Promoting Pro-Environmental Behavior

An Investigation of the cross-cultural environmental behavior patterns. The Case of Abu Dhabi

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Acknowledgements

Abstract

In response to the rapidly growing global environmental problems many call for changes in how individuals should deal with the environment. An important aspect of moving towards an environmentally sustainable world is to promote pro-environmental consumer behavior. Against this background, the purpose of this study is to conduct a literature review to identify social and psychological factors that influence environmental behavior and use these as a basis for an empirical study in Abu Dhabi, United Arab Emirates, for analyzing current behavioral patterns between population groups. The findings suggest that willingness to sacrifice for the environment, perceived behavioral control of environmental problems and the feeling of responsibility of environmental problems are significantly positively related to environmental behavior in Abu Dhabi. It was evaluated that younger age groups, very low and very high income groups, people from developing nations and low education groups are performing worse in environmental behavior than older age groups, middle income groups, people from developed nations and high education groups. Furthermore, it was concluded that the general level of environmental behavior is low. This is ascribed to a lack of facilities supporting environmental behavior in Abu Dhabi, and a lack of environmental values in the country. Policies aimed at promoting environmental behavior should aim at changing the attitudes and values regarding the environment of the society. Such policies should be tailored for specific population segments.

Contents

1. Introduction

Increasing temperatures as a result of rising CO2 levels are 'very likely' threatening the livelihoods of millions of people around the world (IPCC, 2007), hundreds of millions of people will face severe water shortages in the near future (Pearce, 2007), and global waste output has reached detrimental levels. These are some of the environmental problems the world is facing today.

In order to manage these problems, increasing numbers of scientists, organizations and concerned people around the world call for urgent and fundamental changes of human behavior and the implementation of environmentally friendly technologies worldwide in order to preserve the life support systems of the Earth. While clean technologies are recognized as critical factors in resolving many of today's environmental burdens, academics and policy makers agree that changing consumer behavior through deeper changes in the society also has to play a vital role (Jackson and Michaelis, 2003). As Saunders et al. (2006) state,"[t]he transition to global sustainability will require changes in human values, attitudes, and behaviors".

Therefore one general question that needs to be answered is "How can pro-environmental behavior[1] and a 'green culture' be promoted?"

Increasingly, policy makers have realized that information campaigns and regulations alone have been rather unsuccessful in promoting behavior change (Jackson, 2005). Therefore, in recent years there has been a call for policy making that is informed by the fields of social marketing and psychology. Kotler and Zaltman (1971) define social marketing as "the design, implementation, and control of programs calculated to influence the acceptability of social ideas and involving considerations of product planning, pricing, communication, distribution, and marketing research". Thus, the authors argue, "it is the explicit use of marketing skills to help translate present social action efforts into more effectively designed and communicated programs that elicit desired audience response". In many cases, marketing efforts use psychological models as a basis for developing strategies to achieve the desired outcome in the audience (be it for increasing sales of a product or for encouraging recycling behavior).

Studies show that a combination of rules, regulations, tax incentives and social marketing techniques has been far more effective in achieving behavioral change compared to information campaigns and regulations alone. This can be explained by the fact that such comprehensive programs have deeper impacts on the values and attitudes of the population. For example, the United Kingdom government has developed a policy framework based on social psychology theories. It aims at achieving cultural change in order to promote pro-social and pro-environmental behaviors (United Kingdom Government, 2008).

Promoting pro-environmental behavior has proven to be difficult (Jackson, 2005). While no general theory about what drives behavior has emerged so far, in recent years there have been extensive

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[1] Pro-environmental behavior refers to personal behavior which aims at protecting the environment, such as separating waste, reducing energy and water consumption, etc. In this report the terms pro-environmental behavior, environmental behavior and environmentally friendly behavior will be used interchangeably.

theoretical developments and empirical studies in this area. Most of these studies have focused on western countries such as the United Kingdom, Sweden, Germany, and the United States of America. Fewer studies have been conducted in Asia and very few, if any, in the United Arab Emirates (UAE), which will be the focus of this study.

Against this background, the aims of this research are *to evaluate the current level of environmental behavior in Abu Dhabi, to identify differences in environmental behavior between population groups in Abu Dhabi as well as to identify reasons for these differences. Finally categories in the Abu Dhabi population with homogenous environmental behavior will be developed.* Hence, this study will be a part of the marketing research element that Kotler and Zaltman (1971) mention in their definition of social marketing.

The following sections will detail the general research strategy that has been followed to achieve the above research aim, followed by a description of the geographical and organizational context of this study. Thereafter, a literature review and a research framework, the research methods, analysis, and a conclusion will be presented.

2. Research Strategy

In order to assess the environmental behavior in Abu Dhabi, and to identify the factors that trigger different behavioral patterns as well as develop categories with similar levels of environmental behavior (section 1), a series of analyses was conducted.

First, a review of the literature on environmental behavior, primarily drawing on the fields of sociology and psychology, will allow to form hypotheses on the factors that drive (antecede) environmental behavior. Then the current level of behavior will be evaluated followed by empirically testing the hypotheses for the Abu Dhabi population, using regression analysis.

Further, the question of how the different population segments in Abu Dhabi compare to each other regarding pro-environmental behavior will be answered and the factors which have been shown to be significant predictors in the previous step, as well as factors specific to the Abu Dhabi context (e.g. possible lack of infrastructure supporting environmental behavior), will be used to explain these differences.

Lastly, homogenous patterns of environmental behavior within the Abu Dhabi population sample will be identified followed by a discussion on the theoretical and policy implications of the findings.

Behavioral change needs to occur among several groups of actors, such as: consumers, businesses, politicians and policy makers. However, in order to reduce the scope of this research, the focus will be specifically on consumer behavior. Moreover, in addition to attitudes and values, a very important aspect of behavior is the set of rules and regulations that govern how people should behave (such as the implementation of fines), which are not explored in this study.

The following section explains the regional context of this study (i.e. political system, economic background, societal variables) and discusses the relevant developments regarding environmental protection in the United Arab Emirates.

3. Context of this Study

This research was supported by the Masdar Institue of Science and Technology[2], a graduate level engineering university in Abu Dhabi, focused on advanced alternative energy technologies and sustainable development. The university is part of the larger Masdar Initiative, a project that aims at supporting the industrial transformation of the region through economic diversification into renewable energy industries and transitioning towards a knowledge based economy. An important component of the Masdar Initiative is the development of Masdar City. Masdar City is a project based in Abu Dhabi, which has been launched with the aim of developing a sustainable City at the periphery of Abu Dhabi. The project aims at the creation of a community of approximately 50,000 inhabitants, that will be ecologically, socially and economically sustainable while providing a high standard of living for its residents. Masdar City is supposed to be based on environmental ('green') technologies and a specific design in order to achieve its goals. While green technologies play a vital role in achieving Masdar City's goals, the residents need to adopt a more environmentally sustainable life style, than is currently the norm in the UAE (al-Hosany, 2009). The fact that the society of the UAE has highly diverse population groups may add additional difficulty for developing effective strategies for the promotion of such behaviors. Furthermore, considering that the UAE has the biggest per capita environmental footprint[3] in the world (9.5 global hectares per person compared to that of the USA which is 9.4 or European Union, which is 4.7; footprintnetwork.org, 2008) shows that environmental protection has not been a priority in the past.

It needs to be stressed that the UAE is fundamentally different from countries outside of this region in terms of governance, culture, population demographics and economic development, which makes it a special case for social science studies. In order to understand the context of the present study it is important to understand the features that differentiate the UAE from other countries. Additionally, since the launch of the Masdar Initiative, there has been a shift towards sustainable development in Abu Dhabi. Future development within Abu Dhabi is likely to be intertwined with the goals of the Masdar Initiative. Therefore, the following sections will give an overview of the UAE, the Masdar Initiative and Masdar City as well as a number of concepts Masdar City is based on.

3.1. Overview of UAE and the Abu Dhabi Emirate

The UAE is a federation of seven emirates Abu Dhabi, Ajman, Dubai, Fujairah, Ras al-Khaimah, Sharjah and Umm al-Quwain. As shown in Figure 1, the UAE lies on the Persian Gulf, bordering Oman to the East

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[2] The Masdar Institute of Science and Technology is created with the assistance of Massachusetts Institute of Science in Technology in the United States of America.

[3] The environmental footprint is a measure for measuring the environmental impact of human societies. It is measured as the total area of biologically productive land and sea area needed to regenerate the resources a human population consumes and to absorb and neutralize its waste products (such as CO2 and garbage).

and Saudi Arabia to the West and South. The country was established in 1971 and is bound together by a constitution which was ratified in 1998 (O'Brien et al., 2007). The current ruler and president of the UAE (who is also the ruler of the emirate of Abu Dhabi) is Sheikh Khalifa bin Zayed Al Nahyan. He came into power on the 4.November 2004 after the death of his father, Sheikh Zayed bin Sultan al Nahyan, the founder of the country (UAE Ministry of Information and Culture, 2006). By the end of 2009 the population of the UAE is expected to exceed 5 million people (United Arab Emirates National Media Council, 2009).

FIGURE 1: LOCATION OF THE UAE (SOURCE: UNITED NATIONS, N.D.)

3.1.1. The Political System of the UAE

The government of the UAE is a mixture of traditional forms of governance, and of modern government structures similar to those of developed nations. Each emirate has a ruling family whose head is the ruler of the specific emirate. The ruler of Abu Dhabi is automatically the ruler and president of the country. The decrees of the rulers have the power of law (O'Brien, 2007). Traditionally, the rulers and senior family members of the ruling families hold open majlis, during which participants can address their ruler about topics of personal and broader interest (UAE Ministry of Information and Culture, 2006).

The federal government consists of a Supreme Council of Rulers, a Council of Ministers, a parliamentary body, a Federal National Council (FNC), and an independent judiciary. The Supreme Council of Rulers consists of the rulers from each emirate and their close advisors. Its responsibilities include the ratification of federal laws and decrees, the planning of general policy and the nomination of the prime minister. The Council of Ministers is the executive authority of the federation and is lead by the prime minister. The prime minister proposes a list of ministers, which has to be ratified by the president (ruler) of the UAE. The responsibilities of the FNC include examining and amending proposed federal legislation and summoning and questioning any federal minister regarding performance. While the FNC members used to be appointed (according to the population size of each emirate), since 2006 half of the

members are indirectly elected. The Federal Judiciary includes the Federal Supreme Court and the Courts of First Instance. The Federal Supreme Court consists of five judges which are appointed by the Supreme Council of Rulers. The UAE has Islamic and secular law (UAE Ministry of Information and Culture, 2009). These structures show that the ultimate power in most aspects lies in the ruler of the UAE.

In addition to the federal government, each emirate has a local government. The local governments vary in structure and size among the different emirates and the relationship between the federal and the local governments is not fixed and is changing over time. The biggest local government is that of Abu Dhabi, which has its own governing body and various autonomous bodies, for example the Abu Dhabi Environment Agency (UAE Ministry of Information and Culture, 2009).

3.1.2. Governance of Environmental Issues in Abu Dhabi
There are a number of governmental and non-governmental organizations in Abu Dhabi which are engaged in managing environmental problems in the region.

The central body for environmental management in the UAE is the Federal Environmental Agency. In Abu Dhabi the Environment Agency Abu Dhabi EAD, which was established in 1996, has overall function of protecting and conserving the environment as well as promoting sustainable development in the Emirate of Abu Dhabi. The Agency is responsible for assisting the Federal Environmental Agency (FEA) and the UAE Ministry of Environment and Water in implementing and setting regulations for environmental protection in Abu Dhabi. Other governmental organizations that are involved in environmental matters are the Ministry of Agriculture and Fisheries, the Ministry of Energy, and the Ministry of Communications (State of the Environment Abu Dhabi, n.d.).

In addition, there is a small number of non-governmental organizations that are active in the area of environmental problems. These include the United Nations Development Programme, the Emirates Wildlife Society – World Wildlife Fund, and the Emirates Environmental Group Dubai.

3.1.3. The Society of the UAE.
The population of the UAE is diverse in terms of nationality, religions, ethnicity and social classes. At the time of writing, no exact data on the nationality distribution within the UAE is available, as publishing this data is prohibited. From various reports and observation it becomes clear that less than 20 % of the population consists of natives (Emiratis). People from India, Pakistan, Bangladesh and the Philippines seem to make up the largest proportion of the population (likely more than 50 percent). A further large population segment, likely around 20%, consists of people from other Middle Eastern countries, including Egypt, Jordan, Iran, Iraq, Lebanon, Oman, Palestine, Syria, and Yemen. A small proportion of the population comes from Europe and North America as well as from African Countries (mostly from North Africa). While there are no figures available, the fact that less than 4% of the population is Christian might indicate that the number of Westerners lies below 4% of the total population (Library of Congress, 2007; cia.gov, 2009). Anecdotal evidence suggests that the UAE is conservative compared to Western countries, but more liberal than other countries in the Middle East, such as Saudi Arabia. In

2005, 68.3% of the population were men and 31.7% were women, indicating a large imbalance in the gender ratio (UAE Ministry of Economy, 2007). As shown in Table 1, the UAE population is very young with more than 75% of the population below 40 years of age and less than 6.5% above 50.

TABLE 1: UAE POPULATION BY AGE (SOURCE: UAE MINISTRY OF ECONOMY, 2007)

Age Group	Total
19 and under	25.2%
20 – 29	26.7%
30 – 39	27.8%
40 – 49	13.8%
50 – 59	5.0%
60 +	1.5%
Total	100%

As shown in Table 2, while 90.7% of the population is literate, the majority has not completed high school education (55.6%). About 14.3% have a university degree. Women tend to have a higher education than men.

TABLE 2: UAE POPULATION BY EDUCATIONAL STATUS AND GENDER (SOURCE: UAE MINISTRY OF ECONOMY, 2007)

Educational Status	Male	Female	Total
Illiterate	10 %	7.6 %	9.3 %
Can read and write	15 %	11.1 %	13.9 %
Primary	15.3%	13.1 %	14.6 %
Preparatory	18.7 %	15.5 %	17.8 %
Secondary	24.2 %	30.2 %	25.9 %
Below University	3.7 %	4.7 %	4 %
University	11.5 %	16 %	12.8 %
Post Graduate	1.5%	1.6 %	1.5 %
Not Stated	0.1 %	0.2 %	0.1 %
Total	100%	100%	100%

Table 3 shows a breakdown of the population by occupation groups within the UAE. Research observation suggests that most employees are low-income service workers (such as taxi drivers, hotel staff, shop clerks, and domestic workers) and construction workers. Most of the low-income workers come from India, Bangladesh, Pakistan and the Philippines. Another occupation group seems to be higher-income knowledge workers (such as consultants and IT developers), often from Europe, India or Middle Eastern countries. The large majority of employees are men (86.5% of the workforce). Women make up only 13.5% of the workforce.

