

Cultural Impact on Environmental Sustainability Practices: a Comparative Study using Hofstede's Cultural Dimensions

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As the importance of environmental sustainability grows on a global scale, it is crucial to understand the factors that impact a country's adoption and implementation of sustainable practices. This study aims to investigate the relationship between cultural factors outlined by Hofstede's framework and the adoption and implementation of environmental sustainability practices across countries. Using data about 87 countries from the World Bank database during the period 2015-2019 regarding environment indicators and the Hofstede Insights website regarding cultural dimensions of the countries, this study finds that out of the six cultural dimensions proposed by Hofstede, the power distance and indulgence dimensions have an effect on environmental sustainability practices of countries. Specifically, low power distance and high indulgence lead to more robust environmental sustainability practices. On the other hand, individualism, masculinity-femininity, uncertainty avoidance, and long-term orientation dimensions have no significant impact on the environmental sustainability practices of countries.

1. Introduction

The worldwide society has recently experienced a paradigm change in social priorities, with a growing understanding of the critical need to address environmental concerns. As the world faces tremendous risks such as climate change (Xu et al., 2015), pollution (Friedler, 2009), and resource depletion (Pimentel et al., 2021), implementing sustainable practices has become a common priority for every country.

The country's culture significantly impacts the attitudes, values, and behaviors of individuals within a society. Using Hofstede's cultural dimensions is crucial to understanding the influence of national culture on many facets of life. This study aims to investigate the role that national culture, determined by Hofstede's cultural framework, plays in promoting or impeding better environmental activities. Hofstede's cultural framework includes six dimensions: power distance, individualism versus collectivism, masculinity-femininity, uncertainty avoidance, long-term orientation, and indulgence-restraint. Each dimension captures specific cultural values and tendencies that can influence attitudes, values, and behaviors toward the environment. The concept of power distance refers to the degree to which individuals in a given society anticipate and accept unequal distribution of power among its members (Li et al., 2021). In countries with high power distances, the majority of power is held by a few individuals and entities, and there is a substantial power gap between those in positions of authority and those who lack it. In these societies, individuals tend to accept and follow the directives of those in positions of authority without questioning them (Hofstede, 2011). Graafland and Noorderhaven (2018) find that power distance has a negative effect on corporate environmental responsibility. This could be due to low levels of public involvement and engagement, diminished responsibility on the part of those in positions of authority, unequal resource distribution, and reluctance to change. Using a sample of 122 countries, Lee et al. (2022) find that power distance hinders the green economy. The dimension of individualism vs. collectivism assesses the extent to which individuals prioritize their personal objectives and independence (individualism) or prioritize cooperation and the maintenance of group harmony (collectivism) (Hofstede, 2011). Individual rights, self-expression, and autonomy are highly valued in individualistic cultures. On the contrary, collectivist cultures emphasize interdependence and allegiance while placing a high value on collective welfare. This dimension

