សាកលវិទ្យាល័យ ភូមិន្ទភ្នំពេញ

ROYAL UNIVERSITY OF PHNOM PENH

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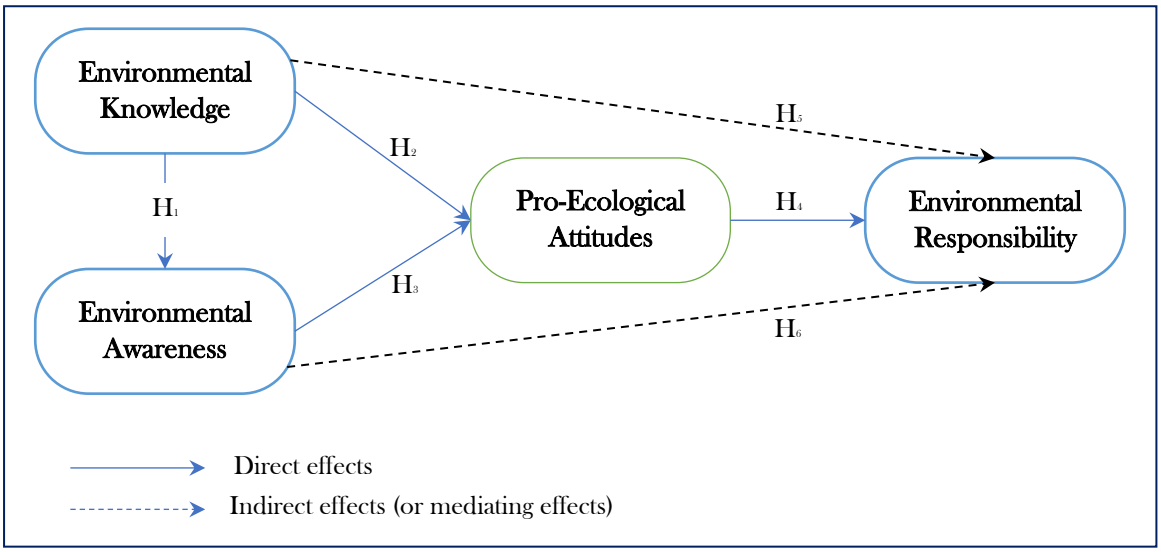
TUTORING SERIES-06: Correlation Matrix

CORRELATION MATRIX

PURPOSES

A correlation matrix is a statistical tool that helps in data analysis and research by assessing the relationships between variables. It helps identify patterns and evaluate the strength of these relationships, aiding in variable selection for regression analysis. It also detects multicollinearity among independent variables, impacting results reliability. It facilitates hypothesis generation, exploring potential causal relationships. The matrix enhances data visualization through heatmaps, making complex data sets more interpretable. It also guides variable inclusion in predictive models based on their relationships with the dependent variable. Overall, it supports robust data-driven conclusions. The correlation coefficient, named after Karl Pearson (1900), measures the strength of the relationship between two sets of interval-scaled or ratio-scaled variables, ranging from -1.00 to +1.00 inclusive, with a value of -1.00 or +1.00 indicating perfect correlation **(Lind et al., 2019)**. The simple correlation coefficient between two variables is a measure of the linear relationship between the variables and is always between −1 and 1. This implies that the square of the simple correlation coefficient is between 0 and 1. The nearer that the square of the simple correlation coefficient is to 1, the stronger is the linear relationship between the two variables **(Bowerman et al., 2019)**.

CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT



1. RULE OF THUMBS: CORRELATION MATRIX

In statistics, the correlation coefficient quantifies the degree to which two variables are related. The range of the Pearson correlation coefficient (r) is from -1 to 1. Here's a general guide for interpreting the strength of correlations and other common ranges include **(Table 1)**. Threshold values can vary depending on the context and the specific field of study, but the ranges above are widely accepted in many applications.