Group of Occupation	Male	Female	Total
Legislators, Senior Officials and Managers	3.91%	2.86%	3.77%
Professionals	8.50%	17.79%	9.75%
Technicians & Associate Professionals	7.73%	10.37%	8.09%
Clerks	3.18%	8.26%	3.87%
Service Workers and Shop and Market Sales Workers	11.42%	45.08%	15.96%
Skilled Agricultural and Fishery Workers	2.08%	0.03%	1.81%
Craft and Related Trades Workers	30.72%	1.95%	26.84%
Plant and Machine Operators and Assemblers	10.17%	1.67%	9.02%
Elementary Occupations	17.48%	4.62%	15.74%
Armed Forces	2.63%	0.44%	2.33%
Occupations not Adequately Defined	0.73%	1.12%	0.78%
Unemployed, Never Worked Before	1.45%	5.80%	2.04%
Total	86.50%	13.50%	100.00%

It should be noted that all data presented above are UAE wide data. No data specifically on Abu Dhabi is available at the time of writing. While the available data might not exactly represent the demographics of Abu Dhabi, it should nonetheless serve as a proxy. Getting access to more precise data is difficult. In many cases this data may not exist, and in other cases it is not made available to the public.

3.1.4. The Emirate of Abu Dhabi

The Abu Dhabi Emirate is expected to have a population of 1.750.161 by 2010, which makes it the emirate with the largest population within the UAE. (Abu Dhabi Tourism Authority, n.d.). The population of Abu Dhabi City is estimated to be about 900 000 in 2009 (world-gazetteer.com, 2009)

The climate in Abu Dhabi is subtropical with very hot temperatures (average temperatures ranging from 22 degrees in the winter months to 35 degrees in the summer months, when temperatures well above 40 degrees are common). Throughout the year there is almost no rainfall and during the summer the air humidity is very high (visitabudhabi.ae, n.d.). As a result, the use of air-condition is extremely common and, especially during the summer months, many people spend most of their time in confined areas, such as offices, shopping malls, cars and homes.

3.1.5. Economic development in Abu Dhabi

Abu Dhabi holds almost 10% of the world's proven oil reserves and 5% of the world's proven natural gas reserves. Before the discovery of oil reserves in 1958, Abu Dhabi was a small economy based on camel herding, date production, and pearl export. Since the 1970s, Abu Dhabi has experienced an enormous oil-based economic growth and has developed from a small economy where people lived in huts made from palm leaves and mud to one of the richest economies in the world. Though the share of the oil sector has been declining in the past years it made up almost two thirds (65.7%) of the GDP in 2007 (Abu Dhabi Chamber of Commerce and Industry, 2008). Other important sectors include construction, manufacturing and finance.

Abu Dhabi aims to diversify its economy in order to reduce its dependency on oil. In order to achieve this goal, the government of Abu Dhabi has developed a broad strategy that outlines the long term vision of the emirate (Abu Dhabi Government, 2008). In this report the government formulates nine 'pillars' on which the economic, social and political future should be based on. These pillars include building a 'sustainable knowledge based economy', a 'transparent regulatory framework', and creating 'premium education, healthcare and infrastructure assets' (Abu Dhabi Government, 2008). Therefore, Abu Dhabi seems to put more weight on factors such as environmental protection and human development than Dubai has in the past, for example (where economic development was by far the largest priority).

3.1.6. Environmental Problems in the UAE

The UAE has the highest per capita environmental footprint in the world and the World Wildlife Fund states that "the major environmental issues in the UAE can be summarized as one that a fast developing country is facing. The transition between a traditional economy based on subsistence fisheries, oasis agriculture and livestock to a modern, highly urbanized country in less than 30 years is affecting the environment" (ameinfo.com, 2003).

Apart from extremely high CO_2 emissions due to high energy consumption, environmental problems also include overfishing and overgrazing, species extinction due to rapid urbanization and industrial development, waste management issues, over exploitation of groundwater sources and pollution of the desert (ameinfo, 2003). These problems can be explained due to the rapid economic growth which resulted in large industrial complexes being built, a lack of space for industry and other construction (ameinfo, 2003). However, the household sector is largest contributor to the environmental footprint. While industry contributes 30% to the environmental footprint of the UAE, the household sector contributes 57% (Vidican, 2009). This can be explained by the current lifestyle of a large proportion of the population (ameinfo.com, 2003).

However, in recent years measures to reduce environmental problems have been implemented by the government, non-governmental organizations and private companies such as education, awareness and cleanup campaigns, establishing protected areas and regulations, and promoting a sector for sustainable development (e.g. the Masdar Initiative).

The following sections will give more detail about the Masdar City project. Before that, the One Planet Living principles will be presented as they build a basis for the development of Masdar City.

3.2. One Planet Living (OPL)

As a response to the global environmental crisis, the World Wildlife Fund (WWF) and Bioregional[4] have developed 10 principles which aim at facilitating environmentally, economically and socially sustainable development and living. It is argued that if everyone in the World would live like the average European we would need three planets to produce the required resources and if everyone would live like the

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[4] Bioregional is a private company that produces solutions which aim at developing sustainable communities (such as consulting, education and policy development).

average American, we would need five planets. If humans want to solve this crisis, economic development needs to aim at creating a world in which humans have a good standard of living but only require one planet to fulfill the resource needs of humanity. OPL provides a high-level framework that aims at achieving this. Table 4 shows each of the principles, the global challenge they are addressing and the OPL goal and strategy to achieve it.

TABLE 4: THE ONE PLANET LIVING PRINCIPLES (SOURCE: BIOREGIONAL, 2008)

GLOBAL CHALLENGE	OPL PRINCIPLE	OPL GOAL and STRATEGY
Climate change due to human-induced build up of carbon dioxide (CO2) in the atmosphere	Zero Carbon	*Achieve net CO_2 emissions of zero from OPL projects.* Implement energy efficiency in buildings and infrastructure; supply energy from on-site renewable sources, topped up by new off-site renewable supply where necessary.
Waste from discarded products and packaging create a huge disposal challenge while squandering valuable resources	Zero Waste	Eliminate waste flows to landfill and for incineration. Reduce waste generation through improved design; encourage re-use, recycling and composting; generate energy from waste cleanly; eliminate the concept of waste as part of a resource-efficient society.
Travel by car and airplane can cause climate change, air & noise pollution, and congestion	Sustainable Transport	*Reduce reliance on private vehicles and achieve major reductions of CO_2 emissions from transport.* Provide transport systems and infrastructure that reduce dependence on fossil fuel use, e.g., by cars and airplanes. Offset carbon emissions from air travel and perhaps car travel.
Destructive patterns of resource exploitation and use of non-local materials in construction and manufacture increase environmental harm and reduce gains to the local economy	Local and Sustainable Materials	*Transform materials supply to the point where it has a net positive impact on the environment and local economy.* Where possible, use local, reclaimed, renewable and recycled materials in construction and products, which minimises transport emissions, spurs investment in local natural resource stocks and boosts the local economy.
Industrial agriculture produces food of uncertain quality and harms local ecosystems, while consumption of non-local food imposes high transport impacts	Local and Sustainable Food	*Transform food supply to the point where it has a net positive impact on the environment, local economy and people's well-being.* Support local and low impact food production that provides healthy, quality food while boosting the local economy in an environmentally beneficial manner; showcase examples of low-impact packaging, processing and disposal; highlight benefits of a low-impact diet.
Local supplies of freshwater are often insufficient to meet human needs due to pollution, disruption of hydrological cycles and depletion of existing stocks	Sustainable Water	*Achieve a positive impact on local water resources and supply.* Implement water use efficiency measures, re-use and recycling; minimise water extraction and pollution; foster sustainable water and sewage management in the landscape; restore natural water cycles.
Loss of biodiversity and habitats due to development in natural areas and overexploitation of natural resources	Natural Habitats and Wildlife	*Regenerate degraded environments and halt biodiversity loss.* Protect or regenerate existing natural environments and the habitats they provide to fauna and flora; create new habitats.
Local cultural heritage is being lost throughout the world due to globalisation, resulting in a loss of local identity and wisdom	Culture and Heritage	*Protect and build on local cultural heritage and diversity.* Celebrate and revive cultural heritage and the sense of local and regional identity; choose structures and systems that build on this heritage; foster a new culture of sustainability.

(TABLE 4 CONTINUED)

GLOBAL CHALLENGE	OPL PRINCIPLE	OPL GOAL and STRATEGY
Some in the industrialised world live in relative poverty, while many in the developing world cannot meet their basic needs from what they produce or sell	Equity and Fair Trade	*Ensure that the OPL project's impact on surrounding communities is positive.* Promote equity and fair trading relationships to ensure the OPL community has a beneficial impact on other communities both locally and globally, notably disadvantaged communities.
Rising wealth and greater health and happiness increasingly diverge, raising questions about the true basis of well-being and contentment	Health and Happiness	*Increase health and quality of life of OPL project members and others.* Promote healthy lifestyles and physical, mental & spiritual well-being through well-designed structures and community engagement measures, as well as by delivering on social and environmental targets.

While these principles are meant to be general, overarching benchmarks for achieving sustainable living, in order to implement them, project specific strategies and measurement tools need to be developed and used. These may differ according to the needs of the project. According to Bioregional (2008), OPL should employ whatever performance measures are necessary for a given project in order to reach the ten goals. These measures include ecological footprint, carbon footprint, mass balance, life cycle assessments and other indicators of environmental and sustainability performance. A different set of strategies and measurement tools may be required for each project.

Masdar City is the reference project for this study. It is based on the OPL framework and will be described in more detail in the following section.

3.3. Masdar City

Masdar City is a planned city in the Abu Dhabi Emirate, currently under construction, which aims to achieve ecological, social and economic sustainability. The city will have a final population of about 50.000 residents and 40.00 commuters from the surrounding regions to jobs in the city and will cover a land area of six square kilometers (Bioregional, 2008). The city is planned to be powered only by renewable energies, have zero carbon emissions, reduce waste production by 99% and to be completely car free. Aimed at being a center of innovation for sustainable technologies and development, the city will host a the Masdar Institute of Science and Technology, a research institute that is specialized in research on sustainable development. Furthermore, companies which produce green technologies will be located in the city. The project budget is more than 22 billion US Dollars.

The project management of Masdar City has adopted the OPL framework as a benchmark for measuring sustainability goals. Together with Bioregional (2008), Masdar has developed a list of project specific key indicators (or measures) and targets for realizing the OPL principles. These are shown in Table 5.

TABLE 5: OPL KEY INDICATORS FOR MASDAR CITY (SOURCE: BIOREGIONAL, 2008)

Key Indicators for each OPL Principle	Masdar Targets
Zero Carbon	
Percentage of energy supplied from renewable sources	100%
Tones of carbon released in generating the power consumed for operating the site	Net 0 Tonnes CO_2
Energy efficient buildings	Masdar specific best practice for energy efficiency
Zero Waste	
Percentage diversion from landfill	Over 99% by 2020
Percentage waste minimisation	30% from baseline (657 kg/capita/annum)
Percentage of waste arising recycled and composted	Recycling 50% Composting 16% Thermal treatment 33%
Sustainable Transport	
Tones of CO_2 emissions due to transport within the city zero emissions zone	$0 kgCO_2$/year
Percentage of land based journeys to and from Masdar	55% by private car and 45% by public transport by 2020
Air transport	Not yet decided
Resident knowledge and behavioral change	Not yet decided
Local and Sustainable Materials	
Embodied CO_2 of construction materials	$600 kgCO_2/m2$
Percentage of recycled materials in construction	up to 25% total by mass
Percentage of sustainable timber	100% of timber from most environmentally appropriate and/or certified sources
Local and Sustainable Food	
Ecological footprint of food consumed in shops and restaurants in Masdar	0.6 global hectares/person
Organic food or food produced using low-environmental impact agricultural techniques consumed from on site shops and restaurants	Minimum 75% by weight of food consumed by 2015
Vegetarian restaurant on site	2 by phase 6
Farm shop on site	One shop sourcing regional food

(TABLE 5 CONTINUED)

Key Indicators for each OPL Principle	Masdar Targets
Local and Sustainable Water	
Water consumption domestic	140l/person/day
Water consumption commercial	3.85l/m2/day)
Percentage of water supplied from recycled sources	100% by 2020
Natural Habitats and Wildlife	
Conservation of Existing biodiversity	If any are found they will be relocated
Enhancement of biodiversity	Investment into biodiversity project in UAE
Conservation of existing biocapacity[5]	very low existing biocapacity. No target needed.
Enhancement of biocapacity	Investment into project to support increasing biocapacity.
Culture and Heritage	
Integrating local culture into Masdar	Narrow streets for shading, wind catchers for passive ventilation, wall city to protect it from the elements
Financial support to integrate local culture and heritage into the operation of the city	Masdar cultural events calender, Community majilis
Built form and building design will integrate local culture and heritage in the context of Masdar	Integrate renewable technologies into cityscape, implement zero emissions zone for transport, segregated waste collection facilities throughout the city.
Financial and personnel support to demonstrate sustainability in the operation of the city	Awareness raising programmes
Equity and Fair Trade	
Fair wages and working conditions	Everyone employed during construction and operation of Masdar from day 1 of their employment
Capacity of a local project that supports a disadvantaged group in society	Identification of a target project, set target for increasing capacity for that project by 100%
Level of support provided to a disadvantaged group to set up a business in Masdar	Identification of group/business opportunity, targets to be developed.

[5] Biocapacity is a measure of the biological productivity of a unit of land.

(TABLE 5 CONTINUED)

Key Indicators for each OPL Principle	Masdar Targets
Health and Happiness	
Built form and building design will integrate health and happiness principles	
Facilities provided for each demographic group at Masdar	
Events run for each demographic group at Masdar	
Celebration of festivals	
Residents satisfaction levels.	

To summarize, the One Planet Living Principles are a set of overarching targets that aim to provide a benchmark for developing sustainable communities. Masdar City will be based on these principles and in order to measure whether these targets have been met, a set of key indicators has been developed. For achieving these goals, Masdar City is based on a number of green technologies and is designed in such a way as to minimize energy and water use. In addition, the Masdar Outline Sustainability Plan (BioRegional, 2008) states that in order to achieve some of the targets listed in table 5, people will need to change their consumer behavior. Some specific behavioral requirements are presented in the following.

The Masdar Outline Sustainability Plan specifies the following behavioral needs (BioRegional, 2008):

- Sustainable energy use is necessary for reaching the zero carbon goal.

- Waste generation needs to be reduced by reuse and by purchasing items that produce less waste for reaching the zero waste goal.