shows to what extent people value their individuality or their membership in a larger collective (Hofstede, 2011). Based on a survey conducted in Hungary, Nagy and Molnarne (2022) found that pro-environmental behavior is negatively influenced by the level of individualism in society. Effective policies and efforts for environmental protection may be hindered by a lack of shared accountability and commitment. The dimension of masculinity-femininity assesses the allocation of societal roles and values that are often linked to features considered masculine or feminine (Lu and Wang, 2021). The concept of masculinity pertains to the extent to which masculine values are prevalent, such as in areas like career progression, financial success, training, and staying up-to-date with the latest developments (Hirokawa et al., 2023). Feminine cultures place a high priority on fostering interpersonal ties, displaying concern for those who are vulnerable or disadvantaged (Taras et al., 2023), modesty, a proper balance between work and life, a strong emphasis on cooperation, humility, and care for the quality of life (Hofstede, 2011). This dimension reveals how much a society typically values male attributes over feminine ones (DasGupta and Roy, 2023). Graafland and Noorderhaven (2018) find that masculinity has a negative effect on corporate environmental responsibility. A strong emphasis on rivalry, success, and aggression in a society with a high level of masculinity may hinder the promotion of more inclusive and collaborative approaches to environmental conservation. Lu and Wang (2021) find that firms in countries with feminine culture have better environmental performance. The dimension of uncertainty avoidance assesses a society's tolerance for uncertainty, ambiguity, and unfamiliar situations (Li et al., 2021). Uncertainty avoidance pertains to the degree of societal stress experienced when confronted with an uncertain future and serves as an indicator of the individuals' capacity to handle ambiguity (DasGupta and Roy, 2023). It reveals the degree to which a culture strives for structured procedures and rules with a limited tolerance for deviating from those established rules or procedures in an attempt to reduce risk and avoid uncertainty. Individuals in countries characterized by low uncertainty avoidance scores have a more relaxed attitude towards change and demonstrate a higher level of comfort in dealing with potential changes owing to reduced levels of stress (Matharu et al., 2023). In contrast, individuals in countries with high levels of uncertainty avoidance tend to see a persistent need to confront uncertainty and mitigate risks and unforeseen circumstances (DasGupta and Roy, 2023). Based on the findings of Graafland and Noorderhaven (2018), corporate environmental responsibility is positively affected by the level of uncertainty avoidance of the country. In societies with high levels of uncertainty avoidance, the tolerance for predictability and certainty may motivate investments in sustainable practices that provide stable environmental benefits. DasGupta and Roy (2023) find that firms in countries with high uncertainty avoidance are encouraged to undertake superior environmental performance. The fifth dimension in Hofstede's framework, long-term orientation, reveals how individuals in cultures that prioritize long-term orientation tend to exhibit a greater propensity to sacrifice current benefits in favor of future benefits, specifically tenacity, and thrift. While individuals in cultures that prioritize short-term orientation emphasize the importance of virtues associated with both the past and present (Hofstede, 2011). Durach and Wiengarten (2017) find that investments in environmental practices are higher in countries with long-term orientations. The preference for future benefits in societies with long-term orientation may lead to a greater focus on better environmental practices for future generations. The sixth dimension, indulgence-restraint, pertains to the fulfillment of fundamental human desires associated with the pursuit of the enjoyment of life (Gallego-Álvarez and Pucheta-Martínez, 2021). Individuals from cultures that prioritize indulgence tend to derive pleasure and enjoyment from various aspects of life. They typically place a high value on their overall well-being, happiness, personal freedom, leisure activities, and maintaining a sense of personal control (Suhartanto et al., 2022). In contrast, restrained societies have more rigid social standards that restrict the gratification of needs (Hofstede, 2011). The presence of stringent rules, regulations, and norms, which are fundamental components of societies characterized by high levels of restraint, is often accompanied by inflexibility and a reluctance to embrace change (Alipour and Yaprak, 2022). Based on the study of Dangelico et al. (2020), the level of indulgence in the country has a positive effect on the environmental performance of the country. Individuals in societies with high levels of indulgence may support and engage in sustainable behaviors for their benefit and enjoyment as a result of the emphasis on personal happiness.

Previous studies investigated the effect of cultural differences on environmental practices at the individual level (Toorzani and Rassafi, 2022) or at the firm level (Qureshi and Ahsan, 2022). Therefore, there is a gap in studies addressing environmental sustainability practices at the country level. However, based on the literature review, there is one study that addresses environmental practices at the country level (Lee et al., 2022). They investigate the effect of cultural differences on environmental practices at the country level using the green production capacity of the country. This study aims to fill this gap by addressing the effect of cultural dimensions on environmental sustainability practices at the country level. This study has several contributions. First, this study is the first to investigate the relationship between national culture and sustainable environmental practices at the country level using a comprehensive index of environmental sustainability practices, which contributes to the current body of knowledge on sustainable environment practices and cross-cultural research. Second, this study uses an index of environmental sustainability practices based on 18 environmental indicators included in

the Environment Pillar of ESG data from the World Bank database and expands upon the most recent cross-country dataset on sustainability indicators, making a valuable contribution to the advancement of empirical studies in the field of international economics. Finally, the results of the study have important implications for policymakers and future researchers.

2. Method

This study aims to answer the main research question if there are differences between countries in environmental sustainability practices based on cultural dimensions. Based on the findings of previous studies regarding the effect of cultural dimensions on environmental practices at individual and firm levels and to answer the research question, the study proposes the following two hypotheses:

Hypothesis 1: Environmental sustainability practices of countries are negatively related to the power distance, individualism, and masculinity of the countries.

Hypothesis 2: Environmental sustainability practices of countries are positively related to uncertainty avoidance, long-term orientation, and indulgence of the countries.

2.1 Data

To build the database, the country-level environmental information is gathered from the World Bank database and merged with information about the cultural dimensions of countries from the Hofstede insights database (Hofstede-Insights, 2023). After deleting observations with missing values in the variables of interest, the final sample includes 87 countries during the period 2015-2019.

