledge at one place for future researchers (Bahuguna & Ramaswamy, 2022; Yong et al., 2019). The literature review has been divided under two sections wherein initial sections provides a brief analysis of the published literature with the help of literature synthesis and citation analysis to present the status of the published literature on Eco-tech PWE studies in hospitality sector followed by the later segment to focus on the development of the hypothesis to understand the theoretical relationship between the selected variables of the study (Vijayarani, S., & Janani, 2016).

### 1.1. Criteria of selection of data

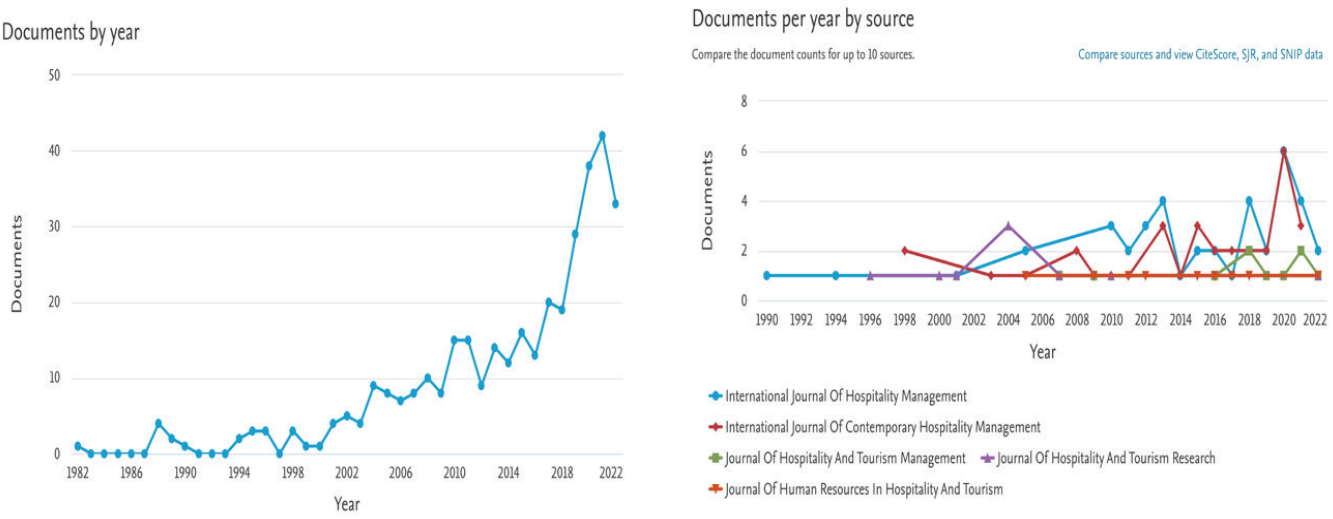
Keywords were diligently extracted from an extensive literature review based on their frequency of occurrence related to “millennials,” “eco-tech work environment,” and “sustainability and technology” through an open search across prominent databases including “ScienceDirect,” “Wiley Online Library,” “SAGE Publications,” “Emerald Insights,” “Google Scholar,” “SpringerLink,” and “Taylor & Francis,” yielding 510 papers. Text mining programme coding was performed on title, abstract, and author keywords in Python software using Matplotlib to extract the keywords based on maximum co-occurrences reference Figure 2 (Choudhary & Datta, 2024). Thereafter the keywords with maximum occurrences were used in combination of multiple queries (sample query given below) performed on Scopus database to screen title, abstract, and keywords without any restriction of language, industry etc., to identify all the relevant literature published on all the study variables, i.e. “millennials”, “eco-tech work environment,” and “sustainability and technology”. Following this, the raw data was further sub-divided by the selection of only Scopus-indexed journals, since it is one of the most reputable databases, and only 359 research published in the English language were shortlisted. A detailed analysis of abstracts with respect to their relevance to study variable and industry relevance resulting in 300 papers and full papers review resulted in final selection of 246 articles those were most pertinent studies on the subject. 92.8 percent of the final publications selected were articles, 4.7 percent were review studies, and 2.5 percent were conference papers.

Figure 2: **Keyword frequency word cloud**


### 1.2. Time frame, region and source distribution

The search period spans from 1982 to June 2023 to capture the maximum number of relevant research including the aspect of PWE and eco-tech PWE. The publishing rate has increased steadily since 2002, as shown in Figure 1, however the years 2019 to 2023 have been notable for studies on PWE and eco-tech PWE in the hospitality industry. Consequently, the publishing is distributed over both subject-specific and interdisciplinary journals, such as "International journal of hospitality management" and "International journal of contemporary hospitality management," which have the highest number of publications and "Sustainability Switzerland" and "International Journal of Environmental Research and Public Health" also have substantial publications.

