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Exploring the Recycling Behavior and Climate Change Mitigation in Booming Countries: A Path to Cleaner Seas and Sustainable Futures- A Case of UAE

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ABSTRACT

The expansion of the global population, technological progress, economic growth, and rapid urbanization have induced substantial shifts in lifestyle choices, reshaping consumption patterns. This research aimed to investigate the interrelation between recycling practices in rapidly developing nations, notably China, Brazil, Turkey, Vietnam, Nigeria, and the United Arab Emirates (UAE), while emphasizing the role of the UAE, particularly Abu Dhabi, in mitigating climate change and addressing marine pollution. Furthermore, the study ascertain the significance of recycling practices, specifically concerning plastic and e-waste in the UAE, in contributing to environmental sustainability and promoting cleaner oceans. This endeavor ultimately aimed for more sustainable and conscientious development pathways. The research methodology was founded on established theoretical and conceptual framework developed through an in-depth analysis of variables rooted in the theory of planned behavior. Following the successful collection of data on recycling behaviors related to plastic and e-waste in Abu Dhabi, the data was analysed using the Statistical Package for the Social Sciences (SPSS). The findings from the correlation analysis conducted showed complex correlations between recycling behavior and environmental factors. The positive connections found between "comparing recycling practice" and a favorable "future development pathway," suggested active recycling involvement and good future perspectives. Similarly, positive correlation between "reducing marine pollution" and "environmental sustainability," demonstrated a shared environmental conscience. However, a negative link was found between "mitigating climate change" and "reducing marine pollution", "recycling behavior, showing that respondents with higher priority on mitigating climate change also not in favour to recycle and prioritize for reducing marine pollution.

INTRODUCTION

The global population's growth, technological advancements, economic expansion, and swift urbanization have brought about significant changes in lifestyles, thereby altering consumption patterns. This transformation has caused in a substantial surge in the disposal of municipal solid waste. Extensive research has already underscored the pivotal role of eco-conscious consumer behavior in promoting socially responsible consumption practices (Coskun, 2022). Municipal Solid Waste (MSW) encompasses household waste and other waste generated from economic and public activities, such as those from restaurants and schools (Peñaflor *et al.*, 2022). Meanwhile, Municipal Solid Waste Management (MSWM) covers the entire cycle of waste management, including collection, transportation, recycling and recovery, and disposal, overseen by local authorities (Maiurova *et al.*, 2022).

In past years, several schemes have been introduced, such as the implementation of multiple operational recycling facilities aimed at providing door-to-door service programs for waste collection, waste drop-off centres, waste recycling bins in public areas such as residential community parks, public parks, shopping malls, restaurant's, offering incentives. These activities were based on the objective of "pay as you throw taxation system while investing a considerable amount of resources on public awareness campaigns. According to a WHO report, despite all such efforts and determinations from governments worldwide, the waste recycling rate is still below 50%. The adoption rate of such activities and practices has been very insignificant in developing countries, as most cases state a lack of proper and formal waste recycling system at the initial place (Haj-Salem & Al-Hawari, 2021).

However, one of the most significant developments has also been observed globally, with regard to increasing waste recycling behavior and recovery practices that have enhanced the recognition of the environmental impact of waste, as stated (Ferronato & Torretta, 2019). As a result, recycling is becoming more and more important to people, communities, and governments as a way to eliminate pollution, save resources, and slow down climate change. These steps are also observed in booming countries that are rapidly developing their waste recycling processes, such as China, Brazil, Turkey, Vietnam, Nigeria, and UAE, as discussed by (Xu *et al.*, 2020).

The composition of Municipal Solid Waste (MSW) is subject to significant variability, which can be attributed to distinctions between municipalities, regions, and nations. This variation is likely a consequence of diverse factors, including disparities in national lifestyles,

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variations in waste generation rates, discrepancies in waste management methodologies and regulatory frameworks, as well as differences in the industrial landscape peculiar to each geographic area (Abdel-Shafy & Mansour, 2018). Moreover, due to global development, the composition of MSW has been greatly affected by the time horizons. The amount of waste composition in the United States was recognized and estimated by EPA in 2013, as shown in Figure 1 below.