2.2 Variables and statistical testing

The dependent variable in the study is the Environmental Sustainability Practices Index. The variable Environmental Sustainability Practices Index is defined as a score (i.e., calculated using principal component analysis) combining 18 environmental indicators (CO₂ emissions, methane emissions, nitrous oxide emissions, PM_{2.5} air pollution, energy intensity level of primary energy, electricity production from coal sources, renewable electricity output, renewable energy consumption, agricultural land, food production index, agriculture- forestry- and fishing value-added, tree cover loss, forest area, mammal species threatened, annual freshwater withdrawals, terrestrial and marine protected areas, net forest depletion, and natural resources depletion). The value of each indicator is its annual average from 2015 to 2019. Before extracting the principle component factor, the indicators that measure positive sustainable environment practices are added in a positive sign, while the indicators that measure negative environmental sustainability practices are added in negative signs. For this study, larger values of the variable Environmental Sustainability Practices Index correspond to countries with more environmental sustainability practices. The study has six independent variables (Power Score, Individualism Score, Masculinity Score, Uncertainty Score, Orientation Score, and Indulgence Score). Each of the independent variables is a dummy variable representing one dimension of Hofstede's cultural framework, and it takes the value of 0 if the country score is equal to or less than the median score of all countries included in the final sample for each corresponding dimension, and one otherwise. In order to test the hypothesis, this study uses the analysis of variance test (ANOVA). The ANOVA test is the standard method used to conduct tests of mean equality in between-subjects designs (Keselman et al., 1998). The selection of ANOVA as the statistical approach was based on its appropriateness for analyzing the variation in environmental performance across different cultural dimensions. This approach has been implemented by previous research (Nagy and Molnarne, 2022), which enables the evaluation of potential statistically significant variations in environmental sustainability practices index among nations characterized by diverse cultural characteristics, as delineated by Hofstede's cultural dimensions framework. The F statistic in ANOVA analysis is used to determine if there are differences between samples in environmental sustainability practices based on each independent variable (i.e., each table represents the analysis of variances in environmental sustainability practices index based on one independent variable).

$$F = \frac{\text{Mean } SSB}{\text{Mean } SSW} = \frac{\frac{SSB}{k-1}}{\frac{SSW}{n-k}} \quad (1)$$

Based on information from Tables 2 to 7, SSB is the sum of squares between groups, SSW is the sum of squares within groups, K is the number of groups, and n is the total number of observations. In each analysis that investigates the difference between countries in environmental sustainability practices according to one of the six cultural dimensions, there are two groups of countries (i.e., K=2). The first group is countries with a score equal to or less than the median score of all countries in the sample for the specific cultural dimension, and the second group is countries with a score larger than the median score of all countries in the sample. For each independent variable (i.e., cultural dimension), if the probability of F (i.e., Prob > F) is less than the critical value

(0.05), this means that there is a difference between countries with high scores and countries with low scores for that independent variable in their environmental sustainability practices.

3. Results

Table 1 shows the means, standard deviations, minimum, 25th percentile, median, 75th percentile, and maximum of the dependent variable Environmental Sustainability Practices Index. The distribution of the dependent variable in the sample of countries fluctuates between -1.62 and 3.37, with an average of 0.

Table 1: Summary of Statistics

Variable	N	Mean	S.D.	Min.	25th	Median	75th	Max.
Environmental Sustainability Practices Index	87	0	1.41	-1.62	-1.09	-0.28	0.88	3.37

The results of ANOVA tests are presented in Tables 2 to 7, and each table shows the mean value of environmental sustainability practices when the value of an independent variable is either high or low. The results of Table 2 show that there is a significant difference in environmental sustainability practices between countries with low power distance and countries with high power distance (F statistics is significant at a p-value less than 0.05). Table 2 indicates that the mean of the variable Environmental Sustainability Practices Index is higher for countries with low power distance compared to countries with high power distance. The results of Table 7 show that there is a significant difference in environmental sustainability practices between countries with low indulgence and countries with high Indulgence (F statistics is significant at a p-value less than 0.05). Table 7 indicates that the mean of the variable Environmental Sustainability Practices Index is higher for countries with high Indulgence compared to countries with low Indulgence. The results of Tables 3, 4, 5, and 6 show that there is no significant difference in the values of the Environmental Sustainability Practices Index variable based on differences in countries in Individualism, Masculinity, Uncertainty, and Orientation.