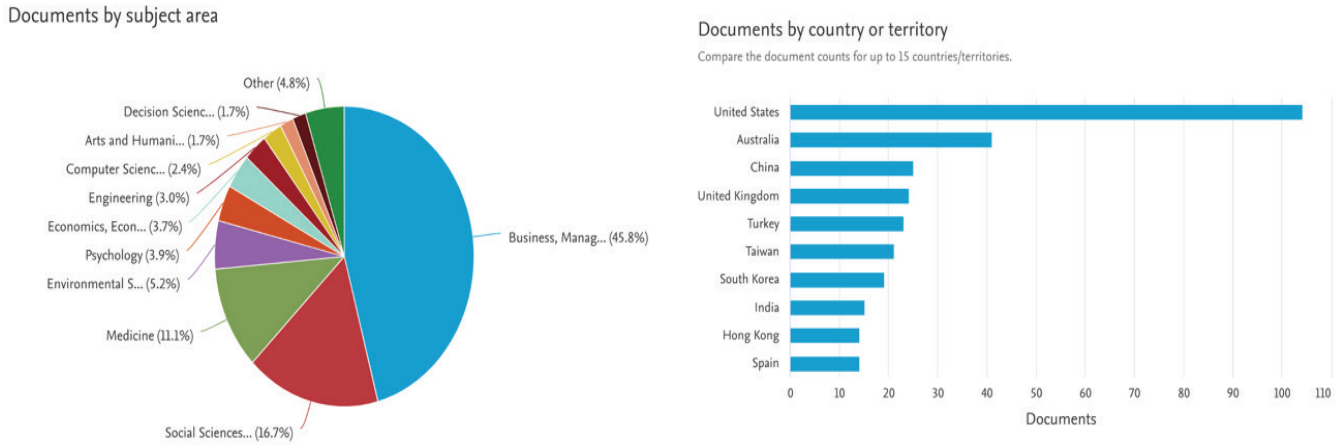
Figure 3: **Details of documents by year and source**




Source: Scopus database

Similarly, figure 4 shows publication are spread across all major continents with United States and Australia have maximum number of publications followed by China, United Kingdom, Turkey and Taiwan with almost equal proportion and analysis also shoe there are very limited studies conducted in developing and underdeveloped nations. Figure 4 also demonstrates that publications are distributed across all major continents, with the United States and Australia having the highest number of publications, followed by China. Thereafter, the United Kingdom, Turkey, and Taiwan is in nearly equal proportions. The analysis also demonstrates that there are very few studies conducted in developing and underdeveloped countries and no representation of any African nation in top 10.

