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Green Practices in Action: Examining HRM's Role in Fostering Environmental Performance in Egypt's Hospitality Sector

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Abstract: This study examines the dynamic relationship between green human resource management (green HRM), environmental performance (EP), green employee behavior (GEB), and environmental knowledge and awareness (EKAW) within the Egyptian hospitality sector context. Using Pearson correlation coefficients and regression analyses on a sample of 400 staff members from hotels and tourist villages in Egypt, the study examines green HRM practices' influence on EP, mediated by GEB and EKAW. The findings reveal significant positive correlations between green HRM practices and these mediators, indicating that comprehensive environmental strategies and incentive management are pivotal in promoting eco-friendly practices among employees. The study further confirms GEB and EKAW's substantial mediating roles in enhancing EP. The results also suggest that while EKAW and GEB independently contribute to EP, their interaction, and the role of environmental awareness as a potential mediator warrant further examination. This research contributes to the literature on sustainable business practices by underscoring human resource strategies' integral role in achieving environmental sustainability goals, highlighting the importance of incentivizing green practices, and cultivating an organizational culture prioritizing EKAW. These insights are precious for organizations seeking to enhance their ecological footprint through effective green HRM practices.

Keywords: green human resource management; green HRM; environmental performance; green employee behavior; environmental awareness; Egyptian hospitality sector

JEL Classification: M12; Q56; L83

Citation: Abedelrahim, S.; Qassim, A.A.; Alatawi, F.M.H. Green Practices in Action: Examining HRM's Role in Fostering Environmental Performance in Egypt's Hospitality Sector. *Sustainability* **2024**, *16*, 3314. https://doi.org/10.3390/su16083314

Academic Editor: Hyo Sun Jung

Received: 18 February 2024
Revised: 8 April 2024
Accepted: 10 April 2024
Published: 16 April 2024

1. Introduction

Organizations are increasingly recognizing the imperative to embed green practices into their core operations in an era marked by a heightened global consciousness towards environmental sustainability. Central to this transformation is green human resource management (green HRM), a pioneering approach that aligns human resource (HR) practices with environmental sustainability goals. This integration facilitates the cultivation of a workforce that is operationally efficient and deeply committed to environmental stewardship. The significance of green HRM lies in its capacity to foster sustainable business operations, a theme explored in numerous studies. Researchers such as Nisar et al. (2021) [1] and Ahmad (2015) [2] have underscored its importance in promoting eco-friendly organizational practices. Furthermore, the literature reveals a growing interest in how green HRM initiatives can improve organizational EP, as documented by the works of scholars such as Kim et al. (2019) [3] and Hameed et al. (2020) [4]. These studies provide a foundation for exploring the effectiveness of green HRM practices in enhancing environmental stewardship within organizations.

A key focus of this investigation is the role of green employee behavior (GEB)—actions such as recycling, sustainable resource utilization, and energy conservation—and its influence on the relationship between green HRM and EP. The impact of such behaviors,

amplified by effective green HRM practices, has been highlighted in research by Dumont et al. (2017) [5] and Chaudhary (2020) [6], indicating the potential for significant environmental benefits. Equally critical is the mediating effect of environmental knowledge and awareness (EKAW) on this relationship. This aspect, discussed in studies by Darvishmotevali and Altinay (2022) [7] and Zhu et al. (2021) [8], examines how an employee's understanding of environmental issues can enhance or hinder the success of green HRM practices and, by extension, contribute to the organization's overall EP.

Adopting green HRM practices offers a promising path for Egyptian organizations to enhance their environmental performance and contribute to the country's sustainability journey. By integrating green principles into HR practices, Egyptian businesses can foster a workforce that is competitive, innovative, and deeply engaged in environmental stewardship, thereby supporting Egypt's transition towards a sustainable future. This endeavor aligns with the global movement towards sustainability and positions Egypt as a leader in the region for environmental responsibility and sustainable development.

This study aims to explore how green human resource management (green HRM) practices impact environmental performance (EP) in Egypt's hospitality sector, specifically looking at how green employee behavior (GEB) and environmental knowledge and awareness (EKAW) mediate this relationship. The study objectives are as follows.

- Evaluate the impact of green HRM practices on environmental performance within Egypt's hospitality sector.
- Examine how green employee behavior (GEB) mediates green HRM practices and environmental performance.
- Assess the role of environmental knowledge and awareness (EKAW) in mediating the relationship between green HRM practices and environmental performance.

The following section presents an extensive literature review to explain the present study's theoretical basis and delineate the areas that still need to be examined in the extant literature. The third section presents the study's methodology, including an overview of the techniques used for data collection, the sample's attributes, and the statistical approaches used to analyze the data. The empirical outcomes are evaluated in the subsequent section, where the results are contrasted with those of earlier studies. The key findings are outlined briefly in the final section, and their significance for policymaking is examined. Recommendations for further research on this topic are also provided.

2. Literature Review

2.1. Applied Organizational Theories

The convergence of HRM theories supports the idea that green HRM drives improvements in EP by fostering GEB and increasing environmental knowledge and awareness (EKAW). According to Kellner et al. (2019) [9], the ability, motivation, and opportunity (AMO) framework provides a structured method for assessing green HRM efficacy to ensure that staff members are capable and motivated to participate in environmentally friendly activities. According to this model, green HRM impacts performance most when employees' motivation, skills, and opportunities to use them align with the organization's sustainability goals.

According to resource conservation theory, people are more likely to invest their resources when they have more of them (Hobfoll, 2011) [10]. Green empowerment and training are some examples of green HRM activities commonly used within organizations to help workers become more environmentally conscious (Chen et al., 2015; Ren et al., 2018) [11,12], encouraging them to adopt green behaviors to a greater extent (Chen and Wu, 2022) [13]. According to stewardship theory, as explained by Davis et al. (1997) [14], inherently motivated individuals' behavior as stewards of the environment will inevitably be aligned with the organization's long-term goals, particularly if these goals align with their beliefs. This inner motivation is a robust mediator between HR procedures and EP regarding green HRM.

Furthermore, Gladwin et al.'s (1995) [15] sustainability theory presents a thorough approach to creating an equilibrium between environmental, social, and economic demands. According to this theory, in addition to being strategic, green HRM is an essential operational requirement for long-term sustainability, expressed as enhanced EP. This method emphasizes how integrating sustainable practices into business culture is strategically critical, particularly in sectors such as hospitality, where environmental stewardship is ingrained.

These theoretical frameworks collectively highlight HRM activities' varied effects on motivating a knowledgeable and behaviorally aligned workforce driven toward environmental stewardship, ensuring the organization's sustainability goals are attained.