- People will need to use alternative fuelled vehicles and hybrids for travelling outside of the city, increase the use of local, national and international public transport and car-pooling and the number of journeys have to be reduced in order to reach the sustainable transport goal.

- Inhabitants need to adjust their diets in order to lower meat consumption and increase the consumption of organic produce. In addition, they should grow some of their own food in window boxes.

- Water consumption will need to be reduced for reaching the sustainable water goal.

- For reaching the equity and fair trade goal people will need to be encouraged to purchase local products.

- A healthy lifestyle needs to be promoted for reaching the 'health and happiness' goals.

Masdar City is located in Abu Dhabi and the demographics of Masdar City are expected to be similar to those of the Abu Dhabi. Therefore, region specific strategies for promoting pro-environmental behavior in Abu Dhabi could also be used in Masdar City for promoting environmentally friendly behavior.

When developing policy recommendations for promoting pro-environmental behaviors (such as described above), one of the questions that needs to be answered is what drives this type of behavior in people? Why is it that some people act environmentally friendly and others do not? Much research has been conducted that tries to answer this question of which some is presented in the following section.

4. Literature Review

No general theory for behavior change is available (Jackson, 2005; Stern, 2000). But there are numerous successes in promoting pro-environmental behaviors. To name a few, nowadays using the car seat belts is the norm, in many countries waste separation has become part of everyone's routine, many people now prefer organic food, and switched to low energy light bulbs. But in order to develop a successful policy for promoting pro-environmental behaviors it is necessary to synthesize the theories and empirical studies of numerous authors (Stern, 2000). Several researchers have developed models that can predict behavior to a certain extent. The most influential models, and empirical studies thereof, are discussed below. The outcome of this section is a list of factors which have been hypothesized to influence environmental behavior. These factors will form the conceptual framework for the empirical study.

4.1. Models of Behavior

A highly embedded theory in western policy making is the rational choice model (Elster, 1986). Its fundamental hypothesis is that we behave in such a way as to maximize net expected benefits to ourselves. A typical policy approach based on the rational choice model is to increase the tax for a product or service. This increase in costs leads to a decrease of net expected benefits. In theory this would reduce the demand of that particular product or service. While the importance of this model cannot be denied, it is based on partly unrealistic assumptions, namely that choice is always rational, that the individual is the unit of analysis, and that choices are purely made in the pursuit of individual self-interest (Jackson, 2005). Factors such as habits, attitudes, emotions and social context have a limited place in this model.

A further model, the Means-End Chain Theory (Gutman, 1982), partly addresses some of these shortcomings. According to Gutman, (consumer) behavior is goal-directed, in other words people consume in order to achieve certain goals. These goals include personal, social and moral values (e.g.

the desire to feel happy, to feel useful, to protect one's family and the environment, etc). These values are the 'ends' that consumers seek to fulfill by purchasing goods (the means).

4.1.1. The Theory of Planned Behavior

The Theory of Planned Behavior by Ajzen (1991) is a widely used social psychological model which has been used to predict pro-environmental behavior. As shown in figure 2, this theory is based on three factors on people's intention to behave in a certain way. The first factor is attitude. A certain attitude towards a behavior is driven by beliefs about the outcomes of the person's behavior and the evaluation of those outcomes. The second factor is the subjective norm. It is the person's 'perception that most people who are important to him think he should or should not perform the behavior in question' (Ajzen and Fishbein, 1980). The third influence is perceived behavioral control. Ajzen has recognized the fact that the perceived ability to act in a certain way has a great impact on actual behavior. According Ajzen (1991) attitude towards the behavior, subjective norm and perceived behavioral control then determine the intention to act, which is the key precedent of behavior.

For example, the likelihood that a person will start to separate waste (recycling) depends on the attitude about recycling (e.g. 'It is a waste of time' or 'Recycling is good for the environment') and the subjective norm ('Should I recycle?'). The attitude will be formed by two factors. First, it depends on the beliefs about the outcomes of the action (e.g. 'Recycling will not make any difference anyways' or 'If everyone recycles, we will help to save our environment') and the evaluation of these outcomes ('Is it important or unimportant?'). The subjective norm will be formed by what other people close to the person think

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[6] The theory of reasoned action and the theory of planned behavior have been combined into one graphic.

15

he/she should or should not do, and on the perceived behavioral control ('How easy is it for me to separate waste?', 'Will it make any difference if I recycle?'). The attitude towards the behavior and the subjective norm will then influence the intention to recycle, which in turn will influence the ultimate behavior.

The theory of planned behavior has been shown to be valuable in predicting environmental behavior in a number of studies (e.g. Oreg & Katz-Gerro, 2006; Taylor & Todd, 1995; Kaiser et al., 2005). But Kaiser et al. (2005), amongst others, found that its predictive power is limited. For the purpose of this study, the only component that will be used from this theory is *perceived behavioral control*.

4.1.2. The Value-Belief-Norm Theory

Stern's Value-Belief-Norm Theory (VBN, figure 3) is one of the most cited models for explaining pro-environmental behavior. The theory links value theory, the New Environmental (or Ecological) paradigm (NEP) perspective and norm-activation theory through a causal chain of five variables leading to behavior (Stern 2000). Each of these will be discussed in further detail below.
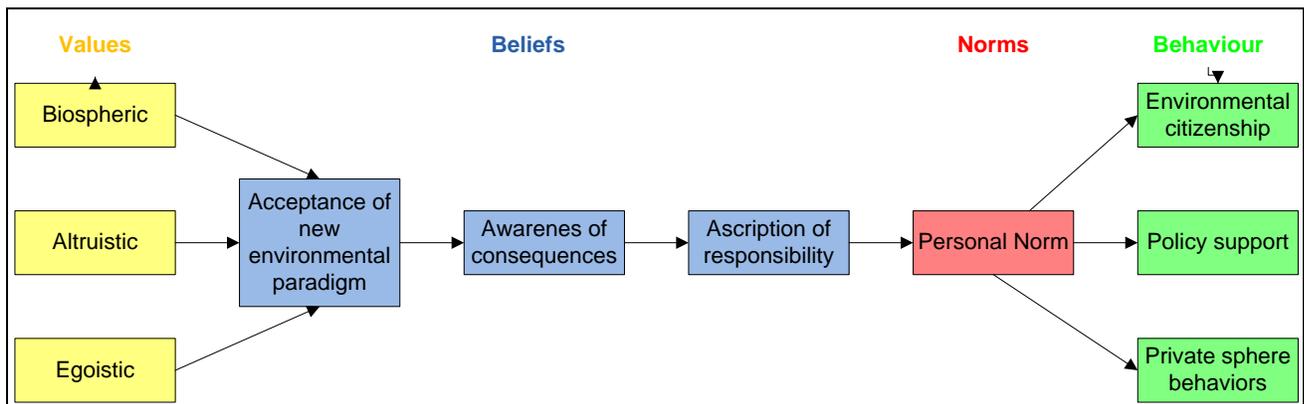
Figure 3: Value-Belief-Norm Theory (Source: Stern, 2000)

A range of studies has shown that human values can be classified into three categories, namely biospheric, altruistic and egoistic values (e.g. Milfont, Duckit and Cameron, 2006; Schulz et al., 2005; Schulz, 2001; Stern, 2000). People with a predominantly biospheric orientation 'judge environmental issues on the basis of costs or benefits to ecosystems', people with a predominantly altruistic orientation 'judge environmental issues on the basis of costs and benefits to a human group', and people with a predominantly egoistic orientation judge environmental issues on the basis of costs or benefits to themselves (Milfont et al., 2006). These categories have been shown to be consistent across a wide range of nations and cultures (e.g Brazil, Czech Republic, Mexico, Brazil, Germany, New Zealand, India, Russia), therefore making it a useful model for research within the UAE. There is an ongoing argument about which of these values are conductive for pro-environmental behaviors. A number of studies has shown consistently strong links between pro-environmental behavior and a biospheric value orientation (e.g. Schultz, 2004; Milfont et al., 2006; Deng et al. 2006). The connection between pro-environmental behavior and the egoistic and altruistic value orientations has been inconsistent. While a number of studies has shown a significant positive relationship between behavior and an altruistic value

orientation (e.g. Schmuck, 2003) other studies have not found significant relationships (e.g. Schultz et al., 2004). Similarly, egoistic concern has been found to have a significant negative relationship with environmental behavior (Schultz et al., 2004), other studies have not found any significant relationship (Schultz, 2001), yet others have found a positive relationship (Milfont et al., 2006). An interesting study is that of Milfont et al. (2006) about environmental behavior in European New Zealanders and Asian New Zealanders. Results of the study showed that European New Zealanders ascribed more importance to biospheric values than Asian New Zealanders and Asian New Zealanders ascribed more importance to egoistic values than European New Zealanders. There was no difference in altruistic values between the two groups. Importantly, the link between value orientations and actual behavior differed between the two cultural groups. While biospheric value orientation was significantly positively related to pro-environmental behavior in both European and Asian New Zealanders, an altruistic value orientation was only significantly related to pro-environmental behavior in the Asian New Zealander group and an egoistic value orientation was significantly positively related to pro-environmental behavior in the European New Zealander sample. The authors ascribe this difference to a difference in individualist and collectivist value orientations in the two samples. Asians tend to be more collectivistic and therefore may be more likely to act upon altruistic concerns while Europeans tend to be more individualistic and may be more likely to act upon egoistic concerns. Similarly, a study by Deng et al. (2006) found that Chinese in Canada were more likely to have an altruistic value orientation than Anglo-Canadians, who were more likely to have an egoistic value orientation.

While the exact relationship is not clear, the value orientation has an influence on the acceptance of the New Environmental Paradigm (NEP), a concept that was developed by Dunlap and van Liere in the 1970s. It has been argued that "our belief in abundance and progress, our devotion to growth and prosperity, our faith in science and technology, and our commitment to a laissez-faire economy, limited governmental planning and private property rights all contribute to environmental degradation and/or hinder efforts to improve the quality of the environment" (Dunlap & van Liere, 1978). While this might be slowly changing, this constellation of values, attitudes and beliefs comprises our society's 'Dominant Social Paradigm', which is a world view "through which individuals or, collectively, a society interpret the meaning of the external world… [and]... a mental image of social reality that guides expectations in a society" (Priages and Ehrlich, 1974, pp43-44 as cited by Dunlap & van Liere, 1978). Dunlap and van Liere (1978) argue that a new world view (the NEP) is emerging which recognizes the facts that humans are dependent on nature and that there are limits to the exploitability of our natural resources if we want to sustain the life support systems of our planet (Dunlap & van Liere, 1978). It is therefore a measure of how the public sees environmental problems.

While the NEP has not been without critics (e.g. Lalonde & Jackson, 2002), many studies have shown a direct and/or an indirect link between endorsement of the new environmental paradigm and pro-environmental behavior. For example, a study by Johnson, Bowker and Cordell (2004) with 50000 participants showed a correlation between the NEP and pro-environmental behavior and that there is a difference in the acceptance of the NEP among Asians, Blacks, Latinos and Whites in the USA. It was shown that Blacks and Latinos scored lower on the NEP scale than Whites and Asians. Similarly, Oreg

and Katz-Gerro (2006) have shown a significantly positive link between NEP and pro-environmental behavior across a sample of 31041 people from 27 nations.

The next link in the VBN Theory is the Norm Activation Theory (Figure 4), which is 'one of the most widely used applied models for understanding pro-social, altruistic behaviors' (Jackson, 2005). 'The basic premise of the theory is that personal norms are the only direct determinants of pro-social behaviors' (Jackson, 2005).
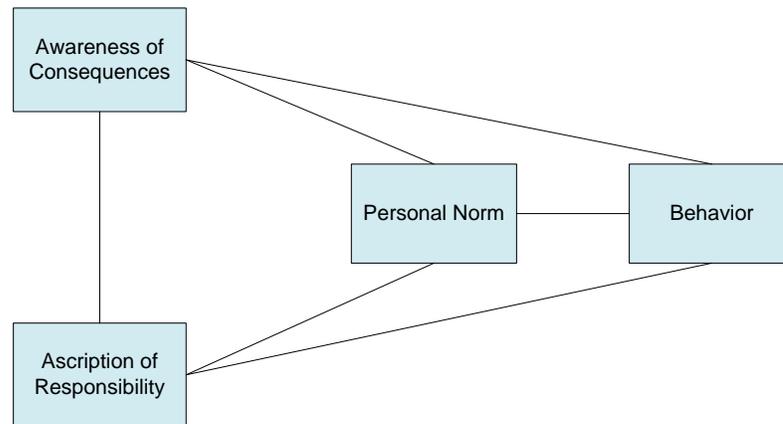
FIGURE 4: NORM ACTIVATION THEORY (SOURCE: JACKSON, 2005)

In the VBN theory acceptance of the NEP links to the Norm Activation Theory because it would lead to an awareness of consequences of a certain behavior which in turn leads to an ascription of responsibility of one's actions. Once a person has realized that he/she has a certain responsibility to adopt or to cease a behavior there is a probability that they will act accordingly.

Stern distinguishes between three types of behavior: environmental citizenship, policy support and private sphere behaviors. Environmental citizenship behaviors include actions such as joining environmental groups and environmental activism. Policy support includes accepting government decisions that aim at protecting the environment including raises in taxes and prices. The final category of behavior is private sphere behaviors, which include 'the purchase, use, and disposal of personal and household products that have environmental impact' (Stern, 2000).

Stern's (2000) model shows that 'environmentalist personal norms and the predisposition to pro-environmental action can be influenced by information that shapes these beliefs'. For example, 'environmentalism can be affected by the findings of environmental science (about consequences), publicity and commentary about those findings, and the actual and perceived openness of the political system to public influence' (Stern, 2000). Programmes aimed at changing behavior should include, among other things, school syllabi that teach students about the environment and how we deal with it, relevant public communication aimed at influencing values, encouraging public participation, etc.

While this model has proven to be one of the best fitting models for explaining pro-environmental behavior, research shows that it can only predict actual behavior between 19% and 35% of the time (Kaiser et al., 2005). For this reason, Stern (2000) stresses that pro-environmental values and attitudes are very important but other factors that influence behavior have to be taken into account. These will be discussed in the following sections.

4.2. Cultural Theories

Barnouw (1985) defines culture as a set of attitudes, values, beliefs, and behaviors shared by a group of people which are communicated from one generation to the next. For example, Johnson, Bowker, and Cordell (2004) argue that different populations with specific social practices and cultural traits are likely to have different values on and attitudes towards nature or the environment. As shown by the Value Belief Norm theory, values and attitudes affect environmental behavior. Therefore it seems reasonable to include a cultural dimension into theories that aim at explaining pro-environmental behavior. Various researchers have attempted to link cultural and behavioral theories to explain pro-environmental behavior but no conclusive results have emerged. Cultural theories that have been put into an environmental behavioral context include the modernist/post-modernist theory (Inglehart, 1997), Hofstede's individualism/collectivism and harmony/mastery cultural dimensions, and sacredness of nature. Each of these will be discussed in further detail below.