Figure 4: **Details of documents per subject and regional distribution**

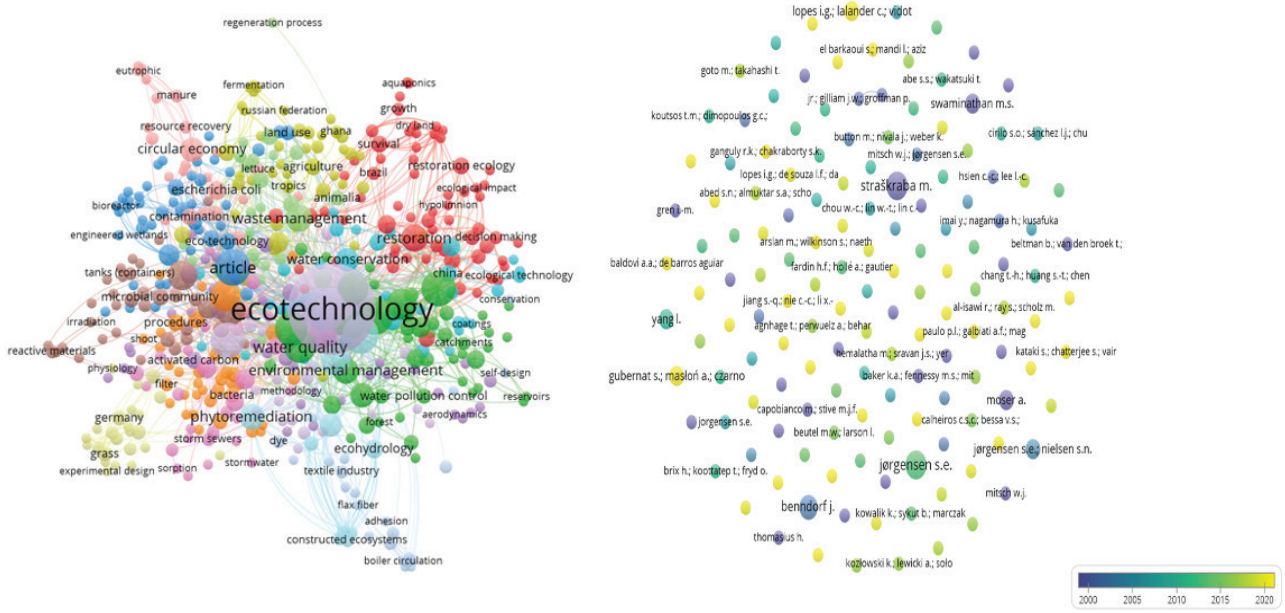



Source: Scopus database

### 1.3. Prominent authors, keyword and citation analysis

During citations analysis, it was established that the work of Mitsch W.J.et al received the most citations, ranging from 666 citations and article by Ewald N et.al. received 262 citations. Mitsch W.J.et had emerged as a noteworthy author with 343 citation on the domain of eco-tech PWE in hospitality and tourism sector. Further keyword analysis also reveals that service environment, organisational climate, and work satisfaction are among the most intensively researched subjects of eco-tech PWE in the hospitality sector. The co-authorship and cluster analysis highlighted that there is very limited networking and collaboration among the authors in this field of research.

Figure 5: **Citation analysis of publication and Key variables**




Source: VOS Viewer

### 1.4. Setting of hypotheses

The study of Litwin & Stringer, (1968) specified that "PWE is a set of measurable factors of the organization's environment, founded on the collective perceptions of the people who work in the environment and demonstrated to influence their work behavior". Investigation of (Datta, 2020; Datta & Singh, 2018) has observed the positive effect of eco-tech PWE in hotel business's accomplishment. The sustainability and adoption of technology of the business especially that of hotel industry depends on consumer satisfaction and also depended on staff's commitment in which PWE towards eco-tech integrations has a significant role to play (Seal, 2018).

Eco-tech PWE is the most important factor that influences employee attitudes toward their perceived job challenges and advantages of changing dynamics of sustainable work environment (Choudhary & Datta, 2023). Understanding the expectations and opinions of millennials about the sustainable practices is critical, not just because their overall strength is at an all-time high and continues to rise, it will also reduce HR-related difficulties and would help the hotel sector expand and thrive towards green practices (Choudhary & Datta, 2022a; Parvez et al., 2022). The eco-tech PWE varies from one industry to the next and in different organizational contexts, according to (Agrawal & Pradhan, 2023). The primary goal of this study is to analyze the variables of eco-tech PWE by high-end hotel employees, since the PWE towards eco-tech work climate of the hotel sector in by millennials is yet unknown.

Golubovskaya et al., (2017) indicates that the work environment of the hotel is a multi-level concept that is experienced differently by various demographic groups of millennial employees. To anticipate the eco-tech PWE of the hotel sector, it is important to comprehend the perceptions of each group. Survey of (Emiroğlu et al., 2015) on age and its relationship to hotel staff's work attitude, imply that it improves with the growth of age. Rincon-roldan & Lopez-cabrales, (2020) findings show that the newly joined millennial employees may perceive the hospitality work environment differently than the aged one since every age group have their own advantages and insecurities at the same time (Datta & Jain, 2017).

Ha1: There is a statistical difference between the millennial hospitality employees of different age groups regarding eco-tech PWE

Hiring discrimination is strictly prohibited in the hospitality industry. However, actual scenario has witnessed an unbalanced distribution of gender in different field in a hotel and limited number of females in leadership position (Goh & Okumus, 2020). The work environment of an organization needs to be unbiased since the successful fulfillment of sustainable practices requires the effective contributions of both the genders, which in turn will be possible if both male and female employees' perceive eco-tech PWE favorably (Alyahia et al., 2024).

Ha2: There is a statistical difference between the millennial hospitality employees of different genders regarding eco-tech PWE
The employee brigade is broadly classified into three levels managerial, supervisory, and frontline levels. In accordance with the position the job responsibility and delegation power vary enormously, and the lower-level employees generally lack the power of autonomy and empowerment. The present millennials hospitality employees are highly qualified (both socially and technically) and they value healthy work environment that promote sustainable practices (Manning et al., 2005; Shen et al., 2016). In addition to it the association between the job levels is never amicable (Acharya & Datta, 2023a; Sharma et al., 2024), which is not to the likings of the millennial groups. The study aims to determine whether the diverse levels of these cohort of hospitality employees experience eco-tech PWE differently.