2.2. Green HRM

Organizations have been under increasing pressure to enhance their environmental and social sustainability. With rising global awareness regarding environmental protection, businesses have been compelled to adopt green HRM practices (Renwick et al., 2008) [16].

Green HRM aims to cultivate practices to create environmentally conscious employees, benefitting businesses/industries, society, and nature (Hristova and Stevceska-Srbinovska, 2020) [17]. Green human resource management (green HRM) encompasses a suite of practices designed to integrate environmental sustainability into all aspects of human resource management. Green HRM seeks to enhance organizational environmental performance (EP) and encourage pro-environmental behavior among employees by fostering a culture that prioritizes ecological responsibility.

Green Job Analysis and Description: Involve identifying and incorporating environmental responsibilities into job roles. This process ensures that every position within the organization contributes to sustainability goals. Rani and Mishra (2014) [18] emphasize the strategic role of green job design in promoting environmental responsibility, which is crucial for embedding sustainability into the organizational DNA.

Green Human Resources Planning: Is about forecasting the need for and developing strategies to recruit, retain, and develop a workforce capable of achieving the organization's environmental objectives. Ahmad (2015) [2] highlights the importance of aligning HR planning with sustainability goals, ensuring that the workforce is prepared to meet the challenges of environmental stewardship.

Green Training and Development: Programs equip employees with the knowledge and skills necessary for environmental management and sustainable practices. Dumont et al. (2017) [5] demonstrate that such training can significantly influence workplace green behaviors by creating a psychologically green climate and instilling green values in employees.

Environmental Incentives Management: Involves designing and implementing reward systems that recognize and encourage eco-friendly behaviors among employees. Saeed et al. (2019) [19] discussed the effectiveness of environmental incentive programs in promoting pro-environmental behaviors, suggesting that well-designed incentives can enhance the organization's overall EP.

Green Performance Evaluation: Assesses employees' contributions to the organization's environmental goals. Kim et al. (2019) [3] explored the impact of green HRM on eco-friendly behavior and environmental performance, underscoring the importance of evaluating and recognizing employees' sustainability efforts.

Studies such as those by Nisar et al. (2021) [1] and Hameed et al. (2020) [4] provide empirical evidence supporting the efficacy of green HRM practices in improving EP and instilling eco-friendly behavior. The research by Zhu et al. (2021) [8] on the mediating effect of environmental belief and green organizational identity further enriches our understanding of how green HRM influences employee behavior and organizational outcomes.

As illustrated by Zhang et al. (2019) [20] and Awwad Al-Shammari et al. (2022) [21], innovation, sustainable performance, and positive environmental effects are critical outcomes of green HRM. As noted by Darvishmotevali and Altinay (2022) [7], leadership styles and managerial attitudes toward the environment play a crucial role in the success of

green HRM initiatives. Moreover, employee involvement and specific personality traits are significant in fostering environmentally friendly behavior through green HRM practices, as Ababneh (2021) [22] and Saifulina et al. (2020) [23] highlighted.

2.3. Green Employee Behavior

Green employee behavior (GEB) is characterized as prosocial inherently (Chou, 2014) [24] and involves actions that employees take to preserve natural resources and protect the ecological environment, along with efforts to address environmental degradation and improve environmental quality (Norton et al., 2015; Steg and Vlek, 2009) [25,26]. GEB is crucial in sustaining the organization's EM system (Fawehinmi et al., 2020) [27]. Researchers have acknowledged such behavior's significance and examined management strategies organizations can implement to motivate employees to adopt environmentally friendly practices (Chen and Wu, 2022) [13]. The HRM behavioral literature has indicated that HRM influences employee work attitudes and behavior and, thus, affects organizational performance (Becker and Huselid, 2006; Wright et al., 2001) [28,29].

According to the HRM behavioral literature, HRM attributions significantly influence employees' outcomes due to HRM practices (Nishii et al., 2008) [30]. Consequently, how an employee views organizational support for environmental concerns is crucial to motivating GEB. Various approaches—such as environmental policies, performance appraisals, and encouraging employee participation—can reinforce this perception (Shen et al., 2018) [31]. Bos-Nehles et al. (2013) [32] indicated that green HRM affects employees' dedication and motivation to achieve organizational objectives, particularly initiatives related to environmental sustainability.

Dumont et al. (2017) [5] suggested that the focus of green HRM practices—e.g., performance management, training, and rewards—was on sustainability, an essential requirement of GEB. Chaudhary (2020) [6] analyzed the correlation between green HRM and GEB, which supports the idea that organizational practices can motivate employees to act in an environmentally responsible manner. In environmental sustainability (ES) programs, employees are the key sources of expertise, knowledge, and innovation (Sanyal and Haddock-Millar, 2018; Renwick et al., 2013) [33,34]. Involving employees in green initiatives is crucial to ensuring that the organization's EM efforts are successful (Tang et al., 2018) [35] because employees' goodwill and individual actions ultimately determine the success of most environmental initiatives, e.g., recycling waste material, switching off lights, efficient utilization of resources, or turning off electronics at the end of the day (Boiral et al., 2015) [36]. Thus, management must ensure employees are willing to participate in the environmental cause with their hearts and minds instead of mandating compliance (Renwick et al., 2013) [33]. Saeed et al. (2019) [19] and Sabokro et al. (2021) [37] examined green behavior's broader effects on CSR and organizational sustainability.

2.4. Environmental Knowledge and Awareness

A person's awareness of environmental issues and how to address them is reflected in their environmental knowledge (Zsóka et al., 2013) [38]. According to Ziadat (2010) [39], environmental awareness is "the extent of knowledge possessed by distinct groups of individuals regarding the seriousness of environmental issues and their response or interaction with the environment". Various extant studies have asserted that the terms environmental knowledge and environmental awareness are interchangeable in some contexts (Kwatra et al., 2014) [40].

More excellent environmental knowledge increases green HRM practices' impact on GEB and environmental knowledge development. Green HRM facilitates the development of sustainable environmental behavior (Saeed et al., 2019) [19]. Employees should be encouraged to participate in EM programs through knowledge and attitude development, which is vital to aligning green HRM with EM (Fawehinmi et al., 2020) [27]. When employees develop environmental protection awareness, they also realize the value of greening the workplace (Bhattarai et al., 2023) [41]. Green HRM may affect employees' cognition and

inherent attributes as a source of external influence, thereby encouraging GEB (Chaudhary, 2020) [6].