Table 1. General Rule of Thumbs

Correlation	Very Weak	Weak	Moderate	Strong	Very Strong
Negative (-)		$-0.3 < r \leq -0.1$	$-0.5 < r \leq -0.3$	$-0.7 < r \leq -0.5$	$-1 \leq r \leq -0.7$
Positive (+)	$-0.1 < r < 0.1$	or	or	or	or
		$0.1 < r \leq 0.3$	$0.3 < r \leq 0.5$	$0.5 < r \leq 0.7$	$0.7 \leq r \leq 1$

Source: Lind et al. (2019)

2. STEP BY STEP...

2.1. COMPUTE MEAN SCORE

Go to **Transform >> Compute Variable** (Figure 1.1) >> in "Target Variable" box, you can type any abbreviation for individual research constructs or factors or sub-dimension (for this tutoring "Environmental Knowledge" will replace ENK for SPSS coding. In "**Numeric Expression**" box, you can write down and insert questionnaire items after a formal test of factor analysis and reliability test: Mean (ENK1, ENK2, ENK3, ENK4) or you can use another style, Mean (ENK1+ ENK2+ENK3+ENK4)/4 (Figure 1.2) >> OK. Then, the results of these two computing styles will be consistent (Refer to Figure 1.3). Finally click on "Data View" to see the results of computing mean score.