Ha3: There is a statistical difference between the millennial hospitality employees of different job levels regarding eco-tech PWE

Chittiprolu et al., (2020) explains that the operation style of the different departments is quite distinct. Among them, the pressure of work of the front office department is comparatively lower than the culinary and F&B service, whereas the staffs feel housekeeping job as uninteresting since they the lack the skillset and are not sometimes well acquainted to newer technological and business advancements (Murtza & Rasheed, 2023). This study aims to examine whether these trait variances affect the opinion about eco-tech PWE among the millennial employees.

Ha4: There is a statistical difference between the millennial hospitality employees of different departments regarding eco-tech PWE

## 2. STAGE II: CONSTRUCT VALIDATION & EMPERICAL ANALYSIS

### 2.1. Developing the measuring instrument

Eco-tech PWE factors of millennials was assessed by modified version of PWE parameters, as these factors helps to access the perception of the young employees of the hotels on changing business environment (Nam et al., 2020; Vui-Yee & Paggy, 2018). After extensive literature search (Jones & James, 1979) established 35 organizational-climate factors and segregated them in four features specifically: job & role, leadership, workgroup, and subsystem & organizational. Using a slightly modified version of the psychological climate questionnaire, a study of fourteen 4/5-star hotels in Australia was conducted by Davidson et al., (2001). They outlined 70 items originating on the identical 35 concepts, with each concept having two items. The study drifted from the original approach and loaded 70 items as a substitute for 35 summated components, and it validated seven factors.

Later research of (Datta & Singh, 2018) demonstrated that the PWE tool that (M. C. G. Davidson, 2000) created is more dependable than the previous PWE measurements which were used in the hotel sector. Considering this fact, (Datta, 2020) study considered the 70 items or quality-components of Davidson, but instead of item loading, 35 summated-component loading was applied which could be used to draw synthesis on the changing dynamic of work environments like sustainability and technology automation (Odekerken-Schröder et al., 2022; Yu et al., 2022). Exploratory factor analysis (EFA) identified the four underlying dimensions and later it was validated by confirmatory factor analysis (CFA). The dimensions were labelled as: "esprit of profession, organization & workgroup (EPOW)"; "leader facilitation & support (LFS)"; "cohesion, clarity & objectivity of system (CCOS)" and "job challenge, variety & feedback (JCVF) for changing work dynamics" and the model was named "hospitality organizational climate scale".

For this study, the 44 items of (Datta & Singh, 2018) has been considered as it is based on employees of high-end hotel, and it is outlined on a Likert scale (5-point: 1=strongly disagree to 5=strongly agree). After a few modifications the tool eco-tech PWE comprising of four factors: EPOW (16 items), LFS (14 items), CCOS (8 items), and JCVF (6 items) was implemented. Sample items for each factors were: (a) EPOW – "Opportunity for independent thought and action towards eco-tech practices", "I get the eco-tech resources needed to do the work well" (b) LFS – "Supervisor emphasises high standards of eco-tech performance", "Supervisor provides the help I need to perform eco-tech practices" (c) CCOS – "There is friction in my workgroup towards implication of eco-tech practices*", "The suggestions of staff towards eco-tech practices are paid attention to" (d) JCVF – "Work hours are irregular to maintain eco-tech practices*", and "Required to perform certain unnecessary tasks that hampers eco-tech practices*". [* - Reverse coded items].

The questionnaire was initially given to 30 hotel staff after receiving positive insights from five experts. The pilot survey group took an average of 15 minutes to complete the questionnaire, and there were no serious issues with the instrument's understandability. Cronbach alpha statistic established the reliability of the eco-tech PWE components as the alpha value was 0.947, which is acceptable (Hair et al., 2006 ).