Environmental knowledge and awareness facilitate sustainable practices within organizations. Darvishmotevali and Altinay (2022) [7] examined the relationship between green HRM and environmental awareness. Fawehinmi et al. (2020) [27] examined it further, particularly academics' green behavior, and recognized green HRM and environmental knowledge's role in this field. Increased cognitive and interpersonal capabilities are required to implement green HRM practices, including employees' environmental knowledge (Ren et al., 2018) [12], which can be developed when they experience the psychological willingness to obtain such knowledge (Markey et al., 2019) [42]. Thus, to develop responsible green behavior and ensure effective implementation of green HRM practices (Ren et al., 2018) [12], environmental knowledge and awareness need to be improved (Fawehinmi et al., 2020) [27].

2.5. Environmental Performance

Organizations increasingly recognize that they need to contribute to sustainability, as they are part of a rapidly evolving environment that requires adopting management practices aligned with developing institutional pressures for sustainability (IPS) (Baker and Schaltegger, 2015) [43]. Thus, businesses must reassess their activities and exhibit greater responsibility (Epstein et al., 2010) [44]. Elkington (1994) [45] described sustainability as extending the corporate perspective to include environmental, social, and economic dimensions. Schaltegger and Wagner (2006) [46] put forth another definition in which they characterized sustainability performance as an organization's performance in all the aspects and drivers of corporate sustainability. An increasing number of companies are pursuing sustainability goals by incorporating green initiatives into their business models, and they depend on their HRM departments, an essential internal resource, to execute their sustainability vision (Wirtenberg et al., 2007) [47]. HRM is critical in addressing various pressures from governmental and international organizations, including institutions, organizational renewal, evolutionary developments, and organizational efficacy (Bombiak and Marciniuk-Kluska, 2018) [48]. As a result, HRM department managers focus on driving change and improving their companies' sustainability efforts (Gim et al., 2022) [49] by influencing employees' motivations, attitudes, and behaviors, which their perceptions of HRM predict (Tang et al., 2018) [35].

Green HRM in EM plays an influential role, as HR is vital to achieving green corporate objectives (Jabbour and Santos, 2008; Paillé et al., 2020) [50,51]. Employees' eco-friendly behavior determines the success of an organization's EM, which collectively enhances the organization's EP (Daily et al., 2009; Lo et al., 2012) [52,53]. Understanding how green HRM influences employees' eco-friendly behavior is critical for a company to attain ecological sustainability, with this behavior consequently affecting the company's EP (Kim et al., 2019) [3]. Hameed et al. (2020) [4] demonstrated that green HRM practices can directly impact employees' EP, establishing a robust correlation between HR practices and the organization's environmental outcomes (Kim et al., 2019) [3]. Thus, the research hypothesis has been confirmed through the creation of a direct relationship between green HRM, eco-friendly employee behavior, and EP.

2.6. Literature Gap and Hypotheses

While studies such as Dumont et al. (2017) [5] and Zhu et al. (2021) [8] have examined green HRM's influence on employee behavior, these behaviors' specific mediating role in translating green HRM into tangible EP has not been examined extensively. Research could provide deeper insights into how employee behavior bridges the gap between HRM practices and environmental outcomes. Furthermore, studies such as Darvishmotevali and Altinay (2022) [7] have touched on environmental awareness. Still, its role as a moderator in the relationship between green HRM, GEB, and EP has been examined less often. This

research could show how different organizational environmental awareness levels influence green HRM practices' efficacy.

By addressing these literature gaps, the present study could significantly contribute to understanding how green HRM practices influence EP, mediated by GEB and EKAW. This could provide valuable insights for practitioners and policymakers looking to enhance organizations' environmental sustainability. To add depth and specificity to the extant body of knowledge, this study's hypotheses can be expressed as follows:

H1. *GHRM has a significant positive effect on EP.*

H2. *GHRM has a significant positive effect on EKAW.*

H3. *GHRM has a significant positive effect on GEB.*

H4. *EKAW significantly affects EP controlling for GHRM.*

H5. *GEB significantly affects EP, controlling for GHRM).*

H6a. *EKAW and GEB together significantly mediate the relationship between GHRM and EP.*

H6b. *After including EKAW and GEB in the model, the direct relationship between GHRM and EP will become non-significant, indicating full mediation.*

3. Methodological Framework

3.1. Measures

All scales used in the study were translated into Arabic using Brislin's (1970) [54] back-translation technique. A Likert-type scale ranging from "strongly disagree (1)" to "strongly agree (5)" measured each item of the green HRM, GEB, EKAW, and EP variables. Dumont et al.'s (2017) [5] scale was used to measure green HRM. Aboramadan (2022) [55] and Bissing-Olson et al.'s (2013) [56] scale was used to measure GEB. Saeed et al.'s (2019) [19] scale was used to measure EKAW. Yong et al.'s (2020) [57] methods were used to measure EP.

3.2. Sample

A field study was conducted on the target population (senior and middle management levels) working in hotels, tourist villages and in Egypt and in floating hotels. Senior management staff in hotels and tourist villages comprised 1600 individuals. The sample size was determined using Cochran's formula for a finite population. The researchers determined that a sample of at least 400 from the target population was needed. The questionnaires were distributed according to the proportion of each stratum of the target population, so the researchers applied a stratified random sampling technique to select the individuals.

The statements in the questionnaire were closed-ended, using a Likert-type scale with five levels. The questionnaire contained 39 statements, divided into ten variables. The researchers set up the study variables to reflect the research axes by calculating the weighted mean of the responses to the statements that pertained to each variable. This calculation aimed to convert the collected data from ordinal to ratio data so that parametric techniques could be applied to analyze the data, such as the Pearson correlation coefficient, regression analysis, etc. The study's variables and suggested estimated models are presented in Figure 1 below.

Table 1 below presents the study variables and statements that pertain to each variable (the arithmetic mean was calculated to represent the study variables) and the type of each variable.

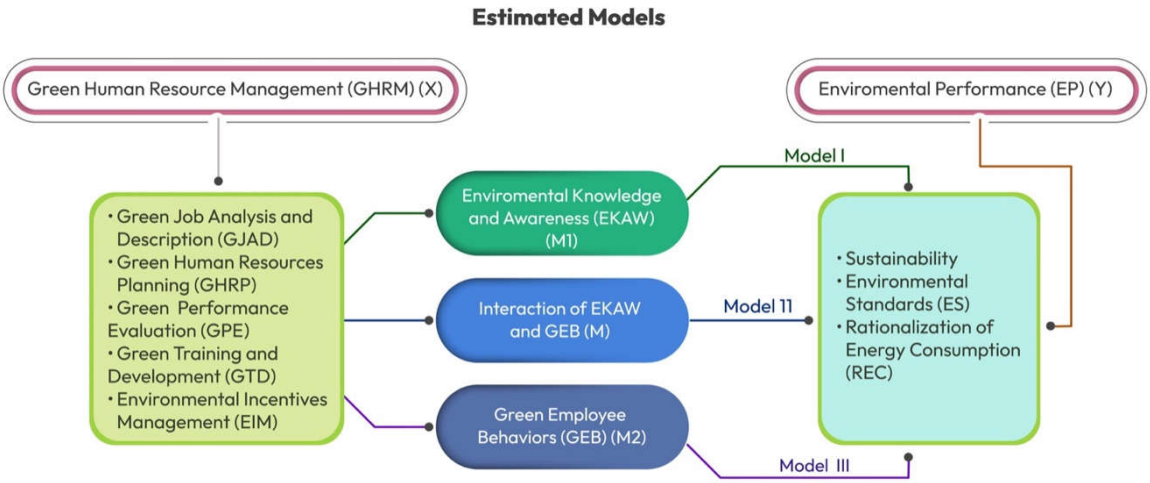

Figure 1. The relationship between the study variables and the suggested models.