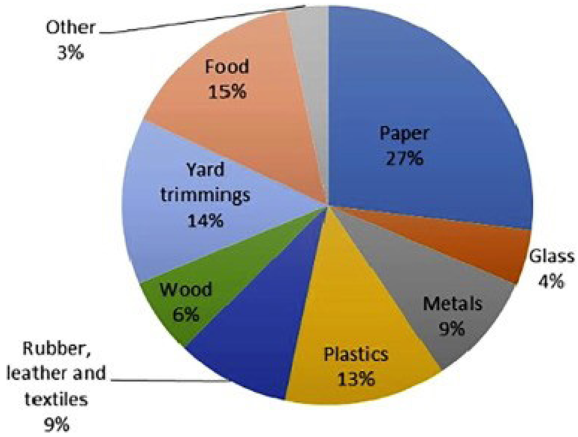

Figure 1: Composition and classification (by material) of MSW generated by the United States in 2013

However, the composition of the percentage of plastic and e-waste has been growing exponentially, with approximately 53,6 million tons generated globally. Authors like, (Liu *et al.*, 2023) recognized that this growth is 21% as compared to the past 5 years. Regardless of this growth, only 17.4 wt% of e-waste is recovered and recycled through proper recycling practices. The remaining portion is comprised of valuable metals and highly valued materials are restrained instead of recycled (Liu *et al.*, 2023).

Similarly, the composition of plastic waste has experienced a notable escalation on a global scale. Notably, worldwide plastic consumption has quadrupled over the past three decades, primarily propelled by the growth witnessed in emerging markets. This surge in plastic consumption has been accompanied by a substantial increase in global plastics production, which doubled from 2000 to 2019, resulting in a staggering total of 460 million tonnes (Liu *et al.*, 2023).

It is discerned that a substantial proportion, nearly two-thirds, of this plastic waste emanates from plastics with lifespans of fewer than five years. Of this portion, approximately 40% is attributed to packaging, 12% to consumer goods, and 11% to clothing and textiles. This compels the acknowledgement that a mere 9% of plastic waste is subjected to recycling despite 15% being collected for such purposes. It is concerning that a substantial 40% of the collected plastic waste ultimately ends up as residues, exacerbating the challenge of waste management.

Additionally, 19% of the plastic waste is incinerated, while 50% is consigned to landfill sites. Perhaps most disconcerting is the revelation that 22% of the plastic waste circumvents established waste management systems and is either disposed of in uncontrolled dumpsites or incinerated in open pits, resulting in its escape into terrestrial or aquatic environments. This predicament is especially pronounced in low-income countries.

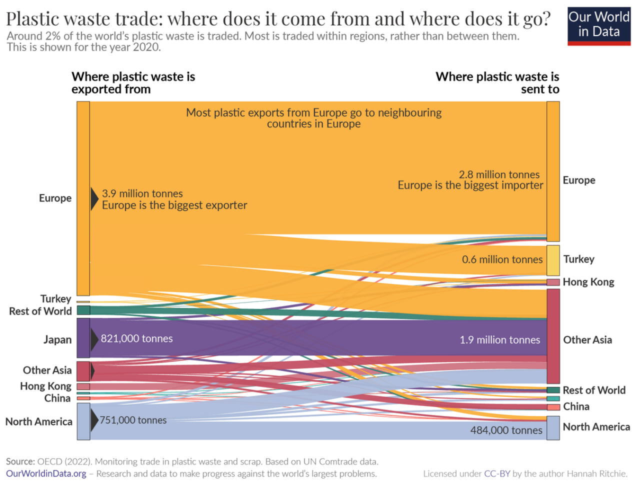

Figure 2: Plastic waste trade

Furthermore, the year 2019 witnessed an alarming release of 6.1 million tonnes of plastic waste into aquatic environments, with an additional 1.7 million tonnes flowing into oceans. The cumulative consequence of these actions has led to an estimated accumulation of 30 million tonnes of plastic waste in seas and oceans (van Laarhoven, 2023).

However, with the increase of plastic and e-waste, effective measures related to waste recycling and recovery behavior and practices have also been improved and leading to protecting the environment and mitigating climate change. Therefore, this study was aimed to explore and investigate the association between recycling behaviour in rapidly developing or booming countries such as China, Brazil, Turkey, Vietnam, Nigeria, and UAE while comparing their practices and role in mitigating climate change, with a specific focus on reducing marine pollution in UAE's capital Abu Dhabi. Moreover, the significance of the study was to identify the extent to which recycling practices of plastic and e-waste in the UAE are contributing to environmental sustainability and the promotion of cleaner seas, ultimately paving the way for more sustainable and responsible development pathways."