### 2.2. Participants and procedure

The selection of research frame was directed by the fact that the utilization of technology in hotel operations is still limited and is mostly implemented in high-end hotels. Since the hospitality millennial employee population was unavailable, convenience sampling method was implemented to select the hotels and draw the samples from the chosen research frame. A request mail was sent to the training managers of the high-end hotels in India where the researcher has some form of contacts. After getting their consent to take part in the survey the online link of the validated questionnaire was mailed to them, and they were instructed to forward it to the employees, those who were hospitality graduates and below 36 years of age i.e., millennial generation. The study was administered in March-April 2024. A total of 513 questionnaires were filled online by the selected millennial employees. Due to missing data 51 cases were removed, leaving a total sample of 462 for analyses. The data was loaded in the SPSS-21 software, and the Amos-22 software was used for factor analysis. The sample consists of entry-level (51.5%), supervisors (27.9%), and managers (20.6%); 72.9% were male and 27.1% female. 44.8% of the sample was found to be ≤ 25 years employee followed by 26 to 30 years (36.1%) and 31 to 36 years (19%). Majority of the samples were from f&b service department (33.3%) followed by culinary (29.6%), housekeeping (22.5%), and front office (14.5%). The sample distribution presented here is similar to the hospitality manpower distribution statistics, as stated in the studies of Choudhary & Datta, (2022c); Emiroğlu et al., (2015), which indicates that the sample pattern distribution depicted here is a fair representation of the hotel population in India and enhance the generalisability of the findings.

Table 1: **Sample Structure**

| Demographic | Groups | F | % |
|---|---|---|---|
| Age-groups | ≤ 25 years | 207 | 44.8 |
| | 26 to 30 years | 167 | 36.1 |
| | 31 to 36 years | 88 | 19.0 |
| Gender | Male | 337 | 72.9 |
| | Female | 125 | 27.1 |
| Job levels | Entry-level | 238 | 51.5 |
| | Supervisor | 129 | 27.9 |
| | Manager | 95 | 20.6 |
| Department | Culinary | 137 | 29.6 |
| | F&B Service | 154 | 33.3 |
| | Housekeeping | 104 | 22.5 |
| | Front Office | 67 | 14.5 |
| Overall | | 462 | 100 |

f=frequency, %=percentage

### 2.3. Testing the construct

For this study, 44 items of (Datta, 2022; Subramanian & Shin, 2013) were loaded in SPSS and the mean of each two components of the 22 eco-tech PWE factors has been calculated. The factor analysis' appropriateness was ascertained by the KMO (0.94) and Bartlett's score ($\chi 2$ =8679.73, d.f =460, p =0.00). Significant result of the measures of KMO > .7 indicate that the degree of information among the variables overlaps significantly, which suggests a strong partial correlation, and the p-value of Bartlett's score (< 0.5), suggests that there is a reasonable association among the factors, and it is not an identity matrix. Hence, it is plausible to conduct factor analysis (Byrne, 2013).

Table 2: **Factors of perceived eco-tech work environment**

| **Factors of eco-tech PWE** | **M** | **s.d** |
|---|---|---|
| **Esprit of Profession, Organization & Workgroup (EPOW)** | | |
| Eco-tech job autonomy | 3.818 | 0.869 |
| Efficiency of eco-tech job-design | 3.745 | 0.873 |
| Reputation for sustainable effectiveness | 3.998 | 0.744 |
| Workgroup friendliness & warmth towards eco-tech practices | 3.923 | 0.887 |
| Green ambiguity of organizational structure | 3.851 | 0.855 |
| Organizational eco-tech esprit de corps | 3.719 | 0.801 |
| Professional eco-tech esprit de corps | 4.023 | 0.757 |
| Green opportunities for growth and development | 3.849 | 0.837 |
| **Leader Facilitation & Support (LFS)** | | |
| Support towards eco-tech practices | 3.715 | 1.021 |
| Eco-tech goal emphasis | 3.873 | 0.832 |
| Green work facilitation | 3.771 | 0.909 |
| Green interaction facilitation | 3.923 | 0.837 |
| Upward green interaction | 3.969 | 0.856 |
| Confidence and trust towards eco-tech initiatives | 3.812 | 0.835 |
| Awareness of employees' eco-tech practice challenges | 3.808 | 0.843 |
| **Cohesion, Clarity & Objectivity of System (CCOS)** | | |
| Eco-tech planning & coordination | 3.253 | 0.815 |
| Workgroup green cooperation | 3.477 | 0.829 |
| Openness of expression towards eco-tech practices | 3.283 | 0.763 |
| Interdepartmental cooperation towards eco-tech implications | 3.462 | 0.900 |
| **Job Challenge, Variety & Feedback (JCVF)** | | |
| Eco-tech job challenge | 3.891 | 0.849 |
| Eco-tech job variety | 3.708 | 0.972 |
| Eco-tech reviews and feedback | 3.853 | 0.854 |

M=mean, s.d=standard deviation, β=standardized regression weights

CFA i.e. Confirmatory factor analysis was done to assess the construct reliability (CR) and convergent validity of the eco-tech PWE structure. The study of (Fornell & Larcker, 1981) revealed that, the convergent validity of the theory is still acceptable with AVE > 0.4, if CR is > 0.6. Examining the estimate's standardized regression weights, the values of the summated components were found significant (loading >0.5) (Hair et al., 2006; Tabachnick & Fidell, 2007) The values of CR and AVE of the eco-tech PWE factors are: EPOW (0.879; 0.479), LFS (0.897; 0.556), CCOS (0.732; 0.407), and JCVF (0.858; 0.627) which reveals good internal consistency and establishes the model's validity.