Table 1. List of study variables, corresponding statements, and symbols.

Variables and Symbols	Statements	Type
Green environmental analysis and characterization X_1	S1 to S3	Independent
Green HR planning X_2	S4 to S6	Independent
Green performance evaluation X_3	S7 to S9	Independent
Green training and development X_4	S10 to S12	Independent
Environmental incentive management X_5	S13 to S15	Independent
Green human resource management practices X	S1 to S15	Main Independent
Environmental knowledge and awareness M_1	S16 to S24	1st Mediator
Green employee behaviors M_2	S25 to S30	2nd Mediator
Sustainability Y_1	S31 to S33	Dependent
Environmental standards Y_2	S34 to S36	Dependent
Rationalization of energy consumption Y_3	S37 to S39	Dependent
Environmental performance Y	S31 to S39	Main Dependent

4. Empirical Results

The researchers used the statistical analysis program STATA 9.02 to conduct statistical analyses in the following stages:

- Cronbach's alphas were used to verify the stability and reliability of the expressions for each variable in the whole data set.
- Tests of normality were conducted for each study variable.
- The diagnostic tool Pearson correlation coefficient was used to identify the strength and direction of the relationship between each pair of variables.
- Multiple regression models were applied to estimate the best model to explain the data effectively.

4.1. Reliability and Validity Test

Table 2 below presents Cronbach's alphas and validity coefficients for each variable mentioned in the questionnaire.

Table 2 indicates that the minimum Cronbach's alpha coefficient value was 0.977 and the minimum validity coefficient value was 0.989, thereby providing statistical evidence with a 95% confidence interval that the collected data's reliability and validity are acceptable. The statistical analysis and test hypotheses were based on the collected data set.

Table 2. Cronbach's alphas and validity coefficients for each variable.

Variables and Symbols	Cronbach's Alpha	Validity
Green environmental analysis and characterization X_1	0.978	0.989
Green HR planning X_2	0.980	0.990
Green performance evaluation X_3	0.977	0.989
Green training and development X_4	0.978	0.989
Environmental incentive management X_5	0.978	0.989
Green human resource management practices X (main independent)	0.978	0.989
Environmental knowledge and awareness M_1	0.989	0.995
Green employee behaviors M_2	0.989	0.995
Sustainability Y_1	0.977	0.989
Environmental standards Y_2	0.978	0.989
Rationalization of energy consumption Y_3	0.977	0.989
Environmental performance Y (main dependent)	0.977	0.989
Minimum Value	0.977	0.989

4.2. Test of Normality

To apply the parametric analysis (correlation and regression), the following assumptions must be met:

1. Normality: The data in each group should be distributed normally (Shapiro–Wilk test).
2. Equal Variance: The data in each group should have equal variance (Levene's test).

Table 3 below presents Shapiro–Wilk normality and Levene's test results for all study variables.

Table 3. Shapiro–Wilk and Levene's test results.

Tests of Normality and Equal Variance	Shapiro–Wilk Test	*p*-Value
Green environmental analysis and characterization X_1	0.992	0.059
Green HR planning X_2	0.984	0.062
Green performance evaluation X_3	0.993	0.048
Green training and development X_4	0.997	0.537
Environmental incentive management X_5	0.996	0.532
Environmental knowledge and awareness M_1	0.996	0.342
Green employee behaviors of M_2	0.996	0.334
Sustainability Y_1	0.993	0.059
Environmental standards Y_2	0.992	0.075
Rationalization of energy consumption Y_3	0.993	0.063
Levene's test	0.987	0.552

Table 3 indicates that all Shapiro–Wilk and p-value results were greater than 0.050, indicating that all study variables were distributed normally with equal variance. Furthermore, the p-value of Levene's test was greater than 0.050, thereby providing statistical evidence that all study variables had equal variances.

4.3. Correlation between Study Variables

Firstly, the researchers analyzed the Pearson correlation coefficient between each pair of study variables, and the results are laid out in Tables 4 and 5 below.

Table 4. Correlation coefficients between independent and mediator variables.

Independent Variables/Mediator Variables		Environmental Knowledge and Awareness M_1	Green Employee Behaviors M_2
Green environmental analysis and characterization X_1	R	0.354	0.378
	Sig. value	0.000	0.000
Green HR planning X_2	R	0.339	0.435
	Sig. value	0.000	0.000
Green performance evaluation X_3	R	0.398	0.374
	Sig. value	0.000	0.000
Green training and development X_4	R	0.402	0.431
	Sig. value	0.000	0.000
Environmental incentive management X_5	R	0.641	0.537
	Sig. value	0.000	0.000

Table 4 indicates that the Sig. values of the mediator variables and each independent variable are smaller than the significance level of 5%, so the researchers have statistical evidence that a significant and positive relationship exists between the mediator and independent variables, with a confidence interval of 95%. Furthermore, the Pearson correlation coefficient was estimated to discover the relationships between the mediator and dependent variables, as presented in Table 5 below.

Table 5. Correlation coefficients between dependent and mediator variables.

Dependent Variables/Moderate Variables		Environmental Knowledge and Awareness M_1	Green Employee Behavior M_2
Sustainability Y_1	R	0.410	0.556
	Sig. value	0.000	0.000
Environmental standards Y_2	R	0.205	0.207
	Sig. value	0.000	0.000
Rationalization of energy consumption Y_3	R	0.221	0.174
	Sig. value	0.000	0.000

Table 5 indicates that the Sig. value for each mediator variable and each dependent variable was smaller than the significance level of 5%, so the researchers have statistical evidence of a significant and positive relationship between the mediator and independent variables with a confidence interval of 95%. Furthermore, the Pearson correlation coefficient was estimated to determine the relationships between the main independent variables, two mediator variables, and the main dependent variable, as presented in Table 6 below.