This study has been further covered in 4 sections, bringing together the continuity with the literature review explaining and comparing the recycling behavior in booming countries that are already discussed in previous paragraphs. In the third section, this study has presented a research methodology comprised of theoretical frameworks along with a conceptual framework developed based on analyzing the theory of planned behavior variables. The section on questionnaire survey and data collection is of significant importance in the methodology part. Additionally, the fourth section has carried out the data analysis after successful data collection from UAE regarding recycling behaviors of plastic and e-waste in UAE's capital city, Abu Dhabi. Data has been analyzed through SPSS. The final section has covered the results and discussion, along with a conclusive summary of the results and future recommendations for the research.

LITERATURE REVIEW

In recent years, plastic and e-waste pollution has turned out to be a serious environmental issue throughout the world and has become a hot topic of significant consideration. According to the estimations, about 300 million metric tons (MMT) of plastic waste is generated every single day. Specifically, the recent outbreak of COVID-19 resulted in increased demand for single-use plastics (SUPs) at an intense level, along with some uncontrolled global plastic waste crises. Over 8 million tons of pandemic-related PW were produced globally in 2021, with over 25,000 tons ending up in the seas. Around 16% of PW is recycled, 25% is burned, and substantially more than 40% is disposed of in waste dumps, landfills, or the environment directly on a global scale. Since the consumption and disposal of plastics at the current rates would have disastrous effects on marine life and the health of the oceans, plastic pollution in seas and coastal regions is a significant issue (Phan *et al.*, 2022).

In contrast to traditional solid waste, such as household waste, electronic waste, or e-waste, it possesses a unique combination of characteristics, as it is both potentially hazardous and a valuable resource. E-waste is rich in a variety of metals, including copper, gold, silver, palladium, aluminium, and iron, totalling up to approximately 60 different types. From a resource utilization standpoint, the metal and non-metal components found in e-waste are highly suitable for recycling, as stated by (Ilankoon *et al.*, 2018) and recalled by (Liu *et al.*, 2023).

As of 2017, the estimated value and reserves of these such metals within e-waste were as follows: iron/steel, valued at 9 billion Euros, with a quantity of 16,500 kt; copper, valued at 10.6 billion Euros, with a quantity of 1900 kt; aluminium, valued at 3.2 billion Euros, with a quantity of 220 kt; gold, valued at 10.4 billion Euros, with a quantity of 0.3 kt; silver, valued at 0.58 billion Euros, with a quantity of 1.0 kt; and plastics, valued at 12.3 billion Euros, with a quantity of 8600 kt. The combined economic worth of the recyclable resources present in e-waste is estimated to be as high as 57 billion USD, exceeding the gross domestic product of many countries worldwide, as noted by (Forti *et al.*, 2020).

According to the United Nations University's United Nations Educational Research Department, published on April 19, 2015, China has significantly contributed to the production of global e-waste. In 2014, the amount of global e-waste reached record highs of 41.8 million tons, and China ranked second in the world with six million tons of e-waste discarded. The National Bureau of Statistics reports that in 2013, China generated 100 million units of "four machines and one brain" (TV, refrigerator, air conditioner, washing machine, and computer) garbage and 70 million units of mobile phone waste (Wang *et al.*, 2016).

Waste Management Practices in China

According to a survey on the industry for disposing of electronic waste, China produced 11.1 million tons of e-waste in 2012, or 22.7% of the total produced worldwide. Also, illegally imported e-waste stands at over 2 million tons each year in China (Iyer-Raniga, 2020). Heavy metals and other dangerous elements found in electronic waste items would linger in the environment for a long time and might seriously impact both human health and the environment in the case of the vast amount of e-waste in China if e-waste is handled using basic rather than scientific methods.