Extent to which the indicators denote the hypothesized underlying construct is known as model fitness and the insignificant p value (< 0.05) of the $\chi^2$ indicated its fitness (Tabachnick & Fidell, 2007). The tool was tested using CFA, and the values suggest fitness of the model (df=199; $\chi 2$=518.836; CMIN/DF=2.607). The fit indices test like the "goodness-of-fit index (GFI)", "normed-fit index (NFI)", "comparative-fit index (CFI)", "incremental-fit index (IFI)", and "Tucker-Lewis index (TLI)" should be used to assess the framework's suitability, if these values are ≥ .9 and the "root-mean-square-error-of-approximation (RMSEA)" is <.06, it indicates the fitness of the model (Tabachnick & Fidell, 2007). These values of the eco-tech PWE construct were found: GFI =0.910; CFI =0.939, NFI =0.905; IFI = 0.939; TLI =0.929; RMSEA = 0.059, which suggests that the eco-tech PWE construct is appropriate to the given context.

### 2.4. Eco-tech PWE prediction by different profiles of millennial hotel employees

The established eco-tech PWE construct now needs to be analyzed to determine the differences of millennial hospitality employees of different demographic groups about it. The mean differences of the eco-tech PWE factors were equated within the groups with ANOVA to test the hypotheses (Byrne, 2013). The scores suggest that significant differences are there among the millennial employees of diverse gender ($F = 6.487$, $p = 0.011$), job levels ($F = 6.483$, $\alpha = .002$), and operation department ($F = 11.748$, $\alpha = .000$) since $p < 0.05$, but failed to establish any significant differences among age-groups ($F = 0.450$, $p = 0.638 > 0.05$) of millennial employees of high-end hotels about eco-tech PWE. The mean-value suggests that the female millennial employees have higher eco-tech PWE (M=3.83) than the males (M=3.68). Among age-groups: 26-30 years (M=3.75) age-group were found to have better eco-tech PWE than the 31-36 years (M=3.71) and the ≤ 25 years age-group was found to have the least eco-tech PWE (M=3.70). The managerial employees (M =3.83) were found to have the most favorable eco-tech PWE than the supervisors (M = 3.80) and entry-level (M = 3.63) millennial hospitality staff. The millennial employees of f&b service department perceive the eco-tech PWE least favorably (M = 3.57) followed by culinary (M = 3.71) and housekeeping (M = 3.75). Whereas the millennials working in the front office department perceived it the most (M = 4.03).

Table 3: **One-way ANOVA scores of the variable profiles on eco-tech PWE**

| Groups | F-Value | p | Result |
|---|---|---|---|
| Age group | 0.450 | 0.638 | Reject $H_a1$ |
| Gender | 6.487 | 0.011 | Accept $H_a2$ |
| Job level | 6.483 | 0.002 | Accept $H_a3$ |
| Department | 11.748 | 0.000 | Accept $H_a4$ |