4.2.1. Modernism and Post-Modernism

It seems that the largest body of literature has focused on the relationship between environmental attitudes and behavior and Inglehart's (1997) modernist/post-modernist theory. A modernist culture is one in which material values play the central role. For example, many developing countries focus greatly on economic growth and on keeping law and order within the country.

A post-modern culture on the other hand is one in which material prosperity has been achieved and new goals relating to the quality of life are pursued. As this includes protecting the environment it seems reasonable to assume that post-modern values are related to pro-environmental behavior. But studies on whether post-modernism is a predictor of environmentalism have not always confirmed a simple relationship. A cross-cultural study (Oreg and Katz-Gerro, 2006) with a 27 country sample shows that there is a significant positive relationship between post-modernism and pro-environmental behavior. Similarly, a study of Sweden, Norway, USA, and Canada by Olofsson and Ohman (2006) also found a significant positive relationship between these two variables. Other studies suggest that there seems to be a more complicated relationship. For example, Dekker et al. (1997) found a positive relationship between post-modernism and willingness to pay for the environment but not for post-modernism and environmental concern. Furthermore, Goksen et al. (2002) distinguish between concern for local environmental problems and global environmental problems. Their study showed a positive relationship between local problems and modernist values and a positive relationship between global problems and post-modernist values. This seems to be a promising distinction. Modernists may be more concerned about immediate security (thus concern for local environmental problems), while post-modernists may put more value on future well-being (thus concern for global environmental problems).

4.2.2. **Belief in Sacredness of Nature**

Ignatow (2006) argues that a fundamental factor that contributes to environmentalism is how humans relate to nature. Ignatow refers to two models, namely the ecological model and the spiritual model. Within the ecological model, nature is seen as understandable by scientific enquiry and controllable by human knowledge and technology. In this model, modernity is seen as compatible with nature as it allows humans to find ways to balance and integrate modern society with nature. In the spiritual model on the other hand, nature is seen as sacred and in harmony by itself and that humanity is a threat to the balance of nature. A number of studies have shown that a spiritual view of nature is positively related to environmental behavior (e.g. Stern et al., 1999).

4.3. Demographic Background

Many studies have shown that environmental behavior differs between population groups (e.g. Ignatow, 2006, van Liere and Dunlap, 1980, Engel and Ploetschke, 1998). For the purpose of this study variance in behavior between age, gender, education, income and country of origin will analyzed, all of which have been shown to be relevant in analyzing environmental behavior.

4.3. Additional Factors that Influence Behavior

A number of other factors that influence behavior could be identified in the literature. Although these will not be empirically measured in this study, it is worth mentioning two of these factors here as they will be referred to in later sections.

4.3.1. Social Context

Cialdini et al. (1993) found that individuals look at the people in their vicinity in order to decide how to behave in a given situation. For example, if a person lives in a community in which most people separate waste, that person is far more likely to separate waste than a person living in a community where no one does. Two factors play a role. Firstly, descriptive norms, which specify what is usually done in a given situation; secondly, injunctive norms, which specify what is generally approved in the society (Cialdini, 2000; Cialdini, 1993).

To illustrate this, Cialdini (2003) conducted a study in the Petrified Forrest in the USA, where people used to steal large amounts of wood. Two different signs where put up at two different times at the entrance of the forest. The one read '*Many past visitors* have removed petrified wood from the Park, changing the natural state of the Petrified Forest', and the other read 'Please don't remove the petrified wood from the Park, in order to preserve the natural state of the Petrified Forest'. It was shown that five times more people stole wood from the forest in the first case than in the second case.

In a similar study by Goldstein et al. (2008) three different messages calling hotel guests for re-using towels in order to help protect the environment were put into different hotel rooms. The messages read as the following:

- 'HELP SAVE THE ENVIRONMENT. You can show your respect for nature and help save the environment by reusing your towels during your stay.'

- 'JOIN YOUR FELLOW GUESTS IN HELPING TO SAVE THE ENVIRONMENT. In a study conducted in Fall 2003, 75% of the guests participated in our new resource savings program by using their towels more than once. You can join your fellow guests in this program to help save the environment by reusing your towels during your stay.'

- 'JOIN YOUR FELLOW GUESTS IN HELPING TO SAVE THE ENVIRONMENT. In a study conducted in Fall 2003, 75% of the guests who stayed in this room (#xxx) participated in our new resource savings program by using their towels more than once. You can join your fellow guests in this program to help save the environment by reusing your towels during your stay.'

It was found that in hotel rooms with the first message 37.2% of the hotel guests reused their towels at least once, in the second case 44%, and in the third case 49.7%. This makes it clear how important the social context is in promoting behavior.

4.3.2. Habits

Secondly, while the above mentioned models have been shown to predict behavior quite well in many circumstances, there is one important shortcoming to most of them – the fact that they seem to assume that decisions are always made consciously (Aarts et al., 1998). This is not always the case, particularly in the case of habits. Depending on the type of behavior, habits play a significant role and should be targeted by policies aimed at changing behaviors.

After having reviewed the literature on environmental behavior, the factors that drive behavior can be identified. This will be done in the next section, where the research framework is presented.

5. Research Framework

The aims of this research include analyzing the current level of environmental behavior in Abu Dhabi and how this differs between the numerous population groups in Abu Dhabi. This is represented by figure 5.
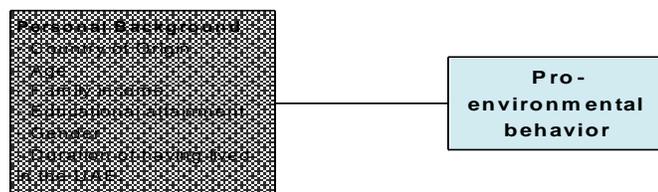
FIGURE 5:FRAMEWORK FOR ANALYZING ENVIRONMENTAL BEHAVIOR BY DEMOGRAPHIC GROUPS

The second research or aim is to identify the reasons for the differences in behavior between the population groups. The first step in answering this question was to identify the factors that influence behavior in the literature (section 4). As shown in figure 6, these factors are endorsement of the new

environmental paradigm (F1), values (F2), perceived behavioral control (F3), personal norms (F4), willingness to sacrifice (F5), ascription of responsibility (F6), awareness of consequences (F7), sacredness of nature (F8), and postmodernism (F9). The arrows between these factors and behavior indicate that there may be a relationship between these factors and behavior (as discussed in section 4). In this study it will be tested which of these relationships are valid for the collected sample from the Abu Dhabi population by regression analysis. In other words, it will be evaluated which of these factors are significant predictors of environmental behavior for the collected sample

The next step is to use the results from the regression analysis to explain differences in behavior between various population groups (as identified from answering the first research question). For example, if a difference in environmental behavior is found between men and women, the statistically significant predictors of environmental behavior in the regression analysis will be used to analyze this difference in further detail. This is graphically indicated by the lines between the demographic variables and the factors F1 – F 9 in figure 6.
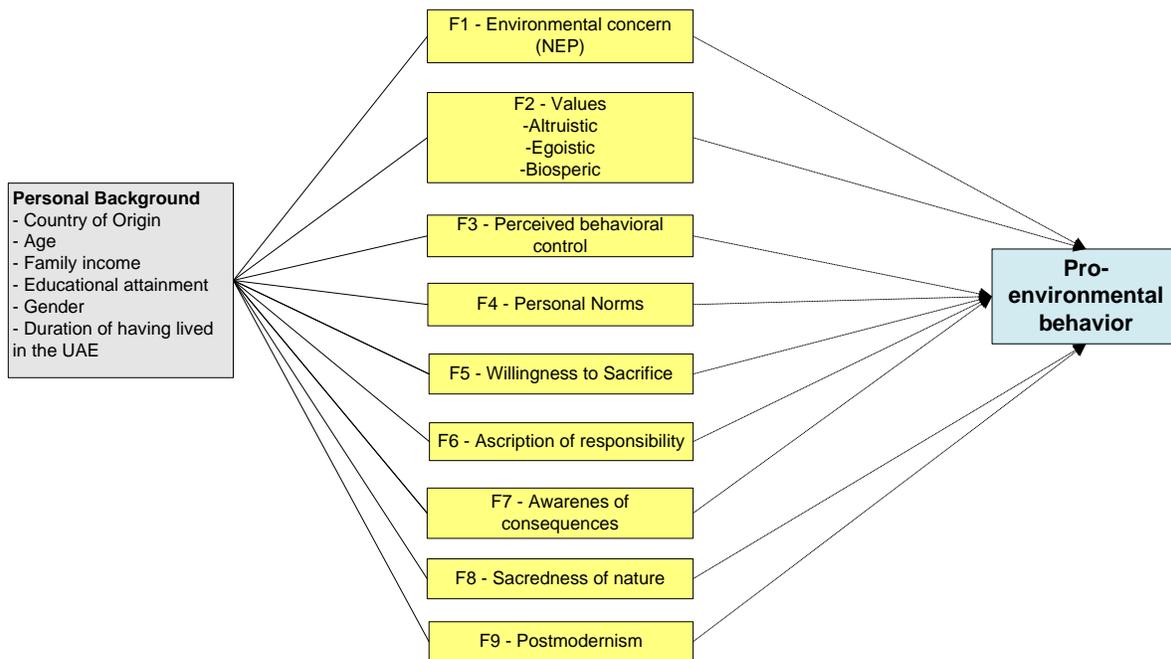
FIGURE 6: RESEARCH FRAMEWORK FOR ANALYZING THE FACTORS LEADING TO ENVIRONEMTNAL BEHAVIOR[7]

Note that this research will not take mediation effects and other interactions between the variables into account (as suggested by the theories). Instead, a simple relationship between each variable and behavior is assumed.

Each of the variables shown in figure 6 will be measured with a block of questions. In addition, positional factors such as country of origin, age, gender, family income, and educational attainment will be asked.

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[7] Note that the labels F1 – F9 are used to reference these variables in other sections within this report.

The research design and methods will be discussed in the following section. Firstly, the data collection method will be described, followed by a critical discussion of the research method. Finally the measurement methods for the variables shown in figure 6 as well as the statistical methods for analyzing the data will be described.

6. Research Design and Methods

This study is quantitative in nature and the data was collected by means of questionnaires. Two means of data collection were used. The first mean was paper questionnaires which were distributed on beaches, in shopping centers (Abu Dhabi Mall, Al Raha Mall, Al Wadah Mall, Khalidiya Mall, Marina Mall and Madinat Zayed Shopping Mall), public parks, schools (Indian High School, International Community School, and Iranian High School) , universities (Sorbonne University and Zayed University). The second mean was an online survey. The link to the online survey was sent to the employees of a number of companies (Abu Dhabi Company for Onshore Oil Operations, Abu Dhabi Future Energy Company, CH2M Hill, Mott MacDonald, and Parsons Brinckerhoff) and members (staff and students) of the Masdar Institute of Science and Technology, Zayed University, and United Arab Emirates University. The paper survey and the online survey were equivalent in terms of content and outline. All the data was collected in Abu Dhabi over a six week period in May and June 2009. About 40% of the data was collected with the paper survey and about 60% was collected by the online survey.

The following sections will discuss some advantages and disadvantages of using questionnaires, followed by a presentation of the measurements used for this study. Finally, the statistical methods that have been used for analyzing the data will be explained briefly.

6.1. Discussion on Research Method

There are a number of considerations when choosing this research method, which are discussed below.

Firstly, as shown in the conceptual framework, one of the aims of this research is to compare population groups according to environmental behavior and to identify the reasons for these differences. This need to compare variables and analyze relationships between variables requires a method to quantify these variables (i.e. environmental behavior, willingness to sacrifice, etc) for statistical analyses such as analysis of variance and regression analysis.

Secondly, as numerous population groups exist in Abu Dhabi, a large number of respondents is needed to obtain a representative sample across the main population groups.

Thirdly, the research method should be practical to apply in the environment of Abu Dhabi. People need to be willing and able to take part in the research. Other research methods such as interviews or focus groups would require the participants to come to the interview location at a certain time and spend a significant amount of time there. This may be difficult to achieve in the given period of 6 weeks of field work.

Survey research is a method which fulfills these requirements well. In addition, almost all research referred to in the literature review is based on surveys. This is an additional reason for using surveys as it allows for easier comparison between the results.

There are however a number of general shortcomings and pitfalls that need to be taken into account when using the survey method. Furthermore, there are a number of problems that are specific to Abu Dhabi when using surveys. Some of these will be discussed below.

One problem with surveys is that they cannot prove causality as is the case of experiments (Aldrige & Levine, 2001). For example, if one finds that environmental behavior and awareness of environmental problems are correlated, this is not sufficient to claim that environmental awareness causes environmental behavior or vice versa.

Another drawback of surveys is that they are intruding into the flow of life of the respondents. As a result, respondents are self-consciously behaving as respondents. This means that their answers are 'influenced by their desire to be helpful and to live up to their own self-image or to an ideal which they think will look good to the researcher. Respondents will therefore over-report their virtuous acts and play down or ignore their failings and foibles' (Aldrige & Levine, 2001). They will also try to appear consistent, with the result that their opinions and beliefs will seem more coherent than they are. In the case of Abu Dhabi another problem might be added. Due to the diversity of the Abu Dhabi population, some people may have misinterpreted the questions (one possible reason being a lack of knowledge of the English language). Additionally, as people may come from regions with very diverse power-relations, some may feel threatened by a researcher approaching them and, as a result, they might overstate their virtuous acts even more. For example, one respondent wrote on the survey "we have a system and fully cooperate with the system". Others might do the same because they want to preserve the image of the group they belong to (country, company, university, etc).

A further limitation of surveys is that there is limited opportunity for respondents to state in their own words what they have to say (Aldrige & Levine, 2001). People are forced to answer predefined questions (most often close ended questions). This can take away some richness of the data. Furthermore, it is difficult to gauge the salience of the issue at hand because it is the researcher who raises the issue in the first place (Aldrige & Levine, 2001). This is a very important point for this research. As an example, while awareness of environmental problems might be highly important for some people, it may play an insignificant role in the lives of others. Yet, both might have the same degree of understanding of environmental problems.

Furthermore, while the response rate of the paper survey was very high (significantly more than 50% of people approached were willing to respond to the survey), the response rate of the online survey was less than 5%. This may have in impact on the results as there is the possibility that mostly people who are interested in environmental problems already chose to participate in the online survey. This may skew the results towards being more positive than the reality really is.

For these reasons it must be stressed that the results and numerical values that come out of the survey analysis cannot be seen as absolute but rather as indications on how various groups compare and how variables relate to each other.