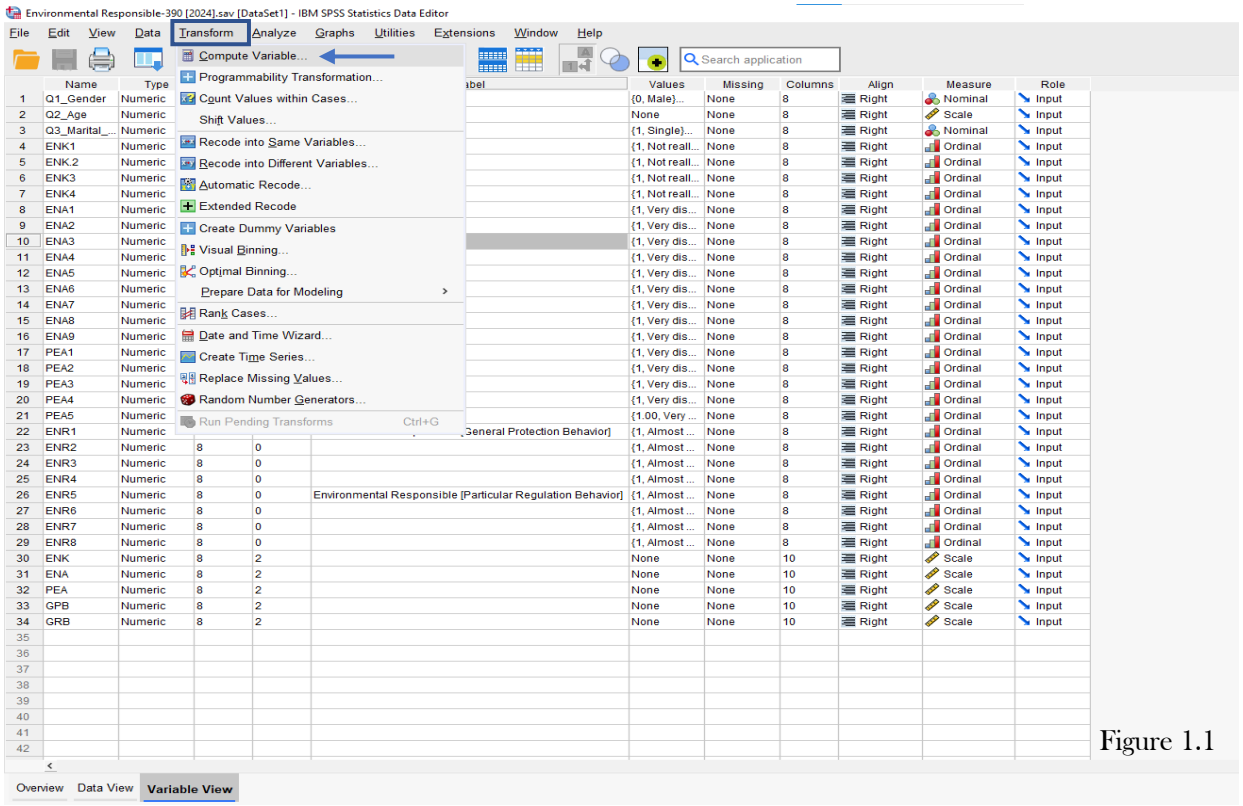


Figure 1.1

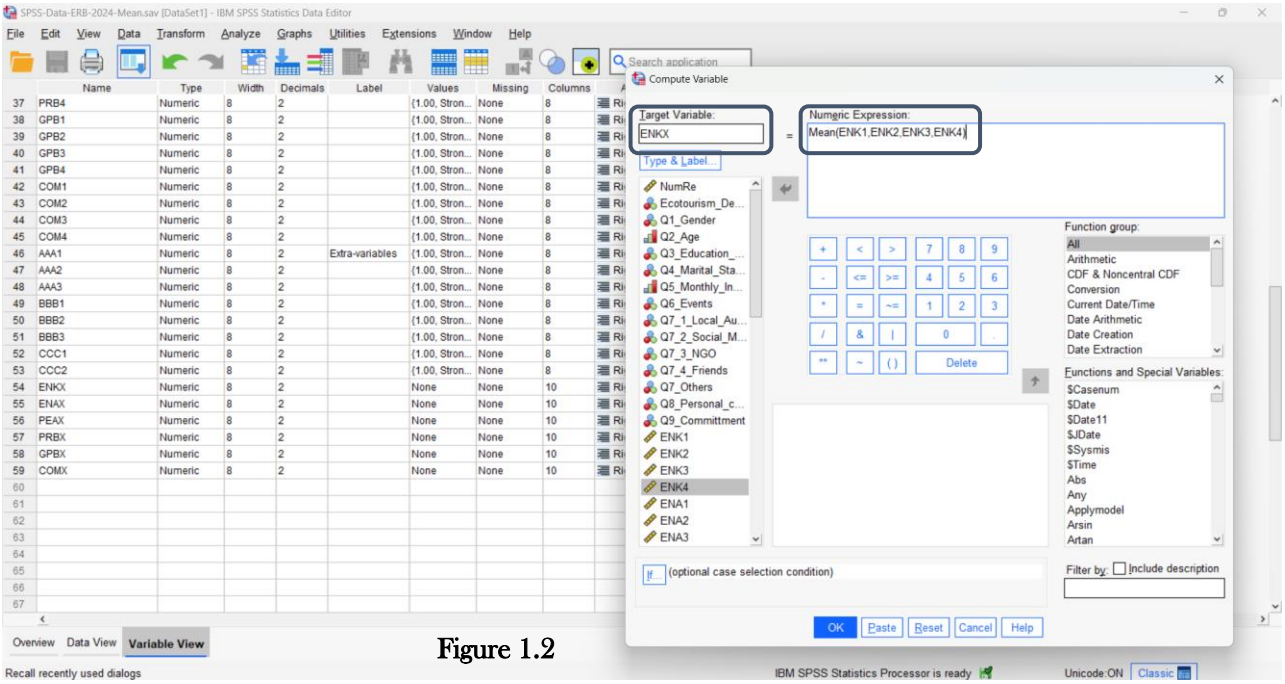


Figure 1.2

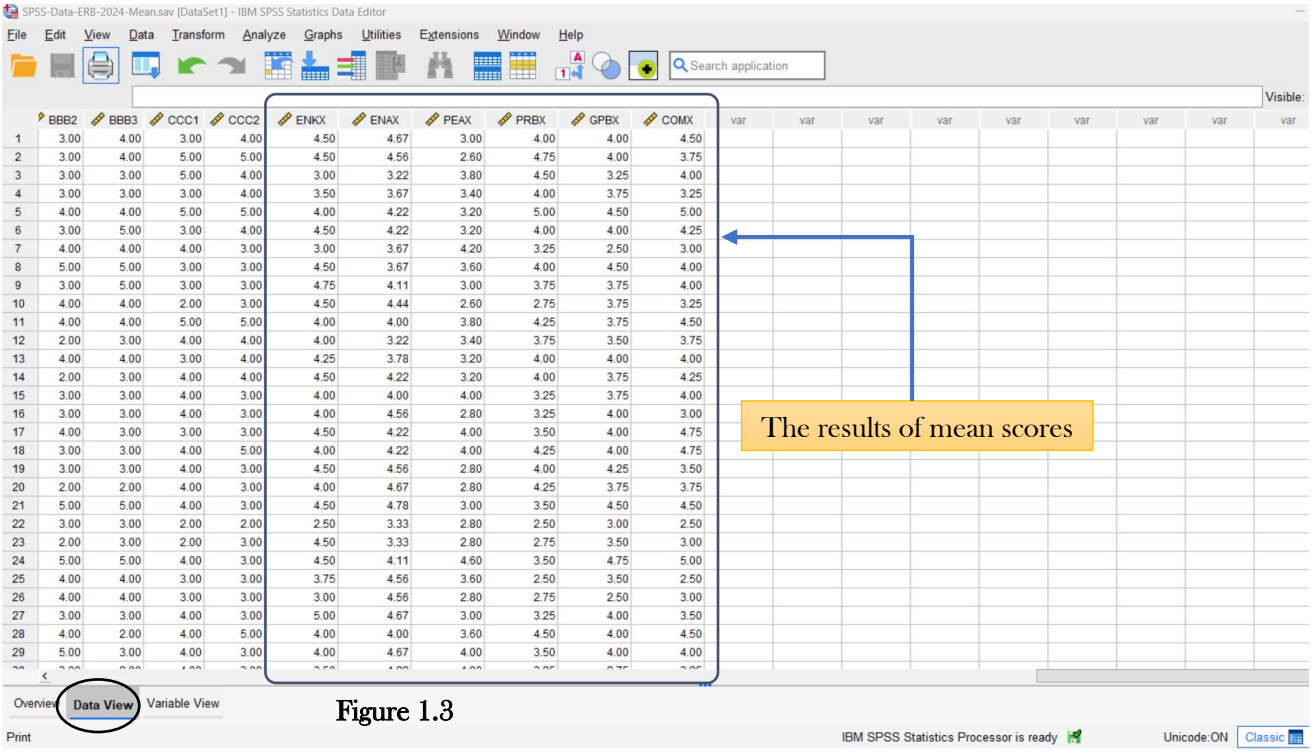


Figure 1.3

2.2. CORRELATION MATRIX

Go to **Analyze >> Correlate >> Bivariate** (Figure 2.1) **>>** move the mean scores of individual research constructs or sub-dimension to "**Variable**" box >> **Options** >> check on "**Means and Standard Deviations**" >> **Continue** >> OK. Then, you will see the outputs of correlation matrix (Figure 2.3).