## 3. DISCUSSION

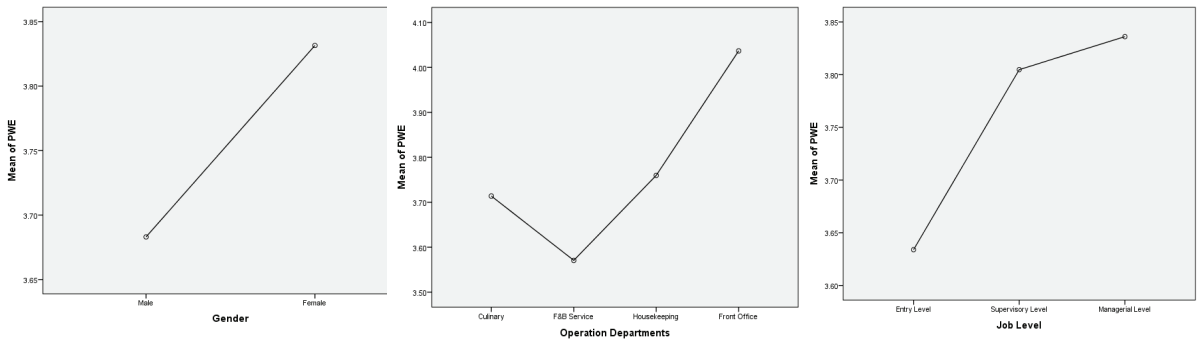
Millennial generation view eco-tech work environment with a preview on purpose served by the integration of technology, type of technology, the flexibility it provides, and above all the how sustainable is the technology in itself. Millennials regard eco-tech workplaces as vital for personal satisfaction, professional involvement, and societal influence. Organisations that emphasise sustainability, use cutting-edge technology, and cultivate genuine, adaptable cultures are more inclined to attract and keep young talent. The study offers a comprehensive perspective for readers regarding the extensive literature on PWE and the development of eco-tech PWE, emphasising its publication history, notable authors, citation matrices, and frameworks that elucidate the components of eco-tech PWE. The literature synthesis utilising a systematic and bibliometric approach offers valuable insights to scholars and researchers for advancing concepts in the eco-tech PWE domain. In an eco-tech hospitality workplace, employees demonstrate a strong dedication towards sustainability by using technology efficiently and actively participating in environmentally conscious practices (Choudhary & Datta, 2022b; Murugan & Marisamynathan, 2024). This contributes to the development of a more ecologically friendly and socially responsible hospitality industry. The millennial generation has been the focal point of this research since their characteristics are much different than the previous groups and their contribution as the workforce of the hotel industry is increasing day by day (Choudhary & Datta, 2024). This study tries to establish the factors of the eco-tech work environment that are perceived by the millennials and establish the eco-tech PWE differences among the groups of millennial hotel employees of India. Here, the 22 components that (Datta, 2022) had established was used to examine their perceptions related to eco-tech work climate, and the findings validated the construct on the studied context. In-line to the above study, the four-factors ratified here are labelled as EPOW, LFS, CCOS, and JCVF.

Millennial hospitality employees prioritize the eight EPOW components. They are brand-conscious and believe in the importance of a professional and organizational esprit de corps. They value the efficiency of eco-tech job design and career advancement opportunities on meeting eco-tech goals. Millennial employees value a reputation for effectiveness and the quality of their workgroup's commitment towards eco-tech work environment. The LFS factor, consisting of seven components, is crucial for millennial employees. They expect caring management, awareness of employee needs and challenges, and effective leadership that will help them to enhance the eco-tech practices. They expect upward interaction from supervisors and support from management to achieve satisfaction and happiness towards performing the eco-tech practices in the workplace (Datta & Singh, 2018; Pillai & Sivathanu, 2020). The CCOS factor is also important for millennial employees to enhance eco-tech practices in the job. They want companies to foster openness of sustainable experimentation and ensure that interaction is not hindered by chain of command regulations. Planning and coordination towards implementation of eco-tech practices are important, and the organization should prioritize interdepartmental and workgroup cooperation towards its achievements. Overall, millennial hospitality employees value a work environment that prioritizes eco-tech collaboration and openness to experimentation. Millennials seek job diversity and job challenges, valuing their expertise and talents. The hotel industry should conduct regular training sessions on eco-tech practices to enhance employee skills (M. A. Islam et al., 2020; Twenge et al., 2010). Job feedback on it is crucial for millennials, and hotel managers should design eco-tech work environments that promote these aspects (Cvelbar et al., 2024).

Analysis reflected that there were no age-related disparities in the perceived eco-tech work environment observed in hospitality sector. However, significant differences are observed with respect to various gender, job levels, and operation department to embrace new sustainable business practices (Ruiz-Sánchez et al., 2024). The findings contradict the results of Datta, (2020), the reason for this is because the participants of the survey are exclusively millennial employees who are always striving to progress in their professional lives. Though they are eager to acquire knowledge about the most recent technology but prefer to

do it in their own way this create a difference in opinion towards the eco-tech work environmental practices. According to the descriptive data, the age group of ≤ 25 years has the least eco-tech PWE and it rises with age, which is consistent to the findings of (Piramanayagam & Seal, 2020). The study found that the 26 to 30 years age-group perceive eco-tech PWE sounder than the other groups since post initial years of work the mid group employees begin to receive recognition and growth, which appeals the millennial generation, leading them to view eco-tech PWE most favourably. The male and female millennial employees have distinct perceptions of eco-tech PWE, which aligns with the findings of (Abualigah et al., 2023). Previous research has shown that women demonstrate a more mature attitude towards their job and profession compared to men (Ismail & Nakkache, 2015). This is supported by the study findings, which indicate that female millennials have a more positive eco-tech work attitude than their male counterparts. On the other hand, most of the males like to join F&B department, whereas the females found the job to be strenuous and meeting the eco-tech practices is a challenge (T. Islam et al., 2020).