Each of the variables presented in the conceptual framework was measured by a set of questions. Most of these measurements have been used by a number of other researchers in the field of social psychology to measure the same phenomenon. The measurements will be explained in more detail in the following sections.

6.2. Measures

In this section the measurements for new environmental paradigm (NEP, F1), value orientations (F2), perceived behavioral control (F3), personal norms (F4), willingness to sacrifice (F5), ascription of responsibility (F6), awareness of consequences (F7), sacredness of nature (F8), postmodernism (F9), pro-environmental behavior and the demographic variables will be given. In many cases one variable is measures by a number of Likert-scale[8] questions. In order to arrive at a single value for a variable, the answers of the respondent for questions of one variable are averaged. All scales where taken from other researches. Some scales where slightly changed from the original versions in order to adapt to the local conditions and to reduce the length of the questionnaire.

6.2.1. The new environmental paradigm scale (F1)

The new environmental paradigm is a scale for measuring the belief of people that individuals are highly dependent on the natural environment, and that due to immense economic growth, humans have become a natural force by themselves, and are severely impacting the environment. In 2000, Dunlap et al. (2000) developed a revised new environmental paradigm scale that takes into account more recent phenomena, such as climate change. This scale measures 4 dimensions, namely ecological limits, balance of nature, human domination and the emergence of ecological catastrophes. Originally this scale consists of 15 Likert-scale type items of which 12 have been selected for this study. The options ranged between 1 (strongly agree) to 5 (strongly disagree). The Cronbach alpha[9] was 0.69. The item measured in this study are:

- We are approaching the limit of the number of people the earth can support.
- Humans have the right to modify the natural environment to suit their needs*.
- When humans interfere with nature it often produces disastrous consequences.
- Humans are severely abusing the environment.
- The earth has plenty of natural resources if we just learn how to develop them*
- Plants and animals have as much right as humans to exist

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[8] A Likert scale is a numerical scale (often from 1 to 5) in which respondents have to indicate the level of agreement with the statement (e.g. 1 – strongly agree – 5 – strongly disagree)

[9] Cronbach's alpha is a statistical measure of internal consistency of the different scale items. In order words, it measures whether the scale items measure a single, uni-dimensional phenomenon. While a Conbach alpha of at least 0.7 is usually recommended, some researchers (e.g. Gliem & Gliem, 2003) have argued that an alpha value of 0.6 or more is 'acceptable'. For the purpose of this study, an alpha value of 0.6 or more will be considered sufficient.

- The balance of nature is strong enough to cope with the impacts of modern industrial nations*
- Despite our special abilities humans are still subject to the laws of nature
- The so-called 'ecological crisis' facing human kind has been greatly exaggerated*
- Humans were meant to rule over the rest of nature*
- Humans will eventually learn enough about how nature works to be able to control it*
- If things continue on their present course, we will soon experience a major ecological catastrophe.

6.2.2. Value Orientation (F2)

There are a number of scales for measuring biospheric, egoistic and altruistic value orientations. For this study, the scales by Joireman et al. (2001) will be used. This scale consists of 4 items for biospheric and egoistic values and 5 items for altruistic values. All items were 5 point Likert scales.

Altruistic values (Cronbach alpha = 0.62):
- The effects of pollution on public health are worse that we realize.
- Environmental protection will help people to have a better quality of life.
- Pollution generated here harms people all over the earth.
- Environmental protection benefits everyone.
- We don't need to worry much about the environment because future generations will be better able to deal with these problems than we are now.

Biospheric values (Cronbach's alpha = 0.34):
- Claims that we are changing the environment are exaggerated.
- Over the next several decades, thousands of species of plants and animals will become extinct.
- Modern development threatens wildlife.
- While some local plants and animals may have been harmed by environmental degradation, over the whole earth there has been little effect.

Egoistic values (Cronbach's alpha) = 0.51:
- Environmental protection is beneficial to my health.
- A clean environment provides me with better opportunities for recreation.
- Protecting the environment will threaten jobs for people like me.
- Laws to protect the environment limit my choices and personal freedom.

The alpha coefficients of biospheric and egoistic values is below 0.6 and therefore these value orientations will not be used for further analysis in this paper.

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* These items are reverse-coded.

6.2.3. Perceived Behavioral Control (F3)

Perceived behavioral control was measured using two questions with 5 point Likert Scales (Oreg & Katz Gerro, 2006). The scale's reliability alpha coefficient was 0.63. The following are the items on the scale (where 1 meant strongly agree and 5 meant strongly disagree:

- It's just too difficult for someone like me to do much about the environment.
- There is no point in doing what I can for the environment unless others do the same.

6.2.4. Personal Norms (F4)

Personal norms were measured by nine Likert scale type questions (1 = strongly agree and 5 = strongly disagree) used by Stern et al. (1999). The alpha coefficient was 0.86. The items that were used are:

- The government should take stronger action to clean up toxic substances in the environment.
- I feel a personal obligation to do whatever I can to prevent climate change.
- I feel a sense of personal obligation to take action to stop the disposal of toxic substances in the air, water, and soil.
- Business and industry should reduce their emissions to help prevent climate change.
- The government should exert pressure internationally to preserve the tropical forests.
- The government should take strong action to reduce emissions and prevent global climate change.
- Companies that import products from the tropics have a responsibility to prevent destruction of the forests in those countries.
- People like me should do whatever we can to prevent the loss of tropical forests.
- The chemical industry should clean up the toxic waste products it has emitted into the environment.

6.2.5. Willingness to Sacrifice (F5)

Willingness to sacrifice was measured with three 5 point Likert type questions (Oreg & Katz-Gerro, 2006), where 1 = very willing and 5 = very unwilling. The scale's alpha coefficient was 0.63. The following items were used in the survey:

- I am willing to pay higher prices to protect the environment.
- I am willing to change my habits to protect the environment.
- I am willing to use less electricity, water and to use public transportation to protect the environment.

6.2.6. Ascription of Responsibility (F6)

Ascription of responsibility was measured by a single 5 point Likert scale (1 = very responsible, 5 = Not responsible at all) type question from Schultz and Zelezny (1998). The question was 'Do you feel responsible for reducing environmental problems?'.

6.2.7. Awareness of Consequences (F7)

Awareness of consequences was measured by nine Likert scale questions, where 1 = definitely and 5 = definitely not. There questions were slightly modified from Stern et al, (1999). The scale's alpha coefficient was 0.89. The questions are:

- In general, do you think that climate change, which is sometimes called the greenhouse effect, will be a very serious problem for you and your family?
- Do you think that climate change will be a very serious problem for the country as a whole?
- Do you think that climate change will be a very serious problem for other species of plants and animals?
- Next, I'd like you to consider the problem of loss of tropical forests. Do you think this will be a very serious problem for you and your family?
- Do you think that loss of tropical forests will be a very serious problem for the country as a whole?
- Do you think that loss of tropical forests will be a very serious problem for other species of plants and animals?
- Next, I'd like you to consider the problem of toxic substances in air, water and the soil. Do you think this will be a very serious problem for you and your family?
- Do you think that toxic substances in air, water and the soil will be a very serious problem for the country as a whole?
- Do you think that toxic substances in air, water and the soil will be a very serious problem for other species of plants and animals?

6.2.8. Sacredness of Nature (F8)

For measuring 'sacredness of nature' respondents were asked to mark an option closest to their views from a list of four options. The options were 'Nature is holy because it is created by god', 'Nature is spiritual or holy in itself', 'Nature is important but not in a spiritual or holy way', and 'Nature is there for humans to gain maximum benefits'. The three first options were taken from Stern et al. (1999).

6.2.9. Postmodernism (F9)

In order to measure postmodernism, the respondents were asked to mark the most important to them with a one and the second most important with a two of a list of four options (two options representing modernist values and two representing postmodernist values). The options where 'Maintaining order in the nation' (modernist), 'Giving people more say in important government decisions' (postmodernist), 'Fighting rising prices' (modernist), and 'Protecting freedom of speech' (postmodernist) (Oreg and Katz-Gerro, 2006). A postmodernist value that was marked by the respondents with a one was given 2 points and a postmodernist value that was marked with a two was given one point. These scores were added and thereby a scale of 0 (meaning modernist) to 3 (meaning post-modernist) was developed.

6.2.10. Pro-environmental behavior

Pro-environmental behavior was measured with ten items taken from Schulz et al (2000). The scale ranged from 0 (never) to 5 (very often). The Cronbach alpha coefficient was 0.84. The following items were used:
In my home country I –
- Look for ways to reuse things.

- Recycle newspapers.
- Recycle cans or bottles.
- Encourage friends or family to recycle.
- Purchase products in reusable or recyclable containers.
- Pick up litter that was not my own.
- Compost food scraps.
- Conserve gasoline by walking, bicycling, or car pooling.
- Write letters supporting environmental issues.
- Volunteer time to help an environmental group or project.

In addition, the respondents were asked what the biggest obstacle is for them to recycle more and reduce water and electricity consumption. The respondents had the following options: 'I am very busy so I do not have time', 'It would be very difficult to change my habits', 'There is no incentive for me to do so', 'There is a lack of recycling facilities where I live', and 'Other. Please Specify'.

6.2.11. Demographic Background

Finally, a number of demographic questions were posed to the respondents. These were age group (options: 19 and under, 20-29, 30-39, 40-49, 50-59, 60+), gender, nationality, occupation, the number of years of having lived in the UAE (options: less than 1 year, 1-2 years, 2-3 years, 3-4 years, 4-5 years, 5-6 years, 6-7 years, 7-8 years, more than 8 years), highest level of education (options: primary school, secondary school, high school, bachelor's degree, master's degree and PhD or higher), religion (options: Muslim, Christian, Hindu, Buddhist, other (please specify), none, prefer not to answer), and family income per month (less than $500, $501 - $1000, $1001 - $2000, $2001 - $4000, $4001 - $8000, $8000 or more). The questions on nationality and occupation were open ended questions.

For analyzing the data, a number of statistical methods have been used, which are discussed below.

6.3. Statistical Methods

As this study is based on quantitative research, a number of statistical methods will be used to present and analyze the data. The statistics software package SPSS has been used for analysis. On the descriptive side, the data has been summarized in tables and graphs. In addition, means, frequencies, percentages and standard deviations have been calculated.

For analyzing which variables are significant predictors of pro-environmental behavior, a regression analysis has been carried out. A regression analysis allows to analyze the relationship between a dependent variable (e.g. pro-environmental behavior) and a number of independent variables (e.g. 'willingness to sacrifice' and 'perceived behavioral control').

In some cases the relationship between two variables will be calculated. This is done by the Pearson correlation coefficient. A coefficient of 1 means the two variables correlate perfectly (i.e. when the magnitude of one variable increases, the magnitude of the second variable increases by the same amount), and a coefficient of 0 means that there is not relationship at all.

For comparing the means of two samples (e.g. comparing the means of 'willingness to sacrifice' of men and women) independent-sample t-tests have been used.

The independent sample t-test can only be used for analyzing differences between two groups. If more than two groups have to be compared (e.g. differences of pro-environmental behavior between people from Europe, America, Middle Eastern Countries and Southeast Asia) other statistical methods, in this case analysis of variance (ANOVA) has been used. This method allows for comparisons of the mean of one variables between two or more groups.

The regression analysis, t-tests and ANOVA analyses result in a p-value. In order to find out whether a statistical test is significant or not, this p-value will be compared to a pre-defined significance level. When the p-value is smaller than the significance level, that result is said to be 'statistically significant'. For this study, a significance level of 0.05 has been used. This means that the results of the hypothesis tests (used in regression, t-test and ANOVA) are less than 5% likely to have occurred by chance. In other words, if the same test will be conducted with a different sample from the same population, there is a 95% chance that the results will be the same.

ANOVA only can test for differences between a number of groups but not where exactly this difference lies. In order to do that, the Tukey HSD test have been used, which will allow to specify which of the groups are significantly different from each other.

As the sample size is rather high (more than 1000 respondents for most variables), statistical significance may not be sufficient to determine whether the results of comparing variables have any practical meaning. For example, there might be a statistically significant difference of pro-environmental behavior between males and females but this difference might be very small, and therefore may have very little meaning in reality. For this reason, another statistic, eta squared, was calculated for comparisons of means. Eta squared is a measure of the effect size one variable has on another. Generally, the following guidelines are recommended for interpreting eta squared:

- Eta squared = 0.01 – Small effect size
- Eta squared = 0.06 – Moderate effect size
- Eta squared = 0.14 – Large effect size

For example, when there is a statistically significant difference of environmental behavior between males and females, but the eta squared value is 0.01, gender has a small effect on environmental behavior, and one may want to neglect gender for practical applications. For the purpose of this study, any eta value of less than 0.02 will be considered as not having any practical value. Therefore, results with an eta of less than 0.02 will be mentioned but not discussed in detail.

After having presented the research framework and the research methods, the next section will present the analysis of the data, according to the steps that are explained in section 2 in order to achieve the research aims.

7. Analysis

First, the demographic distribution of the sample will be analyzed, followed by a presentation of the scores for pro-environmental behavior of the sample. Then, it will be evaluated which of the predictors shown in the research framework are significant, which will be used to analyze differences in environmental behavior between population groups. Finally, categories with similar behavior in Abu Dhabi will be developed.

6.1. Demographic Distribution of the Sample

A total of 1461 questionnaires have been returned. Generally, the demographics are representative of the population of Abu Dhabi. 38.1% of the respondents were female while 61.9% were males, representing the imbalanced gender ratio in the emirate. As shown in table 6, the sample is very young and represents the population age distribution (table 1) very well.

TABLE 6: SAMPLE DISTRIBUTION BY AGE

		Frequency	Valid Percent[10]
Valid	**19 and under**	329	26.4
	20-29	321	25.8
	30-39	204	16.4
	40-49	185	14.9
	50-59	179	14.4
	60+	27	2.2
	Total	1245	100.0
Missing	**Left blank**	216	
Total		1461	

1220 respondents have answered the question on religion, of which 61.1% are Muslim, 19.4% Christian, 13.6% Hindu, 0.2 Buddhist, 2.5% other, 2.3% none and 0.9% 'prefer not to answer'. In total 1178 people have answered the question on country of origin. People from a total of 61 countries have responded to the survey. Of these, 33% were from India, 24.9% were from the UAE, 4.7% were from Britain, 3.9% were from the Philippines, 3.7% were from Egypt, 3.6% from Jordan and 3.1% were from Palestine. For a complete frequency distribution for country of origin, refer to appendix 1. 1.4% of the respondents indicated that they are from mixed backgrounds (e.g. Iranian/American). This category was not included

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[10] 'Valid Percent' excludes the respondents who have not answered this questions from the calculation.

in analyses on regional differences. Of the respondents who are not UAE nationals, 28.8% have been living in the UAE for less than one year, 14.4% for 4 – 8 years and 56.9% for 8 years or more.