The research conducted by (Wang *et al.*, 2016) provides a comprehensive examination of the Chinese Government's role in the management of electronic waste (e-waste). This role is manifested through various channels, including recycling laws and regulations, financial investments, and project initiatives. The key facets of the Government's contributions encompass the following:

1. Implementation of enforceable fund collection mechanisms and financial support structures.

2. Utilization of subsidy measures to incentivize and support e-waste recycling efforts.
3. Establishment of qualification and auditing systems designed to confer benefits upon recyclers.

This underscores the significance of recognizing the coexistence of informal and formal e-waste recycling systems within the Chinese context.

Waste Management Challenges in Vietnam

In this context, Vietnam is confronted not only by escalating urbanization and population growth but also by its status as one of the world's primary importers of plastic scrap. Vietnam struggles with the annual release of approximately 0.35–0.78 million tons of PW into the environment. This volume constitutes a significant proportion, ranging from 16.0% to 23.0%, of the total waste content consigned to landfills. In contrast to China, Vietnam is still in the emerging stages of initiating and endeavoring to enhance the quality of its plastic waste management (PWM) services, with the primary objective of ameliorating uncontrolled or illicit disposal practices (Coskun, 2022).

Nonetheless, several critical challenges impede the progress of PWM in Vietnam. These include the absence of robust waste management infrastructure, reliance on low-tech machinery for waste processing, and constraints related to both administrative capabilities and financial resources allocated by municipal authorities. Collectively, these factors contribute to inadequacies in the management of PW, underscoring the intricate and evolving nature of the waste management landscape in Vietnam (Coskun, 2022).

Many academics posit an alternative perspective, competing that dedicating resources and efforts to waste disposal methods and technologies may not be the most productive approach. Instead, they advocate for the adoption of the zero-waste concept as an integral part of our daily lives. The Zero Waste management paradigm, oriented toward the efficient handling of resources and waste, necessitates precise and strategic interventions aimed at waste minimization (Coskun, 2022).

E-Waste and Brazil

Brazil stands as the second-largest electronic waste (e-waste) producer in the Americas, contributing an annual volume of 1.5 metric tons (Mt). It is succeeded by Mexico, which generates 1 Mt, and Argentina, responsible for 0.4 Mt of e-waste annually. Notably, the Brazilian Agency for Industrial Development (ABDI) has approximated the per capita e-waste production in Brazil, varying from a minimum of 4.8 kg in 2011 to a maximum of 7.2 kg in 2016. In accordance with the Global E-waste Monitor of 2017, Brazil was recorded as generating 7.4 kg of e-waste per inhabitant in the year 2016 (de Oliveira Neto *et al.*, 2019).

Brazil, due to its vast territorial expanse, exhibits pronounced economic disparities among its regions. This divergence becomes palpable through the illicit disposal and importation of Waste Electrical and Electronic Equipment (WEEE), which underscores the inadequacies of public policies in grappling with this predicament, particularly in economically disadvantaged regions. It is worth noting that Brazil is a signatory to the Basel Convention (de Oliveira Neto *et al.*, 2022).

Recent developments in the country involve the approval of a sectoral agreement centred on implementing reverse logistics for the management of electronic waste. (de Oliveira Neto *et al.*, 2022) investigated the behaviors of Brazilian consumers concerning e-waste generation, relying on in-person interviews. The study reported that a substantial majority, 96%, of interviewees acknowledged the significance of an effective collection and recycling system for environmental protection. Most respondents displayed a fundamental awareness of the e-waste issue and expressed a positive disposition towards eco-friendly practices. However, the study's findings indicated that merely 9% of individuals correctly segregated and disposed of their e-waste, with a considerable portion (60%) either retaining waste at home or disposing of it as general refuse. These observations underscore the gap between environmental awareness and actual disposal practices in the context of electronic waste in Brazil.

Waste Types, Generation and Mitigation

In combination with employing advanced methodologies for waste recovery and reuse, it is imperative to identify the driving forces motivating waste management improvements and to distinguish opportunities for enhancement. A pioneering example in the study of zero waste management is the European Green Deal, an innovative European climate strategy introduced by the European Commission and showcased at the 2019 UN COP25 Climate Summit in Madrid.

Numerous scholars have made endeavors to devise alternative products from various types of solid waste, the management of waste materials remains incomplete. It is significantly influenced by the availability and properties of the materials, as explained by (Coskun, 2022). This highlights the evolving landscape of waste management strategies and their complex dynamics.