Table 6 indicates a positive and significant relationship between the main independent variable, GHRM X, and the first mediator variable, EKAW M_1, and the second mediator variable, GEB M_2, which are 0.653 and 0.675, respectively. A positive and significant relationship was found between the main dependent variable, EP Y, and the mediator variables 0.635 and 0.622, respectively. Notably, no significant relationship was found between the two mediator variables.

Table 6. Correlation coefficients between main independent, dependent, and mediator variables.

Variables		GHRM X	EKAW M_1	GEB M_2
EKAW M_1	r	0.653		
	Sig.	0.000		
GEB M_2	r	0.675	−0.063	
	Sig.	0.000	0.207	
EP Y	r	0.921	0.635	0.622
	Sig.	0.000	0.000	0.000

4.4. Testing Mediation with Regression Analysis

A mediation model approximates the relationship between an independent variable, X, and a dependent variable, Y, when a mediator variable, M. is included. The mediation model assumes that X Influences M, which, in turn, influences Y. It also allows for an additional effect from X directly on Y over and above the effect on M. A popular method for testing for mediation is that of Baron and Kenny (1986) [58]. Using this method, the seven linear regression models below in Table 7 are fit.

Table 7. Seven linear regression models.

1st Mediator M_1	2nd Mediator M_2	Main Mediator M
$Y = i_1 + c_1X + b_1M_1 + e_1$ (1)	$Y = i_1 + c_2X + b_2M_2 + e_1$ (2)	$Y = i_1 + cX + bM + e_1$ (3)
$M_1 = i_3 + a_1X + e_3$ (4)	$M_2 = i_3 + a_2X + e_3$ (5)	$M = i_3 + aX + e_3$ (6)
$Y = i_2 + c_3X + e_2$ (7)		
Common model for the three mediators		

A significant relationship was found between the independent and mediator variables and between the dependent and mediator variables, so they created three new variables, as follows: (1) a new independent variable that represents the set of independent variables, designated by the letter X to denote GHRM; (2) a new dependent variable that represents the set of dependent variables, designated by the letter Y to denote EP; and (3) a new mediator variable that represents the two mediator variables, designated by the letter M to denote (EKAW M_1 and GEB M_2).

4.4.1. Testing the Mediated Effect

The total, direct, and indirect effects are all of interest in mediation analysis, but the main hypothesis to be tested is whether the indirect effect, ***ab***, is significant. MacKinnon (2008) [59] demonstrated that this can be conducted using the Large Sample Wald test, which can be used to test whether ***ab*** is zero (first-order standard error) (Sobel, 1982) [60].

$$z = \frac{ab}{\sqrt{(as_b)^2 + (bs_a)^2}}$$

4.4.2. Bootstrapping

Efron and Tibshirani (1993) [61] developed bootstrapping to provide standard errors and confidence intervals when standard assumptions are invalid. The bootstrap sampling process has provided ***B*** estimates of ***ab***, and the standard deviation of these ***B*** estimates is the bootstrap estimate of the standard error of ***ab***. Using this estimate, a Wald-type z-test can be constructed.

Calculating the indirect effect can be approached in two ways: (1) Judd and Kenny's (1993) [62] approach and (2) the Sobel (1982) [60] product approach.

(1) Judd and Kenny's (1981) approach

This approach involves subtracting the partial regression coefficient obtained in model 4, $\boldsymbol{\beta_1}$, from the simple regression coefficient obtained in model 1, $\boldsymbol{\beta}$, given that both parameters represent the effect of $\boldsymbol{X}$ on $\boldsymbol{Y}$. However, $\boldsymbol{\beta}$ is the zero-order coefficient from the simple regression, and $\boldsymbol{\beta_1}$ is the partial regression coefficient from the multiple regression. The indirect effect is the difference between these two coefficients:

$$\beta_{\text{indirect}} = \beta - \beta_1$$

(2) Sobel's (1982) product approach

Calculate the indirect effect by multiplying two regression coefficients from models 2 and 4. Given that model 2 involves the relationship between $\boldsymbol{X}$ and $\boldsymbol{M}$, the indirect effect, according to Sobel's (1982) [60] product approach, is the product of these two coefficients.

$$\beta_{\text{indirect}} = \beta(\beta_2)$$

Our models are represented in the Figure 2 below.

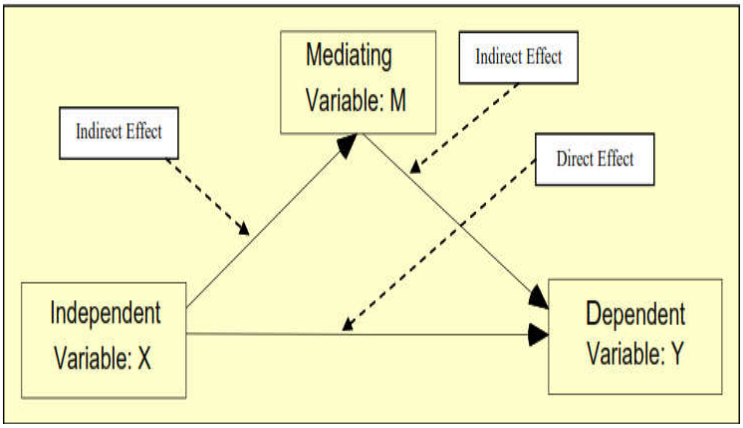

Figure 2. Modeling the mediator in the structural model.

In this model, the researchers examined the direct and indirect effects of X on Y. If the direct effect of X on Y is reduced, the indirect effect (through M) is significant. M is said to mediate in linking X to Y indirectly. If the direct effect of the independent variable on the dependent variable is significant, when the mediator variable, M, enters the model, then the direct effect would be reduced because some of the effects have shifted through the mediator. The mediation effect is called a "partial mediation" if it is reduced but still significant. However, if the direct effect is reduced and no longer significant, the mediation is called "complete mediation". In this model, the researchers examined the direct and indirect effects of X on Y. If the direct effect of X on Y is reduced, the indirect effect (through M) is significant. M is said to mediate in linking X to Y indirectly.

In the next section, the researchers present the analysis of variance in regression models for each mediator variable and for the main mediator variable to check each model's significance, the regression coefficient for each model to check the mediator variables' direct and indirect effects, and the direct, indirect, and total effects for each model. Table 8 below summarizes the variance analysis for each estimated regression model (refer to Table A1 in the Appendix A).

Table 8. Summary of analysis of variance of regression models for each mediator variable.