Table 2: Summary of Environmental Sustainability Practices Index based on Power Score and ANOVA. Bartlett's test for equal variances: $\chi^2(1) = 0.1470$; $Prob > \chi^2 = 0.701$

Power Score	Mean	Std. Dev.	Freq.	Source	SS	df	MS	F	Prob > F
0	0.32702947	1.4194552	45	Between groups	9.96910695	1	9.96910695	5.23	0.0247
1	-.35038872	1.3377935	42	Within groups	162.030892	85	1.90624578		
Total	-1.054e-09	1.4142136	87	Total	171.999999	86	1.99999998		

Table 3: Summary of Environmental Sustainability Practices Index based on Individualism Score and ANOVA. Bartlett's test for equal variances: $\chi^2(1) = 0.0197$; $Prob > \chi^2 = 0.888$

Individualism Score	Mean	Std. Dev.	Freq.	Source	SS	df	MS	F	Prob > F
0	-0.07567631	1.4051187	44	Between groups	0.509827612	1	0.509827612	0.25	0.6165
1	0.07743622	1.4358733	43	Within groups	171.490171	85	2.01753142		
Total	-1.054e-09	1.4142136	87	Total	171.999999	86	1.99999998		

Table 4: Summary of Environmental Sustainability Practices Index based on Masculinity Score and ANOVA. Bartlett's test for equal variances: $\chi^2(1) = 1.0658$; $Prob > \chi^2 = 0.302$

Masculinity Score	Mean	Std. Dev.	Freq.	Source	SS	df	MS	F	Prob > F
0	0.22592754	1.5056759	45	Between groups	4.75796063	1	4.75796063	2.42	0.1236
1	-0.24206523	1.2830167	42	Within groups	167.242038	85	1.96755339		
Total	-1.054e-09	1.4142136	87	Total	171.999999	86	1.99999998		

Table 5: Summary of Environmental Sustainability Practices Index based on Uncertainty Score and ANOVA. Bartlett's test for equal variances: $\chi^2(1) = 0.4376$; $\text{Prob} > \chi^2 = 0.508$

Uncertainty Score	Mean	Std. Dev.	Freq.	Source	SS	df	MS	F	Prob > F
0	-0.10606499	1.4879491	44	Between groups	1.00149216	1	1.00149216	0.50	0.4824
1	0.10853161	1.3433861	43	Within groups	170.998506	85	2.01174713		
Total	-1.054e-09	1.4142136	87	Total	171.999999	86	1.99999998		

Table 6: Summary of Environmental Sustainability Practices Index based on Orientation Score and ANOVA. Bartlett's test for equal variances: $\chi^2(1) = 6.6998$; $\text{Prob} > \chi^2 = 0.010$

Orientation Score	Mean	Std. Dev.	Freq.	Source	SS	df	MS	F	Prob > F
0	0.15690677	1.6593609	44	Between groups	2.19172885	1	2.19172885	1.10	0.2979
1	-0.16055576	1.1063528	43	Within groups	169.80827	85	1.99774435		
Total	-1.054e-09	1.4142136	87	Total	171.999999	86	1.99999998		

Table 7: Summary of Environmental Sustainability Practices Index based on Indulgence Score and ANOVA. Bartlett's test for equal variances: $\chi^2(1) = 1.5285$; $\text{Prob} > \chi^2 = 0.216$

Indulgence Score	Mean	Std. Dev.	Freq.	Source	SS	df	MS	F	Prob > F
0	-0.43148791	1.2191835	44	Between groups	16.5745118	1	16.5745118	9.06	0.0034
1	0.44152252	1.4760785	43	Within groups	155.425487	85	1.82853514		
Total	-1.054e-09	1.4142136	87	Total	171.999999	86	1.99999998		

4. Conclusions

This study investigates the effect of a country's cultural dimensions measured using Hofstede's framework on environmental sustainability practices. Consistent with the theoretical propositions, the study finds that in countries with low power distance scores and high indulgence scores, environmental sustainability practices are better compared with countries where there are high power distance scores and low indulgence scores. Contrary to expectations, the results show that the other cultural dimensions (i.e., individualism, masculinity, uncertainty avoidance, and long-term orientation) do not have significant effects on the country's environmental sustainability practices. The findings of this study contribute to the existing literature on one of the important dimensions of sustainability (i.e., environment) and cultural dimensions. This research is valuable for policymakers, organizations, and, most importantly, the educational system seeking to promote sustainable practices by considering the cultural context in which environmental sustainability initiatives are implemented. In this matter, based on the findings of this study, to enhance the country's environmental sustainability practices, it is important to embrace a more indulgence approach in addition to reducing the level of power distance between individuals of the society.

This paper did not control for any factors that might affect the relationship between countries' cultural dimensions and environmental sustainability practices at the country level. Future research could control for factors that might affect this relationship, such as the level of country development.

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