For the purpose of analysis, respondents were categorized into regions as shown in Table 7. As the sample sizes of India and Emirates is large, these countries are treated as separate 'regions'. This allows to independently compare people from the UAE and India to other regions.

TABLE 7: SAMPLE DISTRIBUTION BY REGION

		Frequency	**Valid Percent**
Valid	Europe	96	8,1
	Middle Eastern Countries	192	16,3
	India	392	33,3
	Emirates	293	24,9
	North America	47	4,0
	North Africa	37	3,1
	Southeast Asia	47	4,0
	Other	74	6,3
	Total	1178	100,0
Missing	0	283	
Total		1461	

1113 respondents have answered the question on occupation. Of these, 22.2% were high school students, 18.1% were university students, 16.1% were engineers, and 3.8% were foremen. Other occupations in the sample include accountants, assistants, consultants, housewives (1.3%), IT professionals, laborers, teachers, sales representatives, scientists, technicians, etc. One shortcoming of this sample is that housewives seem to be underrepresented. It is very difficult to find housewives that speak English and are willing to fill out the survey. This may be a more serious shortcoming as housewives control a large amount of resources that are used within households.

In total, 1222 respondents have answered the question on highest level of education. As shown in table 8, the level of education of the sample is higher than that of the Abu Dhabi population (table 2). 65% of the respondents have a university degree while only 17.6% of the Abu Dhabi population has a university degree.

		Frequency	Valid Percent
Valid	**Primary School**	4	.3
	Secondary School	250	20.5
	High School	174	14.2
	Bachelor's Degree	577	47.2
	Master's Degree	178	14.6
	PhD or higher	39	3.2
	Total	1222	100.0
Missing	**Left Blank**	239	
Total		1461	

Table 9 shows the sample distribution by income class. 63.5% of the respondents indicated that they have a family income of more than $4000 per month. Therefore, people in very low income classes are likely to be underrepresented in this sample. One of the reasons for this is that the questionnaire was only available in English. A high proportion of the people in the lowest income class (mainly construction workers) are from Pakistan and other South Asian countries and do not speak English. Furthermore, people from lower income classes seemed less willing to respond to the survey. But it should be noted that these people are likely to use very little resources per capita and do not cause much environmental pollution. In order to confirm that, further research would be necessary.

TABLE 9: SAMPLE DISTRIBUTION BY INCOME GROUP

		Frequency	Valid Percent
Valid	**Less than $500**	23	2.2
	$501 - $1000	44	4.2
	$1001 - $2000	100	9.5
	$2001 - $4000	219	20.7
	$4001 - $8000	297	28.1
	$8001 or more	374	35.4
	Total	1057	100.0
Missing	**Left Out**	404	
Total		1461	

To summarize, this sample is skewed towards the middle and upper classes in Abu Dhabi and likely under represents Pakistanis. This may not be a big problem for Masdar as the population of Masdar is likely to consist of people in the higher income brackets (Al-Hosany, 2009). A more serious shortcoming

is the lack of housewives in the sample. Further research for investigating the behavior of housewives would be necessary.

6.2. Current Level of Pro-Environmental Behavior

In this section, the first aim of the study, namely finding out what the current level of environmental behavior is will be assessed. A total of 1203 respondents have completed the questions on environmental behavior. Table 10 shows the average scores for the environmental behaviors measured, ordered by the mean. The average score of all environmental behaviors is 2.8 on a scale of 0 (never) to 5 (very often). This can be seen as quite low, especially considering that the respondents may have overstated their behavior, as explained by Aldridge and Levine (2001). The most frequently performed behaviors are looking for ways to reuse things (M = 3.37), recycling of newspapers (M = 3.13) and purchasing of products in reusable or recyclable containers (3.11). The least performed behaviors are composting food scraps (M = 2.46), volunteering time for helping environmental groups (M = 2.31) and writing letters supporting environmental issues (M = 1.79).

TABLE 10: MEANS OF ALL MEASSURED BEHAVIOR TYPES

	Mean	Min	Max
Look for ways to reuse things	3,37	0	5
Recycle newspapers	3,13	0	5
Purchase products in reusable or recyclable containers	3,11	0	5
Encourage friends and family to recycle	3,04	0	5
Recycle cans and bottles	3,03	0	5
Pick up litter that was not my own	2,92	0	5
Conserve gasoline by walking, bicycling or car-pooling	2,78	0	5
Compost food scraps	2,46	0	5
Volunteer time to help an environmental group or project	2,31	0	5
Write letters supporting environmental issues	1,79	0	5
Average Score	2,80	,00	5,00

The following section will identify the significant predictors of environmental behavior.

6.3. Identifying Significant Predictors of Environmental Behavior

As part of the second aim of this study, the significant predictors for environmental behavior will be identified by regression analysis. These will be used to explain the differences in environmental behavior between demographic groups.

A total of 1443 respondents have answered the questions on environmental values (F2). Altruistic values (mean = 4.408 out of 5) and egoistic values (mean = 4.273 out of 5) have been valued higher than biospheric values (mean = 3.7113 out of 5).

1349 respondents have answered the questions on the NEP (F1), 1031[11] the questions on perceived behavioral control (F3), 1033 the questions on personal norms (F4), 1273 the questions on willingness to sacrifice (F5), 1251 the questions on ascription of responsibility (F6), 1248 the questions on awareness of consequences (F7), 1223 the question on sacredness of nature (F8), and 601 the question on postmodernism[12] (F9). The average score of all respondents is 3.5 out of 5 for NEP, 3,52 out of 5 for perceived behavioral control, 4.44 out of 5 for personal norms, 4.03 out of 5 for willingness to sacrifice, 4.12 out of 5 for ascription of responsibility, 4.43 out of 5 for awareness of consequences and 1.43 out of 3 for postmodernism. These numbers are summarized in table 11.

TABLE 11: MEANS OF POSSIBLE PREDICTORS OF ENVIRONMENTAL BEHAVIOR

	Mean	Minimum	Maximum	Std. Deviation
Altruistic Values (F2)	4,4080	1,00	5,00	,61486
Egoistic Values (F2)	4,2730	1,00	5,00	,69126
Biospheric Values (F2)	3,7113	1,00	5,00	,73835
NEP (F1)	3,5064	1,00	5,00	,55682
Perceived Behavioural Control (F3)	3,52	1,00	5,00	1,19
Personal Norms (F4)	4,44	1,00	5,00	,58
Willingness to sacrifice (F5)	4,0294	1,00	5,00	,80835
Ascription of Responsibility (F6)	4,12	1	5	,970
Awareness of Consequences (F7)	4,4274	1,00	5,00	,64161
Postmodernism	1.43	0	3	1.049

For sacredness of nature, 40% of the respondents marked 'nature is holy because it was created by God', 12.5% marked 'nature is holy or spiritual in itself', 23.9% marked 'nature is important but not in a spiritual or holy way', and 13.8% marked 'nature is there for humans to gain maximum benefit'.

A hierarchical multiple regression was conducted for predicting environmental behavior from the scores of altruistic values (F2)[13], new environmental paradigm (F1), perceived behavioral control (F3), personal norms (F4), willingness to sacrifice (F5), ascription of responsibility (F6), awareness of consequences (F7), postmodernism (F8) and sacredness of nature (F9). In order to account for variation of behavior between the population groups, the demographic variables (age group, region of origin, highest level of education, gender, and income group) have been included in the regression model. Table 12 shows the SPSS output for the regression. Note that the dummy variables for the demographic measures are not shown in table 12. Refer to Appendix 2 for the full regression output. The assumptions

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[11] Note that due to an error during the online survey 250 respondents could not answer the questions on perceived behavioural control and personal norms.

[12] Only 601 respondents answered the question on post-modernism correctly. For example, in many cases, more than two items were marked. In other cases only one item was marked. In such cases the data was not included in the analyses.

[13] Remember that due to the low alpha values, biospheric and egoistic values were removed from all statistical tests

of linearity between the dependent and independent variables, as well as independence, normality, and homoscedasticity of errors were met. The model had an adjusted R squared of 0.199, indicating that 19.9 % of the variation in actual behavior is explained by the independent variables[14].

Table 12 shows that among psychological measures perceived behavioral control (F3), willingness to sacrifice (F5), and ascription of responsibility (F6) have significant prediction power for environmental behavior. In contrast to a number of other researchers (e.g. Stern, 1999;), altruistic values (F2), NEP (F1), personal norms (F4), awareness of consequences (F7), and post modernism (F8) could not be shown to be significant predictors of environmental behavior for the case of Abu Dhabi.

There are number of possible explanations why many of the variables could not be shown to be significant predictors of pro-environmental behavior. Firstly, even though 'personal norms' and 'awareness of consequences' could not be shown to be significant direct predictors, they might however indirectly have an effect. For example, a correlation between 'awareness of consequences' and 'ascription of responsibility' (Pearson r = 0.339) indicates that 'awareness of consequences' and 'ascription of responsibility' are related. Similarly, while 'personal norms' could not be shown to have a significant effect on environmental behavior, 'personal norms' correlates with 'ascription of responsibility' (r = 0.533). This could be a representation of Stern's VBN theory (Stern, 2000) which indicates that there are relationships between the variables.

Another possible explanation for these findings is that Abu Dhabi has a severe lack of infrastructure and facilities, as well as a lack of rules and regulations that support pro-environmental behavior. Therefore there is a much larger physical barrier for acting environmentally friendly in Abu Dhabi than in many other countries. As a result, psychological factors are likely to be subordinate to the physical barriers. If an extensive infrastructure supporting environmentally friendly behavior would be implemented in Abu Dhabi, these results might change with time and the psychological factors may play a larger role. Most previous studies that have been carried out in this field took place in countries that have better supporting facilities in place (such as waste separation stations, power saving electronic equipment, etc), as well as rules and regulations, which act as incentives for pro-environmental behavior.

Furthermore, for reasons explained in section 5.3, the data might not be accurate enough for identifying all factors as significant. On the one hand, people might have misinterpreted the questions and overstated their behavior. On the other hand, there is a possibility that some of the measures that are used in this study may not be appropriate for the local Abu Dhabi context and may not reflect the concepts that they were meant to measure.

Postmodernism could not be confirmed as being significant predictor of behavior. The belief that 'nature is holy or spiritual in itself' on the other hand is significantly positively related to environmental behavior. 'Nature is there for humans to gain maximum benefit' is negatively related,

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[14] Note that due to the nature of social survey research this figure is not an accurate measure for the prediction power of the model.

however, with a p-value of 0.051 not statistically significant. One person wrote that s(he) does "not see any obstacle [to act more environmentally friendly]. It is in my personal nature to save as much of water and electricity because I am accountable in front of the Almighty". This shows that for some people, a religious and spiritual view of the environment may improve environmental behavior and that indeed there is some relationship between environmental behavior and how people view nature from a spiritual point of view.

TABLE 12: REGRESSION FOR IDENTIFYING WHICH VARIABLES ARE SIGNIFICANT PREDICTORS OF ENVIRONEMNTAL BEHAVIOR

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1,118	,283		3,946	,000
Altruistic Values(F2)	,033	,046	,021	,730	,466
NEP (F1)	,022	,052	,012	,422	,673
Perceived behavioral control (F3)	**,090**	**,025**	**,094**	**3,653**	**,000**
Personal Norms (F4)	,060	,056	,031	1,070	,285
Willingness to Sacrifice (F5)	**,192**	**,037**	**,151**	**5,152**	**,000**
Ascription of Responsibility (F6)	**,101**	**,031**	**,095**	**3,296**	**,001**
Awareness of consequences (F7)	-,061	,049	-,038	-1,242	,214
Postmodernism (F8)	-,001	,035	,000	-,037	,971
Nature is spiritual or holy in itself (F9)	**,174**	**,077**	**,059**	**2,262**	**,024**
Nature is improtant but not in a spiritual or holy way (F9)	-,036	,063	-,015	-,566	,571
Nature is there for humans to gain max benefit (F9)	-,144	,073	-,051	-1,954	,051
Dependent Variable: Environmental Behaviour (R squared = 0.199)					

The following sections will present the results of comparing the population groups in terms of environmental behavior. In addition, in order to answer the second research question, the psychological variables that have been shown to be significant predictors of environmental behavior in this section (perceived behavioral control, willingness to sacrifice, and ascription of responsibility) will be used to explain the differences in behavior between the population groups. In addition, other possible reasons will be suggested.

6.4. Analyzing Differences in Environmental Behavior between Population Groups

After having identified which factors are significant predictors of pro-environmental behavior, this section will complete the second research aim of this study and analyze environmental behavior by population groups and give explanations for any differences. Differences between males and females, between age groups, between regions of origin, by the duration the respondents have been living in the UAE, between education levels and between income levels will be analyzed.

6.4.1. Differences in Environmental Behavior between Males and Females

As shown in table 13, the average score for behavior is 2.85 for males and 2.75 for females. An independent-samples t-test for evaluating differences in behavior between males and females was conducted and a statistically significant difference was found (t[1207] = 2.384; p = 0.017). However, with an eta squared value of 0.01 and an average difference between males and females of 0.144, the effect size is very small and likely will not have any practical implications.

TABLE 13: T-TEST FOR ANALYZING DIFFERENCES OF ENVRIONMENTAL BEHAVIOR BETWEEN MALES AND FEMALES

Gender	N	Mean	Std. Deviation	T	Df	p – value	Mean difference
Male	749	2,85	1,03	2.384	1207	0.017	0.144
Female	460	2,71	1,01				

6.4.2. Differences in Environmental Behavior between Age Groups

A one-way between-groups ANOVA analysis has been conducted in order to test for significant differences of behavior between age groups. A statistically significant difference could be found (F[5, 1229] = 18.009; p = 0.000). The effect size is moderate (eta squared = 0.07).