Furthermore, the pervasive environmental impact of plastic and e-waste arises primarily from the dispersion of minute particles during routine activities, encompassing the utilization of cosmetics, textile materials, disposable bags, food packaging, bottled water, mobile devices, electronic gadgets, televisions, refrigerators, and other consumer products (Ebuete *et al.*, 2022).

Notably, micro plastics and e-waste exhibit widespread distribution within both freshwater and marine ecosystems. Once introduced into these environments, they have the propensity to release toxic chemicals, thereby altering the overall quality of the water. It is worth emphasizing that plastic and e-waste debris, ranging from substantial fragments to diminutive particles (micro plastics), are progressively accruing within marine water systems (Jain *et al.*, 2021).

Waste Management in UAE

In recent years, waste recycling practices have been changing over time throughout the United Arab Emirates (UAE). The UAE, similar to several other nations, has realized how critical it is to handle waste management and minimize the adverse effects of waste around the environment. There has been a noticeable change in the recycling practices of UAE citizens and companies as a result of many reasons. Research has long focused on the relationship between education, attitudes, and behaviors concerning the issue of plastic waste. Numerous prior investigations have revealed a clear connection between an individual's formal education level and their environmental knowledge, as well as the development of favorable attitudes towards environmental concerns in their personal lives (Nguyen *et al.*, 2023).

Additionally, E-waste is the most rapidly increasing waste throughout the world, with more than 50 million tons reported in 2018. However, UAE is known at the top of the list of major contributing countries of E-waste and according to the United Nations Global Waste Monitor Report of 2016, UAE has produced 17.2 kg of per capita e-waste along with the total quantity of e-waste equal to 134,000 tons. The Government of UAE has taken numerous steps and initiative campaigns to mitigate the generation of e-waste and dispose of it with proper waste disposing practices and procedures. The major initiatives also include the diversion of more than 70% of solid waste collected from many landfills and pits. Moreover, the Government of UAE also aims to implement a number of initiatives targeting the management of e-waste along with active participation and collaboration of different private industrial sectors and commercial business organizations (Abdul Waheed *et al.*, 2023).

METHODOLOGY

Theoretical Framework and Research Hypotheses

In order to study the factors that affect the recycling behaviors of individuals and their intentions, a number of research authors have added their points of view by using frameworks such as the Theory of Planned Behavior (TPB) (Wang *et al.*, 2016). According to the Theory of Planned Behavior (TPB), a person's intention can be independently influenced by three distinct factors. First, there is "attitude toward the behavior," which determines whether a person has a positive or negative opinion of a specific activity. The second factor that predicts is a social component known as the "subjective norm," which has to do with the perceived social influences that either support or oppose engaging in a particular action. The degree of "perceived behavioral control," which measures how simple or difficult a person believes the activity to be, is the third factor that determines intention. This factor is thought to include anticipated challenges and hurdles in addition to prior experiences.

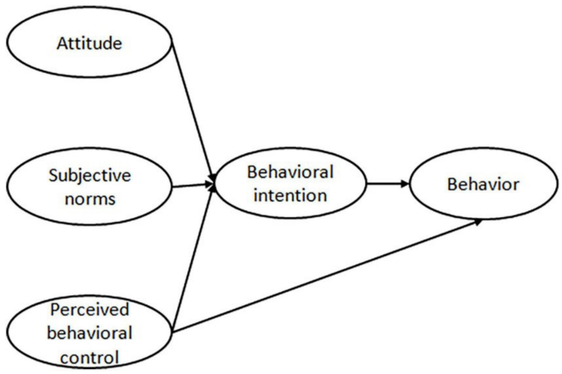

Figure 3: The Framework of Theory of Planned Behavior (TPB)

Conceptual Framework

Expanding upon the theoretical foundation of the Theory of Planned Behavior (TPB), our research primarily delves into the factors that influence residents' intentions to engage in e-waste recycling. To ascertain these influencing factors, we have incorporated relevant variables identified through a comprehensive literature review in section, which focuses on the determinants of e-waste recycling behavior. First and foremost, it is imperative to elucidate the concept of behavioral intention. In the context of this study, behavioral intention pertains to residents' willingness and actions regarding the recycling of e-waste with formal or professional recycling organizations or manufacturers. Our research objectives are centered on identifying the factors that shape residents' behavioral intentions toward recycling e-waste with formal sectors.