Models	Dependent Variable	Independent Variables	R^2	Sig.
Model 7: $Y = f(X)$	Y	GHRM (X)	84.90%	0.000
Model 1: $Y = f(X, M_1)$	Y	GHRM (X)	44.80%	0.000
		EKAW (M_1)	0.20%	0.027
Model 4: $M_1 = f(X)$	EKAW (M_1)	GHRM (X)	42.70%	0.000
Model 2: $Y = f(X, M_2)$	Y	GHRM (X)	46.20%	0.000
		GEB (M_2)	0.00%	0.964
Model 5: $M_2 = f(X)$	GEB (M_2)	GHRM (X)	45.50%	0.000
Model 3: $Y = f(X, M)$	Y	GHRM (X)	1.70%	0.000
		EKAW and GEB (M)	84.24%	0.000
Model 6: $M = f(X)$	EKAW and GEB (M)	GHRM (X)	93.90%	0.000

From Table 8, the researchers have reached the following results:

- Model 7: A confidence interval of 95% was detected, indicating that the main independent variable, GHRM (X), significantly affects the main dependent variable, EP (Y), as the coefficient of determination reached 84.90%, and this model's Sig. value was smaller than 0.050, which strongly supports Hypothesis 1 (H1), indicating a direct effect of GHRM on Y.
- Model 1: The first mediator variable, EKAW (M1), was added in this model, which is still significant, with Sig. values of 0.000 and 0.027 for each variable smaller than 0.050. Furthermore, the coefficient of determination for the main independent variable, GHRM (X), reached 44.80%, and for EKAW (M_1), 0.20%. One can conclude that the first mediator variable, EKAW (M_1), directly affected the dependent variable, EP (Y), supporting Hypothesis 4 (H4), suggesting a potential mediating effect of EKAW.
- Model 4: Statistical evidence with a confidence interval of 95% was found, indicating that the first mediator variable, EKAW (M_1), significantly affected by the main independent variable GHRM (X), as the coefficient of determination reached 42.70%, and this model's Sig. value was smaller than 0.050, which supports Hypothesis 2 (H2).
- Model 2: The second mediator variable, GEB (M2), was added to this model. The Sig. value of the GEB (M_2) was 0.964, greater than 0.050, so this variable did not affect the dependent variable, EP, (Y). Furthermore, the coefficient of determination for the main independent variable, GHRM (X), reached 46.20%, and for GEB (M_2), 00%. One can conclude that the second mediator variable did not affect the dependent variable, (EP) Y, which does not support Hypothesis 5 (H5).
- Model 5: This model represents the effect of GHRM (X) (IV) on the second mediator variable, GEB (M_2) (DV). This model is significant because the Sig 0.00. The value is smaller than 0.050, and the coefficient of determination reached 45.50%. Thus, a significant relationship was found between GHRM (X) and GEB (M_2), which supports Hypothesis 3 (H3) and suggests that GHRM is likely influencing GEB.
- Model 3: This model represents the effect of the main independent variable, GHRM (X), and the main mediator variable, EKAW and GEB (M), on the main dependent variable, EP (Y). The model is still significant, and the Sig. values were 0.000 and 0.000, respectively, with each variable smaller than 0.050. Furthermore, the coefficient of determination of the main independent variable, GHRM (X), reached 1.70% and 84.24% for EKAW and GEB (M), respectively. One can conclude that the main mediator variable directly affects the dependent variable, EP (Y), supporting Hypothesis 6a (H6a).
- Model 6: This model represents the effect of EKAW and GEB (M) on EP (Y). Statistical evidence with a confidence interval of 95% was found, indicating that the main mediator variable, M, significantly affects the main dependent variable, EP (Y), as

the coefficient of determination reached 93.90% and the Sig. value of this model was smaller than 0.050, supporting Hypothesis 6b (H6b).

The coefficient of each regression model, standard error, t-statistic, and 95% confidence interval for each parameter are listed in Appendix A Table A2. From this table, the estimated regression models are listed below:

$$\underset{(R^2=85.06\%)}{\text{EP}} = \underset{(0.048)}{0.046} + \underset{(0.000)}{1.007}\text{GHRM} + \underset{(0.027)}{0.041}\text{EKAW} \quad (8)$$

$$\underset{(R^2=42.69\%)}{\text{EKAW}} = \underset{(0.041)}{0.036} + \underset{(0.000)}{1.032}\text{GHRM} \quad (9)$$

$$\underset{(R^2=84.88\%)}{\text{EP}} = \underset{(0.497)}{0.045} + \underset{(0.000)}{1.049}\text{GHRM} + \underset{(0.964)}{0.001}\text{GEB} \quad (10)$$

$$\underset{(R^2=45.50\%)}{\text{GEB}} = \underset{(0.162)}{0.225} + \underset{(0.000)}{1.032}\text{GHRM} \quad (11)$$

$$\underset{(R^2=85.91\%)}{\text{EP}} = \underset{(0.009)}{0.002} + \underset{(0.000)}{0.596}\text{GHRM} + \underset{(0.000)}{0.447}\text{EKAW\&GEB} \quad (12)$$

$$\underset{(R^2=93.89\%)}{\text{EKAW\&GEB}} = \underset{(0.014)}{0.095} + \underset{(0.000)}{1.013}\text{GHRM} \quad (13)$$

$$\underset{(R^2=84.88\%)}{\text{EP}} = \underset{(0.049)}{0.045} + \underset{(0.000)}{1.049}\text{GHRM} \quad (14)$$

- In the first step, the researchers begin by modeling the simple effect of GHRM (X) on EP (Y) (Model 7).
- In the second step, they entered the first mediator variable, EKAW (M_1), into the model to test the direct effect of GHRM (X) on EP (Y) (Model 1).
- The third step estimated the simple effect of GHRM (X) on the first mediator variable, EKAW (M_1).
- The second and third steps were repeated for the second and main mediator variables.

Table 9 below presents path coefficients and their significance.

Table 9. The path coefficients and its significance.

Dependent Variables	Path	Independent	Estimate	SE	Sig Value	Results
Y	←	X	1.049	0.022	0.000	significant
M_1	←	X	1.032	0.060	0.000	significant
Y	←	M_1	1.007	0.029	0.000	significant
M_2	←	X	0.994	0.055	0.000	significant
Y	←	M_2	1.049	0.030	0.000	significant
M	←	X	1.013	0.013	0.000	significant
Y	←	M	0.596	0.087	0.000	significant

The direct effect of GHRM (X) on EP (Y) The output in Table A2 shows that c_3 is 1.049, and it has a significant effect on Y (Sig. value < 0.050). After entering the first mediator variable EKAW (M_1) into the model, the coefficient reduced from 1.049 to 1.007, and the direct effect on Y is significant (Sig. value = 0.000). Then, the requirement for complete mediation is met for the first mediator variable. Also, it is noticed that after entering the second mediator variable GEB (M_2), the coefficient c_3 does not change; this means that GEB (M_2) does not have a significant effect on EP (Y). However, the main mediator variable makes a big change in the coefficient, which reduced from 1.049 to 0.596. This result means the main mediator variable has the largest effect on EP (Y).