Figure 6: Mean plots of eco-tech PWE prediction by different demographics of millennial hotel employees




Gender Departments Job Levels

Source: SPSS Mean Plot

Hotel's departments display significant differences in eco-tech PWE which is similar to the results of (Datta, 2020; Kang et al., 2018). Job characteristics of the F&B service and culinary section are more complex than the housekeeping and front office, which directs these staff members to perceive the eco-tech PWE less delightfully. In addition to it, millennial employees are continuously seeking a better sustainable lifestyle and are intolerant of non-environmentally friendly hectic working conditions. Eco-tech PWE is perceived differently by the millennial employees of different job levels. The results state that employees of managerial level have shown a more satisfactory attitude towards eco-tech PWE practices than their subordinates. This logical reason might be that, when one progresses through the ranks, they gain more authority, responsibility, perks, and a stable position which provides them with job security. Millennials are not hesitant to change jobs because they realize that if their eco-tech PWE is not appropriate, they have alternative possibilities (M. A. Islam et al., 2020; Kumawat et al., 2025; Twenge et al., 2010).

### 3.1. Implications

The results of this study add to the literature in a variety of ways. First, the four-factorial framework was found to be consistent and appropriate in this context. It will provide researchers with a measurement tool to evaluate the eco-tech PWE of the hospitality and tourism industry. Second, the framework delivers an insight into the factors of the eco-tech PWE which are considered important by the millennial employees of the high-end hotels. Third, the knowledge gained from the findings may help the hospitality leaders in gaining insights into the expectations of the millennial employees of different demographic groups regarding the changing dynamics of eco-tech PWE.

The study also provides the valuable insights that will assist hospitality industry to understand the importance of eco-tech PWE of their young employees. Hotels that embrace eco-technologies provide millennial employees with a more meaningful, dynamic, and future-ready working environment. The industry not only recruits and retains millennial talent by connecting with their beliefs, providing opportunities for advancement, and empowering them to lead sustainability initiatives, but it also creates a strong and responsible future. To address the expectations of millennial employees, hotel managers must actively incorporate eco-technology and sustainability into their management practices. This includes developing a culture of sustainability, utilising technology, encouraging people to participate, ensuring that HR processes are in line with green values, and maintaining open communication. These measures not only increase staff engagement and retention but also position the organisation as a pioneer in sustainable hospitality. To meet millennials' tech-driven efficiency expectations, managers can include eco-tech friendly policies such as green awards and processes that leverage smart technologies into the business culture. This would allow the organisation to boost staff performance and motivation.

Employees' job attitude and performance of the hospitality organization can be improved by promoting eco-tech PWE. The findings also reveal that the improvement of these factors EPOW, LFS, JCVF, and CCOS will improve the overall sustainable work environment of the hospitality industry. Understanding and enhancing these parameters which are valued by the millennial employees will assist the HR administrators in constructing a quality and competitive work environment of hotels. In addition, the result indicates that eco tech PWE is directly related to gender, job levels, and department. The author advises that staff must be responsible and patient first to acclimatize to the hotel's eco-tech working circumstances. Largely, the analysis directs the

strategies to enrich the perceived work environment towards sustainability and AI adoption of the millennial employees, which will assist the management in developing a favorable condition to meet the beliefs of the hospitality staff.

### 3.2. Limitations and Further Studies

The eight Sustainable Development Goal (SDG – 8) seeks to mitigate global job disparities while concurrently harmonizing economic growth with social and environmental accountability by fostering sustainable tourism, industrial development, and economic diversification. This study complies with the objective of sustainable growth since the current workforce in hospitality is more inclined to automation and environmental principles. The samples from high-end hotels in India have been measured in this study and further limited to the millennial employees. In addition, the convenience sampling method has been adopted in this study since the millennial hospitality employee's population frame was unavailable. Further research on eco-tech PWE may be done in different settings, measuring various job attitudes of employees using probability sampling methods may be adopted to bring a holistic viewpoint. The research has adopted cross-sectional design, a longitudinal study may explain eco-tech PWE more accurately. The author recommends that more research needs to be conducted on hospitality and tourism industries to enhance employee perceptions towards the sustainable practices of the organization.

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