Within the framework of TPB, "attitude" alludes to residents' environmental cognizance of e-waste and their attitudes towards recycling. As posited by Tonglet *et al.* (2004), there is a significant influence of recycling attitudes on e-waste recycling behavior. Moreover, Nixon and Saphores (2007) have demonstrated that environmental attitudes have a substantial impact on the willingness to pay an advanced process fee (ARF) for electronics. Consequently, we have chosen "environmental protection consciousness" and "attitude towards recycling" as the two variables to represent the TPB construct of attitude.

The construct of "subjective norm" in our model pertains to the influence of laws, regulations, and related public awareness campaigns that residents have been exposed to regarding e-waste recycling. Hicks *et al.* (2005) argue that the Government plays a pivotal role in developing countries in this context. Furthermore, Yu *et al.* (2014) have documented the contributions of the Chinese Government to e-waste recovery, including relevant laws and regulations. Thus, we have selected "norms" and "publicity" as the measures for this construct.

"Perceived behavior control," as per the TPB framework, encompasses the perceived cost and convenience of recycling e-waste, as well as residents' perceptions of informal recycling processes. It is essential to note that the cost and convenience are based on residents' perceptions rather than actual costs or convenience. Scholars such as Tonglet *et al.* (2004), Wang *et al.* (2011), and Dwivedy and Mittal (2013) have consistently established the significance of these factors in influencing residents' e-waste recycling behavior. Moreover, given the prevailing scenario in China's e-waste recycling landscape, petty dealers constitute a major force driving residents' engagement in e-waste recycling. The perception of residents regarding informal recycling processes profoundly affects their intentions and choices in the e-waste recycling process

In the realm of e-waste recycling behavior research, numerous scholars have underscored the considerable impact of demographic variables. The literature review on factors influencing e-waste recycling highlights income and education levels as pivotal determinants. Residents' income and education levels have been empirically demonstrated to exert a significant influence on their recycling behaviors (Dwivedy and Mittal, 2013; Nixon and Saphores, 2007; Song *et al.*, 2012; Yin *et al.*, 2014).

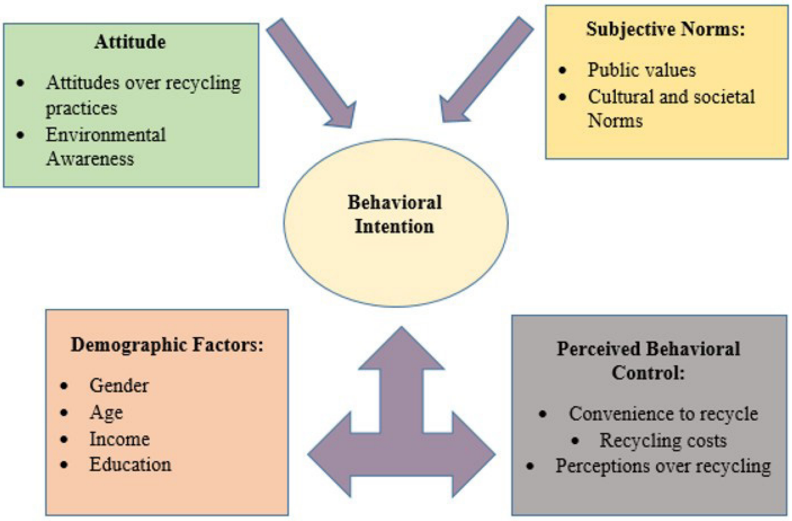

Figure 4: Conceptual Framework

Questionnaire Design and Data Collection

This study has employed qualitative research methodology by conducting a survey questionnaire through random sampling from the residents and commercial, including restaurants, cafes, etc., of UAE to collect the responses regarding recycling behaviors of plastic and e-waste in UAE's capital city Abu Dhabi. Each of the family and restaurant will be given a questionnaire to fill out. The data was analyzed through frequency analysis, correlation and the help of the Statistical software "SPSS".

Sampling Criteria

The primary data was collected by utilizing a random sampling approach; questionnaires were distributed to the residents and restaurants and cafes in Abu Dhabi city over the population of 450, from which 289 individuals participated in the survey and were particularly decided for the study. Additionally, the sampling size of the study is limited to the residents and restaurants and cafes of Abu Dhabi, being the ultimate contributors and producers of plastic and e-waste.