Older people tend to behave more environmentally friendly than younger people. This is also confirmed by post hoc analyses using the Tukey HSD test. Figure 8 confirms that the score tends to increase significantly with age. People who indicated that they are 19 years old or younger do not seem to follow this trend. One explanation for that might be that the programs on environmental issues that have been launched in the high schools of Abu Dhabi show a positive effect on behavior. But it should be mentioned that most of the students in the sample are from two schools only (International Community School and Indian High School) and therefore the data may not be representative sample for all schools in the region.
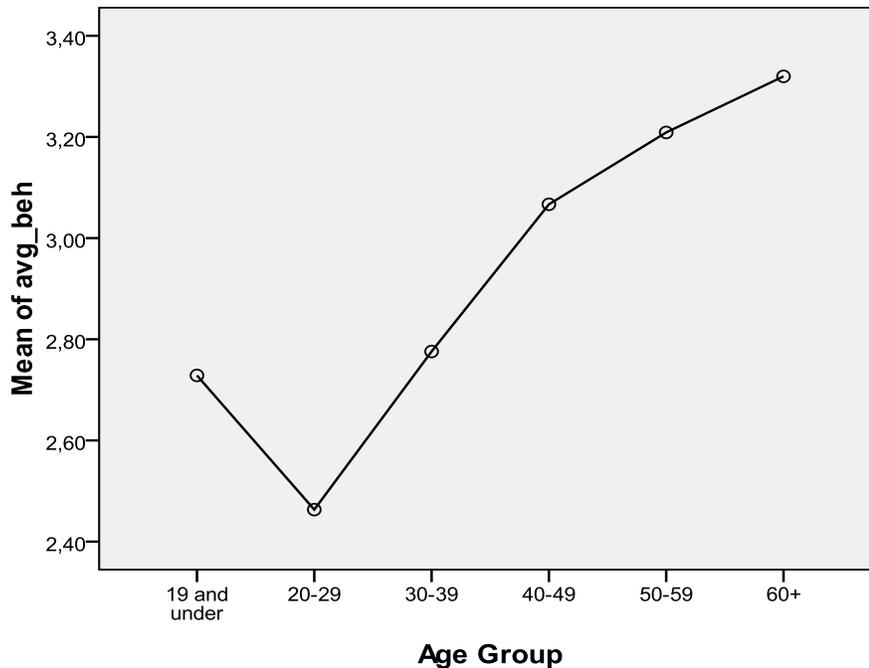
FIGURE 7: MEANS POLT FOR ENVIRONMENTAL BEHAVIOR BY AGE GROUP

The age group of 20-29 has the lowest score for environmental behavior. One explanation for this may be that in this sample, this age group consists to a large part (almost 75%) of people from the Emirates, North Africa and Middle countries, which are the three regions that have the lowest scores for behavior (as discussed in the next section), possibly pulling down the average score. However, there is no similar pattern for the other age groups.

Another possibility that arises is that the younger groups benefited most from the rapid economic growth in Abu Dhabi and had great economic wealth without having developed a sense for environmental problems. A cross tabulation for checking whether a large proportion of the younger groups belong to the high income classes has been conduced and could not confirm this.

By analyzing the variables that have been identified as significant predictors of behavior in this study, two more reasons may be identified. Firstly, an ANOVA analysis ($F[5, 973] = 13.792$, $p = 0.000$) indicated that a moderate difference (eta squared = 0.07) of perceived behavioral control (F3) exists between age groups and a clear trend shows an increasing perceived behavioral control score with age (figure 9). Younger people might think more than older people that it is 'not worth it' to act more environmentally sustainable because they think that they will not be able to change much about environmental problems.
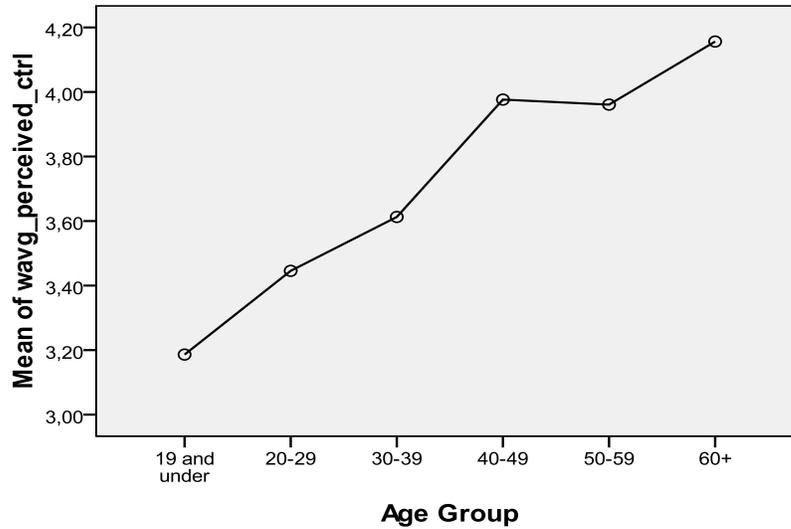
Furthermore, a statistically significant difference of willingness to sacrifice (F5) exists between age groups (ANOVA results: $F_{[5, 1227]} = 23.594$, $p = 0.000$). Willingness to sacrifice also tends to increase with age (except for people who are 60+, who score lower than the trend would suggest, figure 10). The effect size between age group and willingness to sacrifice is moderate to large (eta squred = 0.09), and therefore very relevant. This is an indication that young people are less willing to change their behavior than older people. Young people might consider it a restriction of their freedoms if they have to change their habits and reduce consumption.
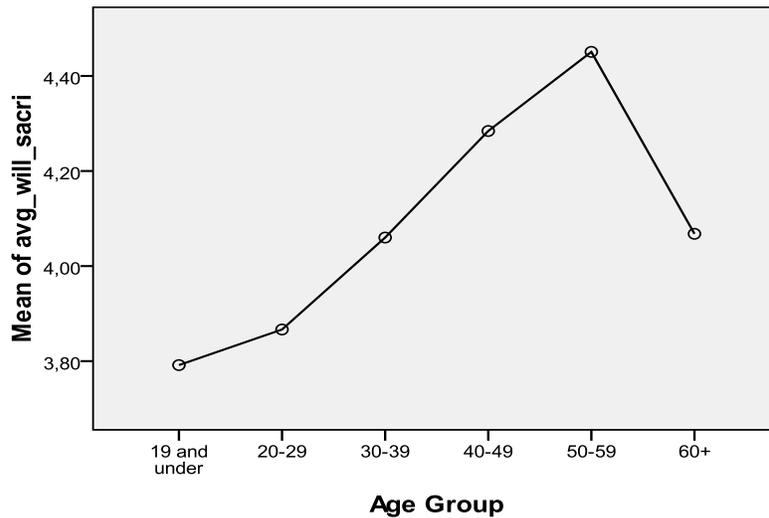
6.4.3. Differences in Environmental Behavior between Regions of Origin

Table 14 shows the average score of all measured behaviors by region ordered in descending order. A between groups ANOVA test has been carried out and statistically significant differences can be found between regions (F[7, 1160] = 17.99; p = 0.000). Eta squared equals 0.11, which indicates a moderate to large difference between regions.

North America has the highest score, followed by Southeast Asia and Europe. What seems contradictory is that Europe scores lower than Southeast Asia as people in many European countries tend to behave relatively environmentally friendly. A possible reason for this may be that while in some European countries people tend to act very environmentally friendly (such as Holland and Sweden), in other European countries they may not. Therefore, the average for Europe might be lower than expected.

The UAE, Middle Eastern Countries and North African countries have the lowest scores. In general, it seems that developing regions score lower than developed regions.

TABLE 14: DESCRIPTIVE STATISTICS FOR ENVIRONMENTAL BEHAVIOR BY REGION

		N	Mean	Std. Deviation	Minimum	Maximum
Average	North America	47	3,32	,83752	1,00	5,00
Behavior	Southeast Asia	47	3,24	,97187	1,10	5,00
	Europe	95	3,18	,96906	,50	4,90
	India	390	3,08	,89290	,67	5,00
	Emirates	289	2,49	1,00251	,10	5,00
	Middle Eastern Countries	190	2,48	1,02781	,00	5,00
	North Africa	37	2,47	1,13771	,60	4,90
	Other	73	2,63	1,09154	,20	5,00
	Total	1168	2,81	1,02016	,00	5,00

There are a number of possible reasons for the differences between nations. The first reason is the variation in development, availability and quality of infrastructure and technologies that support environmentally friendly behavior. On the one hand, this may be due to lack of resources and skills that are needed for developing such infrastructure. On the other hand, it may be because the lower scoring regions (especially the wealthy developing nations) may have different developmental priorities (such as building financial wealth).

From a consumer behavior perspective, the psychological variables measured in this study may give some explanations. Firstly, a statistically significant difference of perceived behavioral control (F3) exists between regions (ANOVA results: F[7, 922] = 2.485, p = 0.016), with North America (M = 3.96) and Europe (3.84) having the highest scores and India (M = 3.52) and Middle Eastern Countries (M = 3.29) having the lowest scores (table 15). Respondents from developed regions (North America and Europe)

tend to have a higher score for perceived behavioral control than respondents from developing regions. The effect size is small (eta squared = 0.02)

TABLE 15: PERCEIVED BEHAVIORAL CONTROL BY REGION

	N	Mean	Minimum	Maximum
North America	40	3,9750	2,00	5,00
Europe	77	3,8442	1,00	5,00
North Africa	31	3,5806	1,00	5,00
Southeast Asia	36	3,5417	1,50	5,00
Emirates	213	3,5188	1,00	5,00
India	333	3,5165	1,00	5,00
Middle Eastern Countries	145	3,2931	1,00	5,00
Other	55	3,5273	1,00	5,00
Total	930	3,5328	1,00	5,00

Furthermore, an ANOVA analysis indicated a statistically significant small to moderate difference in willingness to sacrifice (F5) scores between regions (F[7, 1160] = 4.200, p = 0.000, eta squared = 0.03). North America (M = 4.28) and North Africa (M = 4.23) have the highest scores and UAE (3.93) and the UAE (M = 3.93) and the Middle Eastern Countries (M = 3.86) have the lowest scores (table 16).

TABLE 16: WILLINGNESS TO SACRIFICE BY REGION

	N	Mean	Minimum	Maximum
North America	47	4,2837	2,67	5,00
North Africa	37	4,2342	2,33	5,00
India	390	4,1444	1,00	5,00
Europe	96	4,0486	1,67	5,00
Southeast Asia	47	3,9965	3,00	5,00
Emirates	290	3,9264	1,67	5,00
Middle Eastern Countries	189	3,8598	1,00	5,00
Other	72	4,0069	1,00	5,00
Total	1168	4,0304	1,00	5,00

6.5. Differences in Environmental Behavior by the Duration the Respondents have been living in the UAE

For evaluating differences of behavior by the length of time the respondents have been living in the UAE, a one-way between groups analysis of variance has been conducted. No statistically significant

difference could be found (F[2, 933] = 0.279; p = 0.756), suggesting that the length of time of having lived in the emirates does not play an important role.

6.6.   Differences in Environmental Behavior between Education Levels

A statistically significant difference could be found in environmental behavior by education levels (F[5, 1202] = 3.888; p = 0.002), but the eta-squared value (0.02) indicates that the level of education has a rather small effect on environmental behavior. One might expect that environmental behavior increases with education. But it is likely that this depends on the type of education. If the education is specifically about environmental problems it would likely improve environmental behavior, but education in different areas (e.g. business management or law) may not. Figure 10 shows that the score for behavior tends to increase with increasing levels of education.
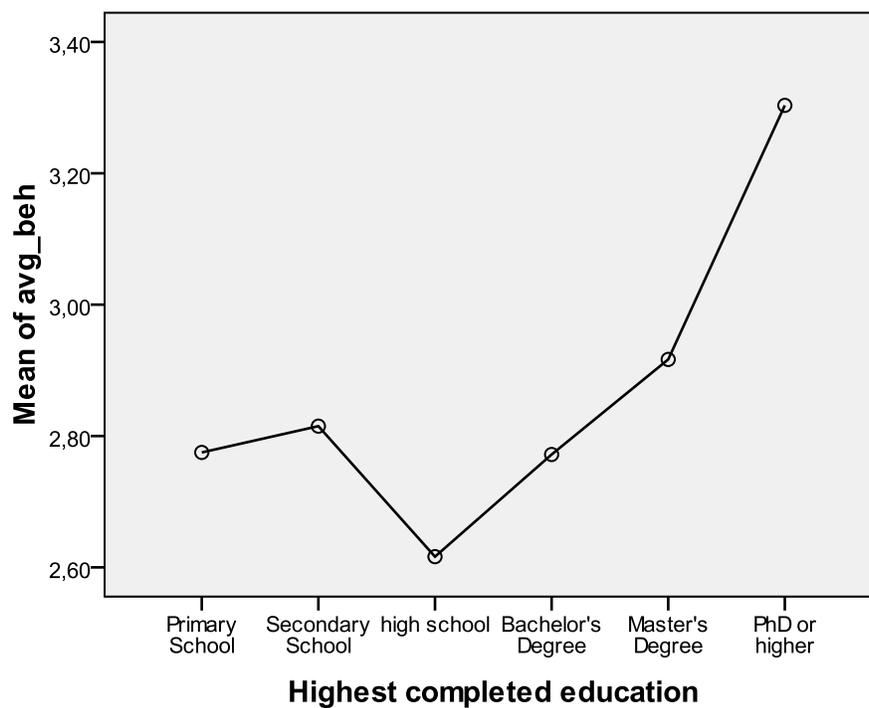
FIGURE 10: MEANS PLOT FOR ENVIRONMENTAL BEHAVIOR BY HIGHEST COMPLETED EDUCATION

From figure 11 one can see that people with a secondary school education score higher than the trend would suggest. Most of the people which indicated they have a secondary school education are high school students. So again, a possible explanation for their relatively higher score for behavior might be due to the environmental programs that have been launched in schools. Therefore, in the future this picture may look different. As these programs will continue and expand, people will learn early to act environmentally friendly, which they will probably carry into adulthood.

Reasons for the positive relationship between education and behavior score might be found in the three variables that have been shown to have a significant prediction power of behavior. Ascription of responsibility (F6), perceived behavioral control (F3) and willingness to sacrifice (F5) all have been shown to vary significantly between education groups by ANOVA analyses (ascription of responsibility: F = 18.11; p = 0.000; perceived behavioral control: F = 9.71; p = 0.000; willingness to sacrifice: F = 5.70; p = 0.000).