4.4.3. Calculate the Direct and Indirect Effect Using the Bootstrap Method

Using the Bootstrap method, the following table shows the total effect, direct effect, and indirect effect of the three mediator variables.

Table 10 shows statistical evidence with a 95% confidence level that the second mediator variable, GEB, has no significant effect on the dependent variable, while the main mediator variable has the highest effect on the dependent variable.

Table 10. Direct, indirect, and total effects using bootstrap.

Type of Effect	Coefficient	SE $S_{b(i)}$	H0: $\beta_{(i)} = 0$	Sig. Value	LL of $\beta_{(i)}$	UL of $\beta_{(i)}$
Total	1.049	0.022	47.260	0.000	1.006	1.093
Direct (X → Y)	1.007	0.029	34.502	0.000	0.950	1.064
Indirect (X → M_1 → Y)	0.042	0.026	1.614	0.017	−0.007	0.096
Total	1.049	0.022	47.260	0.000	1.006	1.093
Direct (X → Y)	1.049	0.030	34.813	0.000	0.989	1.108
Indirect (X → M_2 → Y)	0.001	0.026	0.035	0.972	−0.054	0.045
Total	1.049	0.022	47.260	0.000	1.006	1.093
Direct (X → Y)	0.596	0.087	6.868	0.000	0.426	0.767
Indirect (X → M → Y)	0.453	0.444	1.021	0.037	0.390	1.361

5. Discussion

This study delves into the intricate dynamics between green human resource management (green HRM) and environmental performance (EP), utilizing green employee behavior (GEB) and environmental knowledge and awareness (EKAW) as pivotal mediators within the hospitality sector of Egypt. Analyzing data from 400 hotel and tourist village staff, the research employs Pearson correlation coefficients and regression analyses to uncover the impact of green HRM on EP. The findings indicate robust positive correlations between green HRM practices and both mediating variables, aligning with the work of Ababneh (2021) [22], who emphasized the influence of green HRM practices on employee engagement and behavior.

The results reveal a significant direct effect of green HRM on EP, explaining a significant portion of variance (84.9%), a testament to the importance of green HRM as highlighted by Ahmad (2015) [2] and resonant with the findings of Aboramadan (2022) [55], emphasizing the importance of human resource strategies in fostering eco-friendly employee behaviors. Although the direct effect of EKAW on EP is modest, it is statistically significant, which suggests that even a slight increase in environmental knowledge and awareness among employees can contribute to better environmental performance. This finding is supported by Adeel et al. (2022) [63], who discussed the mediating mechanism of employee outcomes in the link between green HRM and EP, and by Darvishmotevali and Altinay (2022) [7], who noted the role of environmental awareness in enhancing green behaviors.

However, GEB's independent mediating role appears negligible, a surprising result given the findings by Awwad Al-Shammari et al. (2022) [21], who underscored the mediating role of green innovation in the relationship between green HRM and sustainable performance. However, when EKAW and GEB are considered together, the mediation effect is substantially stronger, a unique contribution to the literature that underscores the synergistic effect of knowledge and behavior in environmental strategies, as suggested by Becker and Huselid (2006) [28] regarding the strategic role of HRM in organizational outcomes.

This research contributes a nuanced perspective to the literature on sustainable business practices. It underscores the significant role that human resource strategies play in achieving environmental sustainability goals, resonating with Ari et al. (2020) [64], who highlighted the need for an organizational culture that prioritizes environmental awareness.

It affirms the notion posited by Elkington (1994) [45] and Epstein et al. (2010) [44] regarding the critical role of leadership and organizational culture in sustainability initiatives.

The study's emphasis on integrating comprehensive environmental strategies and HR management contributes practical insights for Egyptian organizations seeking to improve their ecological footprint. This approach is crucial in a cultural context where sustainable practices are not just a corporate responsibility but are increasingly seen as a competitive advantage, aligning with the stewardship theory proposed by Davis et al. (1997) [14] and the sustainable development paradigms discussed by Gladwin et al. (1995) [15].

6. Conclusions and Recommendations

This research provides a compelling examination of how green human resource management (green HRM) practices are instrumental in enhancing environmental performance (EP) within the Egyptian hospitality sector. It affirms that human resource strategies significantly influence the path to environmental sustainability. The study illuminates the critical roles that green employee behavior (GEB) and environmental knowledge and awareness (EKAW) play as mediators in this relationship, offering insights that extend well beyond the theoretical realm into practical applications.

In Egypt, where the nexus of environmental sustainability and economic vitality is increasingly recognized, particularly in the context of the vital tourism industry, the findings offer a promising perspective. The robust positive correlations between green HRM and both GEB and EKAW highlight an organizational imperative: to weave environmental considerations into the fabric of HR practices. Given the high variance in EP explained by green HRM practices, Egyptian hospitality organizations are well-positioned to harness this dynamic for tangible environmental outcomes.

The modest yet significant influence of EKAW on EP, when considered alongside GEB, suggests a synergistic approach to amplify green HRM's efficacy. Egyptian hotels and tourist villages can leverage this by creating comprehensive educational programs that elevate staff awareness about environmental issues and concurrently incentivize green behaviors. Such programs would educate and engage employees, fostering a culture where green practices become the norm rather than the exception.

Integrating green HRM practices could require employee training focused on sustainability, eco-friendly incentive systems, and the establishment of green policies that align individual objectives with organizational environmental goals. For example, a "Green Ambassador" program could be initiated to recognize and reward employees who exemplify eco-friendly practices or contribute innovative ideas for environmental sustainability.

To further cultivate a green organizational culture, management should lead by example, ensuring their actions reflect the environmental ethos they wish to instill. This leadership can powerfully influence employee behavior and attitudes towards environmental stewardship. Moreover, incorporating feedback mechanisms, where employees can voice their observations and suggestions regarding environmental practices, can empower staff and enhance green initiatives.

The study's findings are a clarion call for Egyptian hospitality organizations to deploy green HRM as a catalyst for strategic environmental performance. It is an invitation to view human resources as stewards of employee well-being and architects of a greener, more sustainable organizational future. By embedding environmental knowledge and behaviors into the heart of HR practices, Egyptian hospitality can improve its environmental footprint and set a benchmark for sustainable practices within the region's tourism industry.

7. Limitations and Future Research

This study breaks new ground by examining green human resource management (green HRM) in Egypt's hospitality industry, but it has some limitations that future research could address. First, focusing solely on the hospitality sector overlooks other vital industries in Egypt, such as manufacturing or agriculture, where green HRM could play a different role. Using cross-sectional data also makes it hard to determine cause and effect;

longitudinal studies could shed more light on how green HRM evolves and its long-term impacts on environmental performance and employee behavior. Exploring these areas could help better understand green HRM's role in Egypt.