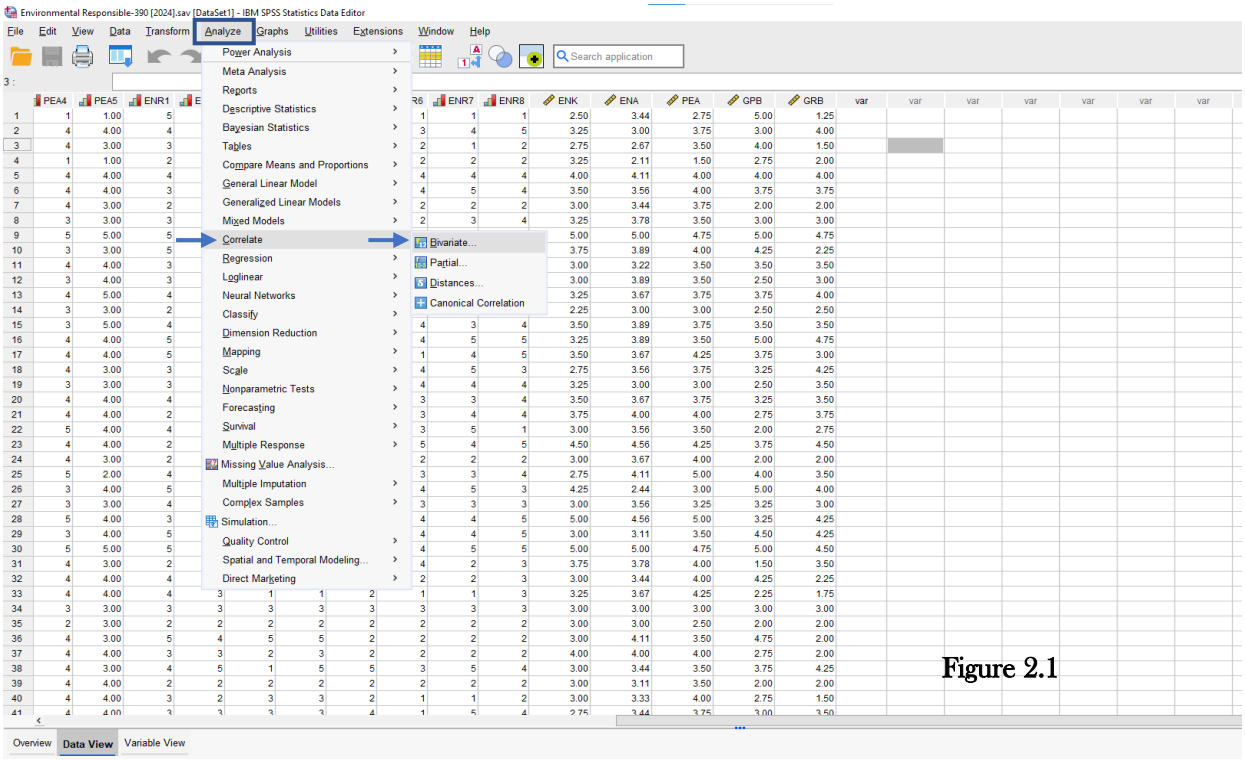


Figure 2.1

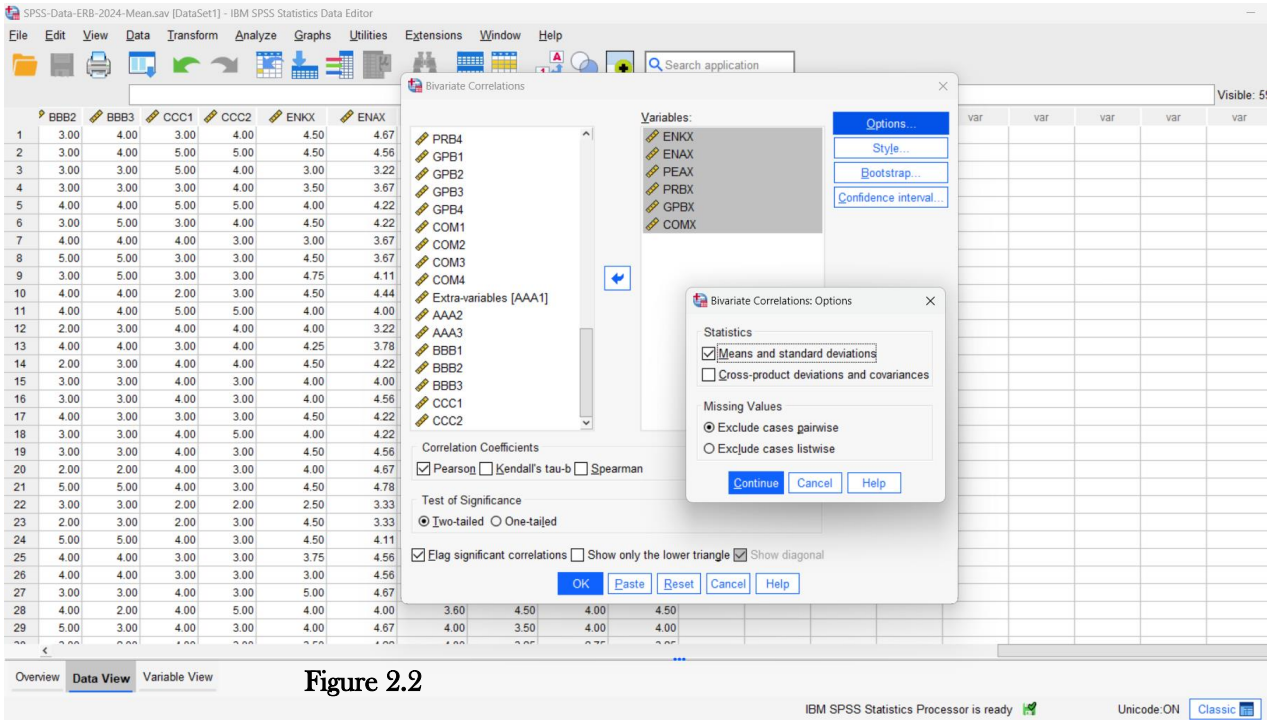
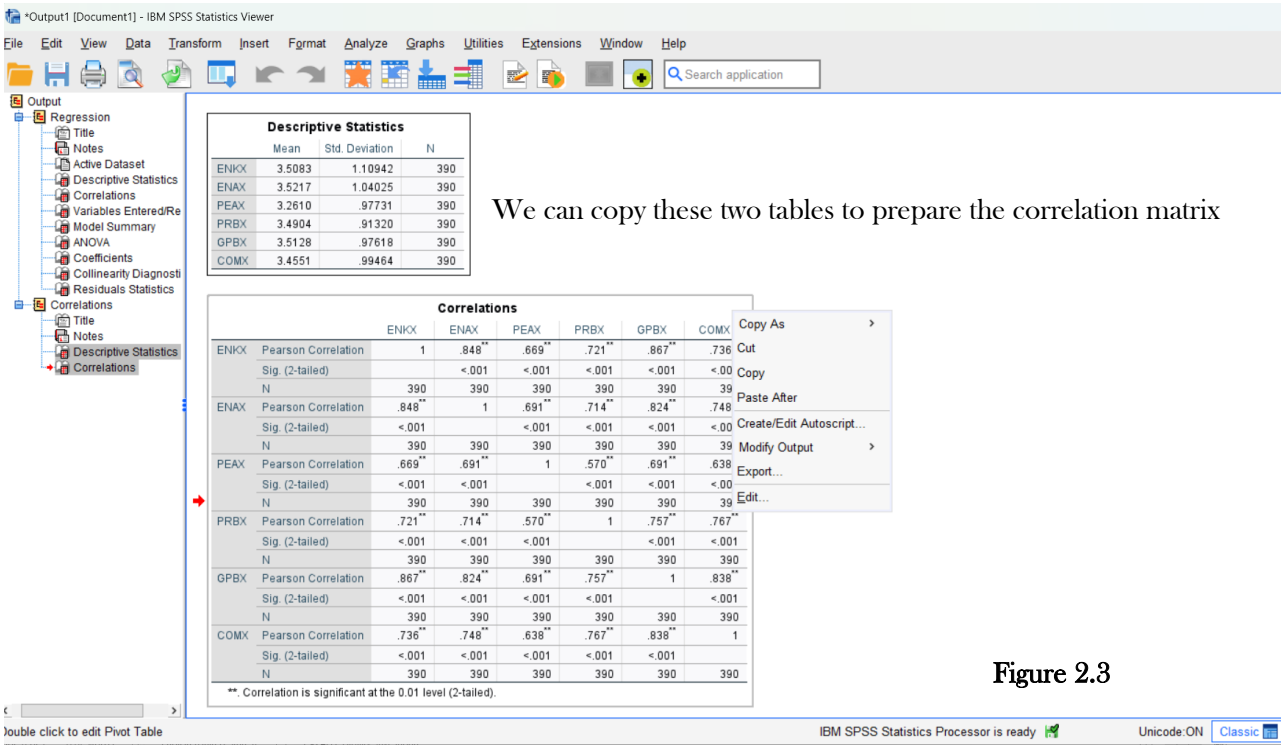


Figure 2.2



We can copy these two tables to prepare the correlation matrix

Figure 2.3

2.3. TABLE FORMAT

Correlation matrix is a table showing the pairwise correlations between all variables (dependent and independent) (Groebner et al., 2018).