RESULTS AND DISCUSSIONS

Frequency Analysis

The frequency table below shows the exact frequency of the responses regarding the variable, such as comparing the waste recycling practices between UAE and other booming countries, mitigating climate change, reducing marine pollution through practices of waste recycling and cleaning seas to reach environmental sustainability for the future development pathways and to access the recycling behaviors of the individuals.

Table 1: Statistics

		Comparing Recycling Practice	Mitigating Climate Change	Reducing Marine Pollution	Environmental Sustainability	Future Development Pathway	Recycling Behaviour
N	Valid	289	289	290	289	289	289
	Missing	13	13	12	13	13	13

Table 2: Comparing recycling practice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	260	86.1	90.0	90.0
	1.33	7	2.3	2.4	92.4
	1.67	21	7.0	7.3	99.7

	2.00	1	.3	.3	100.0
	Total	289	95.7	100.0	
Missing	System	13	4.3		
Total		302	100.0		

The finding of the frequency analysis of comparing the recycling practices shows that from total responses of 289, 95.7% of the individuals agreed that the recycling practices in the UAE are more advanced and effective than those in China, Brazil, Turkey, Vietnam, and Nigeria. However, the respondents disagreed and presented their thoughts that the UAE still requires some advanced practices to recycle waste.

Table 3: Mitigating climate change

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	249	82.5	86.2	86.2
	1.33	19	6.3	6.6	92.7
	1.67	19	6.3	6.6	99.3
	2.00	1	.3	.3	99.7
	2.33	1	.3	.3	100.0
	Total	289	95.7	100.0	
Missing	System	13	4.3		
Total		302	100.0		

Moreover, 82.5% of the respondents agreed and commented that recycling, particularly of plastic and e-waste, plays a significant role in mitigating climate change in rapidly developing countries like the UAE, along with agreeing that there are specific climate change challenges in the UAE that recycling efforts effectively address. Additionally, 6% of the individuals do not agree with the steps of the UAE to collaborate with other rapidly developing countries to exchange best practices in recycling and climate change mitigation. Such, though, can be due to the growing and development strategies of the UAE in the emerging economies.

Table 4: Reducing marine pollution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	242	80.1	83.4	83.4
	1.33	25	8.3	8.6	92.1
	1.67	18	6.0	6.2	98.3
	2.00	3	1.0	1.0	99.3
	2.33	2	.7	.7	100.0
	Total	290	96.0	100.0	
Missing	System	12	4.0		
Total		302	100.0		

The frequency table of reducing marine pollution demonstrates that 80% of the individuals agreed with the statement that recycling practices are directly linked to reducing marine pollution in the UAE, particularly in Abu Dhabi. However, many of the respondents disagreed by stating that they have observed or experienced the negative impact of marine pollution on local ecosystems in the UAE. Therefore, the UAE should implement specific measures or policies to reduce marine pollution through recycling efforts.

Moreover, the results of the frequency of environmental sustainability showed that 85% of the respondents agreed that recycling practices of plastic and e-waste in the UAE significantly contribute to environmental sustainability and cleaner seas. However, few of the respondents 15% disagreed by stating that significant changes or improvements are needed in recycling practices to make a more significant contribution to environmental sustainability and cleaner seas in the UAE.

Table 5: Environmental sustainability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	257	85.1	88.9	88.9
	1.33	14	4.6	4.8	93.8
	1.67	12	4.0	4.2	97.9
	2.00	2	.7	.7	98.6
	2.33	3	1.0	1.0	99.7
	3.00	1	.3	.3	100.0
	Total	289	95.7	100.0	
Missing	System	13	4.3		
Total		302	100.0		