Another area ripe for exploration is the specific kinds of environmental knowledge and awareness that best motivate green behaviors, which could lead to more targeted HR strategies. Cultural factors unique to Egypt that could influence green HRM's success have also been largely unexplored. Additionally, future studies could examine how external factors such as regulations or economic changes affect the relationship between green HRM and environmental performance.

Author Contributions: Conceptualization, S.A., A.A.Q. and F.M.H.A.; methodology, S.A., A.A.Q. and F.M.H.A.; software, S.A.; validation, S.A.; formal analysis, S.A.; investigation, F.M.H.A.; resources, A.A.Q.; data curation, S.A. and A.A.Q.; writing—original draft preparation, S.A. and A.A.Q.; writing—review and editing, S.A. and A.A.Q.; visualization F.M.H.A.; supervision, S.A., A.A.Q. and F.M.H.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data supporting this study's findings were based on surveys conducted as part of the research. The raw data collected from these surveys have not been made publicly available due to privacy and ethical considerations, as they contain information that could compromise the respondents' confidentiality. However, the authors created aggregated data that do not reveal any personal or sensitive information and are available only upon reasonable request. Interested researchers can contact the corresponding author for details on the data's accessibility, subject to compliance with ethical standards and any applicable privacy regulations. The survey instrument and methodology used for data collection in this study were rigorously designed to ensure comprehensive and accurate insights into the research objectives.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. Analysis of variance of regression models for each mediator variable.

ANOVA Model 7: $Y = f(X)$ Common Model for the Three Mediator Variables						
Source	**DF**	**R^2**	**Sum of Squares**	**Mean Square**	**F-Ratio**	**Sig.**
Intercept	**1**		**3864.75**	**3864.75**		
Model	1	84.90%	80.198	80.198	2 233.481	0.000
GHRM (X)	1	84.90%	80.198	80.198	2233.481	0.000
Error	398	15.10%	14.291	0.036		
Total (Adjusted)	399	100.00%	94.489	0.237		
ANOVA model 1: $Y = f(X, M_1)$						
Intercept	1		3864.75	3864.75		
Model	2	85.10%	80.373	40.187	1130.247	0.000
GHRM (X)	1	44.80%	42.326	42.326	1190.405	0.000
EKAW (M_1)	1	0.20%	0.175	0.175	4.935	0.027
Error	397	14.90%	14.116	0.036		
Total (Adjusted)	399	100.00%	94.489	0.237		

Table A1. *Cont.*

ANOVA model 2: $M_1 = f(X)$						
Intercept	1		3544.059	3544.059		
Model	1	42.70%	77.536	77.536	296.467	0.000
GHRM (*X*)	1	42.70%	77.536	77.536	296.467	0.000
Error	398	57.30%	104.09	0.262		
Total (Adjusted)	399	100.00%	181.626	0.455		
ANOVA model 3: $Y = f(X, M_2)$						
Intercept	1		3864.75	3864.75		
Model	2	84.90%	80.198	40.099	1113.941	0.000
GHRM (*X*)	1	46.20%	43.627	43.627	1211.959	0.000
GEB (M_2)	1	0.00%	0	0	0.002	0.964
Error	397	15.10%	14.291	0.036		
Total (Adjusted)	399	100.00%	94.489	0.237		
ANOVA model 4: $M_2 = f(X)$						
Intercept	1		3909.688	3909.688		
Model	1	45.50%	71.922	71.922	332.339	0.000
GHRM (*X*)	1	45.50%	71.922	71.922	332.339	0.000
Error	398	54.50%	86.131	0.216		
Total(Adjusted)	399	100.00%	158.053	0.396		
ANOVA model 5: $Y = f(X, M)$						
Intercept	1		3864.75	3864.75		
Model	2	85.90%	81.172	40.586	1209.929	0.000
GHRM (*X*)	1	1.70%	1.582	1.582	47.172	0.000
EKAW & GEB (*M*)	1	1.00%	0.974	0.974	29.038	0.000
Error	397	14.10%	13.317	0.034		
Total (Adjusted)	399	100.00%	94.489	0.237		
ANOVA model 6: $M = f(X)$						
Intercept	1		3724.63	3724.63		
Model	1	93.90%	74.702	74.702	6112.458	0.000
GHRM (*X*)	1	93.90%	74.702	74.702	6112.458	0.000
Error	398	6.10%	4.864	0.012		
Total (Adjusted)	399	100.00%	79.566	0.199		

Table A2. Coefficients of Regression models, SE, t-statistic, 95% confidence intervals.

Model 7: $Y = f(X)$						
Models	**Coefficient**	**Standard Error**	**T-Statistic**	**Sig.**	**LL**	**UL**
Intercept	0.045	0.066	0.685	0.049	0.028	0.174
GHRM (X)	1.049	0.022	47.260	0.000	1.006	1.093
R-Squared	84.88%					

Table A2. *Cont.*

Model 1: $Y = f(X, M_1)$						
Intercept	0.046	0.065	0.711	0.048	0.082	0.175
GHRM (X)	1.007	0.029	34.502	0.000	0.950	1.064
EKAW (M_1)	0.041	0.018	2.221	0.027	0.005	0.077
R-Squared	85.06%					
Model 2: $M_1 = f(X)$						
Intercept	0.036	0.177	0.201	0.041	0.383	0.312
GHRM (X)	1.032	0.060	17.218	0.000	0.914	1.150
R-Squared	42.69%					
Model 3: $Y = f(X, M_2)$						
Intercept	0.045	0.066	0.680	0.497	0.085	0.174
GHRM (X)	1.049	0.030	34.813	0.000	0.989	1.108
GEB (M_2)	0.001	0.020	0.045	0.964	0.039	0.041
R-Squared	84.88%					
Model 4: $M_2 = f(X)$						
Intercept	0.225	0.161	1.401	0.162	0.091	0.541
GHRM (X)	0.994	0.055	18.230	0.000	0.887	1.101
R-Squared	45.50%					
Model 5: $Y = f(X, M)$						
Intercept	0.002	0.064	0.038	0.009	0.012	0.128
GHRM (X)	0.596	0.087	6.868	0.000	0.426	0.767
EKAW & GEB (M)	0.447	0.083	5.389	0.000	0.284	0.611
R-Squared	85.91%					
Model 6: $M = f(X)$						
Intercept	0.095	0.038	2.482	0.014	0.020	0.170
GHRM (X)	1.013	0.013	78.182	0.000	0.987	1.038
R-Squared	93.89%					

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