Table 2. The Correlation Matrix (n=390)

Variables	Mean	St.D	ENK	ENA	PEA	PRB	GPB	COM
ENK	3.51	1.11	1.00					
ENA	3.52	1.04	.848**	1.00				
PEA	3.26	0.98	.669**	.691**	1.00			
PRB	3.49	0.91	.721**	.714**	.570**	1.00		
GPB	3.51	0.98	.867**	.824**	.691**	.757**	1.00	
COM	3.46	0.99	.736**	.748**	.638**	.767**	.838**	1.00

***. Correlation is significant at the 0.01 level (2-tailed).*

Note:

- ENK: Environmental Knowledge
- ENA: Environmental Awareness
- PEA: Pro-Environmental Attitude
- GPB: General Protection Behavior
- GRB: Particular Regulation Behavior

2.4. *RESULTS AND INTERPRETATION*

Correlation matrix is the standard form for reporting correlation coefficients for more than two variables (Zikmund et al., 2013). Correlation is the measure of the size and direction of the linear relationship between the two variables, and squared correlation is the measure of strength of association between them (Tabachnick

et al., 2018). The results of Table 2 indicates that all research variables of this study have a positive significant relationship with other research variables at significant level of ¨p-value < 0.01 with Pearson Correlation coefficient test of two-tailed test. In other words, the correlation matrix was used to evaluate the correlation between the variables (Steiger, 1980). Correlation matrix illustrates the inter-relationship among key research variables as proposed in the conceptual framework (Ngounhort et al., 2024). When writing the results of a correlation matrix in APA style, you should report the correlation coefficients and their significance clearly and concisely. A Pearson correlation analysis (Table 2) was conducted to assess the relationships between variables (i.e., Environmental Knowledge, Environmental Awareness, Pro-Environmental Attitude, and Environmental Responsibility). The results indicated that there was a statistically significant positive correlation between Environmental Knowledge and Environmental Awareness ($r = 0.848^{¨}$, $p < 0.01$), suggesting that as Environmental Knowledge increases, Environmental Awareness also tends to increase. Additionally, a moderate positive correlation was found between Environmental Knowledge and Pro-Environmental Attitude ($r = 0.669^{¨}$, $p < 0.01$), indicating that higher values of Environmental Knowledge are associated with higher values of Pro-Environmental Attitude. Interestingly, Environmental Awareness has strongly positive correlation with Pro-Environmental Attitude ($r = 0.691^{¨}$ $p < 0.01$), suggesting that as Environmental Awareness increases, Pro-Environmental Attitude also tends to increase. In conclusion, the findings suggest that the local community's environmental awareness significantly influences their perception of pro-environmental attitudes, accounting for 69.1% of the variance observed in this relationship. This substantial percentage indicates that enhancing environmental awareness within the community is imperative for fostering a stronger commitment to pro-environmental behaviors and attitudes. Therefore, efforts aimed at increasing environmental awareness can be an effective strategy for promoting sustainable practices and encouraging a collective responsibility towards environmental stewardship among community members.

REFERENCES

Lind, D. A., Marchal, W. G., & Wathen, S. A. (2019). *Basic statistics for business & economics* (9th ed.). McGraw-Hill.

Bowerman, B. L., Hummel, R. M., Drougas, A. M., Moninger, K. B., Duckworth, W. M., Schur, P. J., & Froelich, A. G. (2019). *Business statistics and analytics in practice* (9th ed.). McGraw-Hill Education.

Groebner, D. F., Shannon, P. W., & Fry, P. C. (2018). *Business statistics: A decision-making approach*. Pearson.

Ngounhort, H., Chanveasna, U., Kirivadid, K., & Veasna, S. (2024). The Antecedents and Consequences of Job Satisfaction on Teachers' Job Retention in HEI, Cambodia. *Open Journal of Social Sciences, 12*(9), 1-33.

Steiger, J. H. (1980). Tests for Comparing Elements of A Correlation Matrix. *Psychological Bulletin*, 245-251.

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2018). *Using multivariate statistics* (7th ed.). pearson Boston, MA.

Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business research methods*. Cengage learning.

GLOSSARY

- **Correlation Analysis:** A group of techniques to measure the relationship between two variables.
- **Correlation matrix:** The standard form for reporting correlation coefficients for more than two variables
- **Correlation Coefficient:** Statisticians use a measure called the correlation coefficient to determine the strength of the linear relationship between two variables. There are several types of correlation coefficients. Thus, it measures of the strength of the linear relationship between two variables.