Table 6: Correlations

		Comparing Recycling Practice	Mitigating Climate Change	Reducing Marine Pollution	Environmental Sustainability	Future Development Pathway	Recycling Behaviour
Comparing recycling practice	Pearson Correlation	1	.005	.051	.178**	.249**	.019
	Sig. (2-tailed)		.933	.386	.002	.000	.753
	N	289	289	289	289	289	289
Mitigating climate change	Pearson Correlation	.005	1	.029	-.085	.057	-.100
	Sig. (2-tailed)	.933		.621	.150	.332	.091
	N	289	289	289	289	289	289
Reducing marine pollution	Pearson Correlation	.051	.029	1	.245**	-.112	.082
	Sig. (2-tailed)	.386	.621		.000	.058	.164
	N	289	289	290	289	289	289
Environmental sustainability	Pearson Correlation	.178**	-.085	.245**	1	.113	.084
	Sig. (2-tailed)	.002	.150	.000		.055	.155
	N	289	289	289	289	289	289
Future development pathway	Pearson Correlation	.249**	.057	-.112	.113	1	.136*
	Sig. (2-tailed)	.000	.332	.058	.055		.021
	N	289	289	289	289	289	289
Recycling behaviour	Pearson Correlation	.019	-.100	.082	.084	.136*	1
	Sig. (2-tailed)	.753	.091	.164	.155	.021	
	N	289	289	289	289	289	289

***. Correlation is significant at the 0.01 level (2-tailed).*
**. Correlation is significant at the 0.05 level (2-tailed).*

The correlation analysis table indicates the strength and significance of relationships between different environmental variables and recycling behavior in the context of the respondents in the study. Such as, there is a strong positive correlation between "comparing recycling practice" and "future development pathway" and between "environmental sustainability" and "reducing marine pollution," while "mitigating climate change" is negatively correlated with both "reducing marine pollution" and "Recycling behavior." The significance levels provide insights into the statistical confidence of these correlations.

However, the table below provides summary statistics for six different variables for a sample of 289 to 290 respondents. These statistics are used to describe the central tendency and variability of each variable within the sample. These statistics provide information about the central tendency and spread of each variable in your sample. For example, "Recycling Behavior" has the highest mean value (1.2042), suggesting that, on average, respondents in the sample exhibit a higher level of recycling behavior compared to the other variables. The standard deviation and standard error mean provide information about the variability and precision of the sample mean for each variable.

Table 7: One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Comparing recycling practice	289	1.0600	.18700	.01100
Mitigating climate change	289	1.0738	.20206	.01189
Reducing marine pollution	290	1.0897	.22784	.01338
Environmental sustainability	289	1.0715	.24112	.01418
Future development pathway	289	1.0819	.20931	.01231
Recycling behaviour	289	1.2042	.37710	.02218

Moreover, the table below shows the results of one-sample t-tests for each of the variables, comparing the sample mean of each variable to a specified test value of 0. This type of statistical test is often used to determine if the sample mean of a variable is significantly different from a known population value (in this case, a test value of 0). For each variable, the t-statistic is substantially greater than zero, indicating a significant difference between the sample mean and the test value of 0. Additionally, the p-values (Sig. 2-tailed) are all very close to 0 ($p < 0.001$), which further confirms the statistical significance. These results suggest that the sample means of all the variables (comparing_recycling_practice, mitigating_climate_change, reducing_marine_pollution, environmental_sustainability, future_development_pathway, and Recycling_behaviour) are significantly different from the test value of 0. The confidence intervals also indicate the range of plausible population mean differences for each variable.

Table 8: One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Comparing recycling practice	96.359	288	.000	1.05998	1.0383	1.0816
Mitigating climate change	90.344	288	.000	1.07382	1.0504	1.0972
Reducing marine pollution	81.444	289	.000	1.08966	1.0633	1.1160
Environmental sustainability	75.545	288	.000	1.07151	1.0436	1.0994
Future development pathway	87.870	288	.000	1.08189	1.0577	1.1061
Recycling behaviour	54.284	288	.000	1.20415	1.1605	1.2478

CONCLUSION

The dynamic landscape of global population growth, technological advancements, economic prosperity, and the rapid urbanization phenomenon have led to significant transformations in lifestyle preferences and consumption habits. This study was undertaken with the primary goal of exploring the intricate connections among recycling practices in rapidly developing countries, with a specific focus on China, Brazil, Turkey, Vietnam, Nigeria, and the United Arab Emirates (UAE). It particularly underscored the pivotal role played by the UAE, notably Abu Dhabi, in efforts to combat climate change and tackle marine pollution. This study presented the response of Abu Dhabi, the capital city of UAE, regarding the practices and improvements required necessary believed by the individuals.

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