A moderate difference of scores for ascription of responsibility exists between education levels (eta squared = 0.07). As shown in figure 11, ascription of responsibility increases with level of education. One explanation for that might be that people with higher education are likely to have greater impacts on the society and therefore feel more responsible. Furthermore, they might have a better understanding of the magnitude of environmental issues and therefore ascribe more responsibility to themselves.
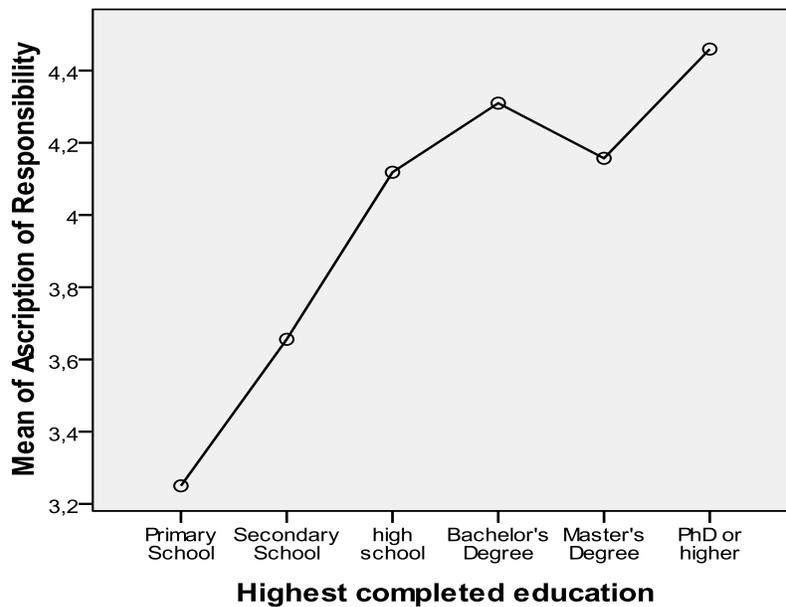
FIGURE 11: MEANS PLOT FOR ASCRIPTION OF RESPONSIBILITY BY HIGHEST COMPLETED EDUCATION

A further reason that people with higher education act more environmentally friendly might be that people with higher education levels have higher scores for perceived behavioral control (figure 12). A moderate difference of perceived behavioral control exists between education levels (eta squared = 0.05). This may be because people with higher education have jobs with more responsibility, and may have an improved view of the problems of society and how to solve them. They may have a better understanding of the relations between human actions and environmental problems, as well as the relations within our societies which lead to or alleviate environmental issues.
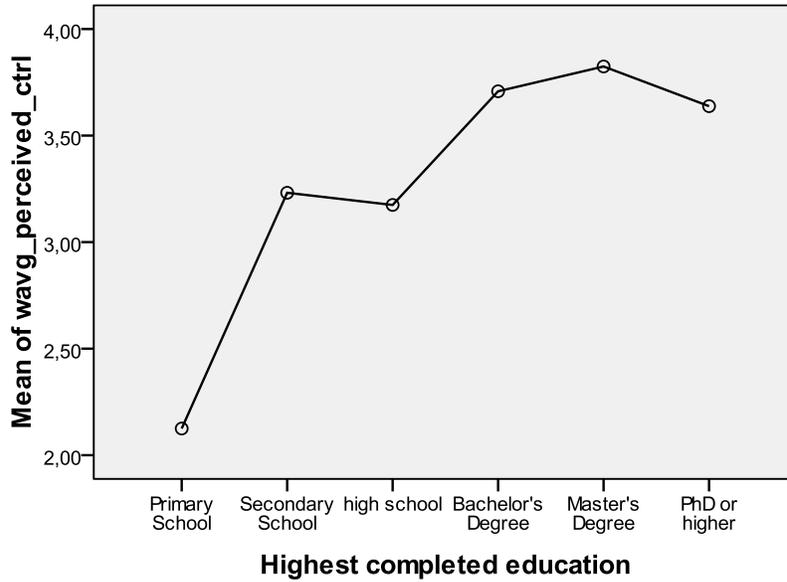
FIGURE 12: MEANS PLOT FOR PERCEIVED BEHAVIORAL CONTROL BY HIGHEST COMPLETED EDUCATION

Finally, willingness to sacrifice also tends to increase with the level of education (figure 13). The effect size is small (eta squared = 0.02). Possible explanations for this are that people with higher education have higher income and therefore more resources, and that they might feel more responsible for acting more environmentally friendly.
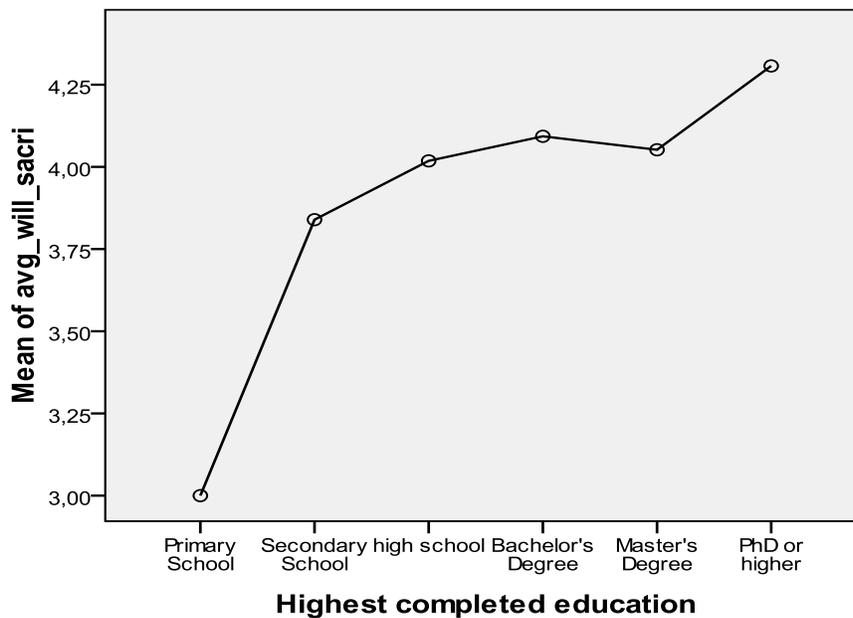
FIGURE 13: MEANS PLOT FOR WILLINGNESS TO SACRIFICE BY HIGHEST COMPLETED EDUCATION

6.7. Differences in Environmental Behavior between Income Groups

Finally, a one-way between-groups ANOVA test for evaluating a difference of the behavior score by income groups has been conducted and indicates a statistically significant difference ($F_{[5, 1042]} = 4.022$; $p = 0.001$). The differences are rather small as indicated by the eta squared value (0.02). Figure 14 shows that the behavior score increases with increasing income and then, for the highest income group, it decreases. The middle income groups score highest.
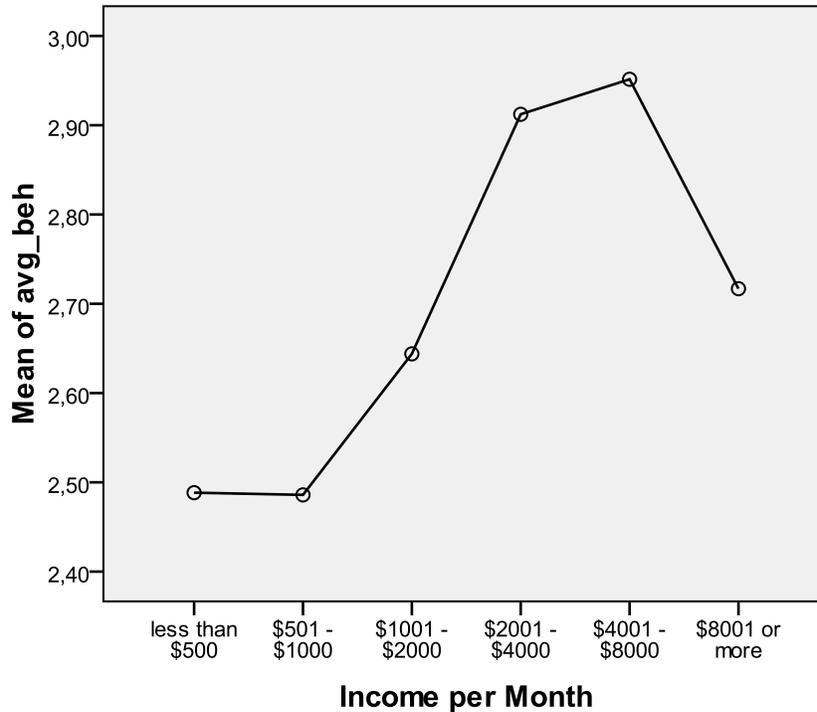
FIGURE 14: MEANS PLOT FOR ENVIRONMENTAL BEHAVIOR BY INCOME PER MONTH

Why do the lower and the highest income groups score lower that middle income groups? For the lower income groups the reason may be that people have different priorities than protecting the environment. The living costs in Abu Dhabi are very high, therefore people with low incomes are likely to struggle making a living. For example one respondent from the low income group wrote that the "cost of living and lack of good standard of living keep me away from even thinking about it". Therefore, environmental issues may not be the most immediate problem for them. For the highest income group the first reason may be that people are very much focused on material wealth without worrying very much on environmental problems. Secondly, this group is likely to use the most resources, and as a result having a wasteful lifestyle. Two of the respondents said that their first reason for not acting more environmentally friendly is that they are 'prone to luxury'. This may be a very important point as luxury, in the traditional meaning, and environmental protection may be conflicting goals.

Two more explanations may be given by the scores for ascription of responsibility (F6) and willingness to sacrifice (F5), which, according to ANOVA analyses, vary significantly with income level (ascription of responsibility: F = 5.29; p = 0.000, eta squared = 0.03; willingness to sacrifice: F = 4.41; p = 0.000, eta squared 0.02).

As shown in figure 15, the lowest and highest income groups score lowest while the middle income groups score highest for ascription of responsibility (F6). The low score for the lowest income group may be explained by the fact that they might use very little resources per capita, and, in fact, are not very responsible for environmental problems. The low scores for the highest income group on the other hand is contradictory. Ascription of responsibility measures how responsible individual personally feel for environmental problems. As this group potentially consumes the most resources per capita, they are most responsible for environmental problems. A possible explanation is that this group is 'disconnected' from the natural environment. Due to the high level of wealth, this group may be used to a very luxurious lifestyle without worrying too much about environmental issues.
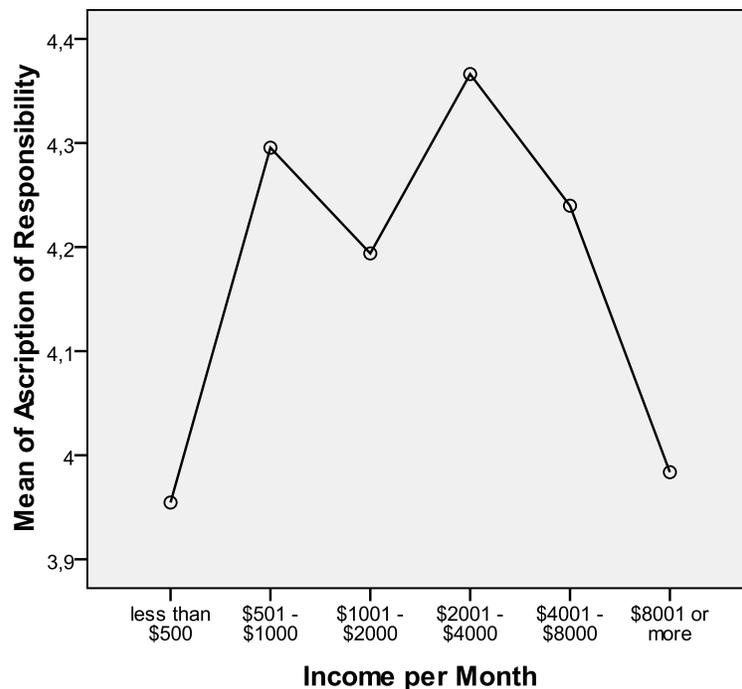
FIGURE 15: MEANS PLOT FOR ASCRIPTION OF RESPONSIBILITY BY INCOME PER MONTH

Furthermore, a similar trend can be seen for the score of willingness to sacrifice (F5). From figure 16 it becomes clear that the middle income groups score higher than the lower and highest income groups. The low scores for the lower income classes can probably be explained by the fact that these people have very low budgets and cannot afford to pay more for environmental protection and have other concerns. A reason for the low score for the highest income group might be that these people might not

be used to saving resources at all. The middle income groups seem to score highest. This is possibly because they are used to saving resources but do have enough money and time to pay higher prices and put more effort into environmental protection.
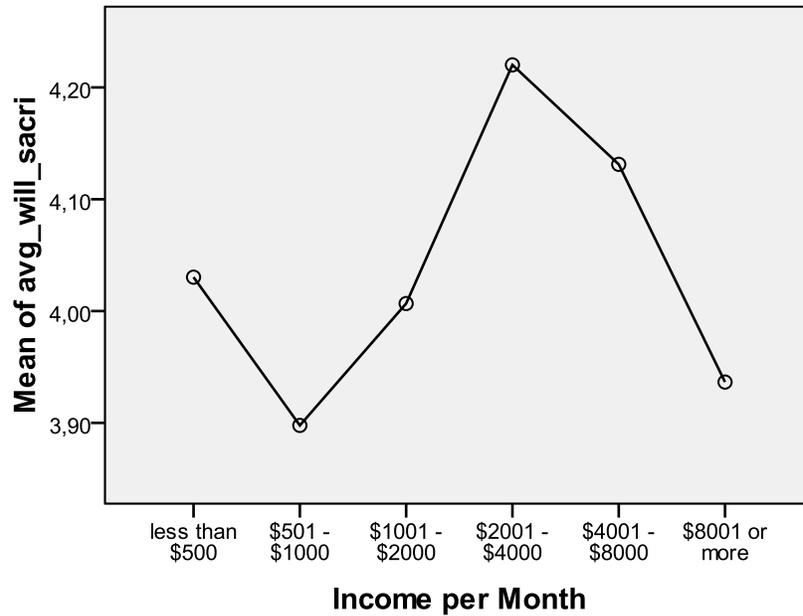
FIGURE 16: MEANS PLOT OF WILLINGNESS TO SACRIFICE BY INCOME PER MONTH

The following section will analyze the responses to the question of what the largest obstacle is to act more environmentally friendly. This will give additional insights into explaining why people act (or do not act) environmentally friendly.

6.8.   Other Obstacles for Pro-Environmental Behavior

When asked what the main obstacle for improving environmental behavior is, 71.4% of the people stated that it is a lack of facilities (figure 17). This is can be explained by the observations that there are very little facilities supporting environmentally friendly behavior in Abu Dhabi. For example, there are very few recycling stations, and people who want to recycle have to go through a rather large effort to do so. Furthermore, the public transport system is not very developed (there are a number of bus lines but apart from that there is no public transport), and the current public transport system does not fulfill the needs of the local conditions (such as protection from the extreme temperatures in the region and allowing privacy for the commuters). Other facilities that are lacking are water efficiency technologies, energy saving light bulbs, and energy saving electronic devices. What adds to the problem is that the environmental conditions in Abu Dhabi make it a requirement to use certain facilities more than in other countries (such as air conditioning). Numerous people indicated that this was a main reason that they do not act more environmentally friendly. For example, one person wrote 'I am living in a hot country where I need the AC [air conditioner] and shower very frequently'.

The second most common choice (9.4%) was that people are busy and do not have time for acting more environmentally friendly. Again, this probably can partly be explained by the lack of infrastructure that supports more environmentally friendly behaviors. Another explanation might be that people might not be committed enough to protect the environment, and therefore do not want to spend extra time on it.

The third most common option that was chosen (9.2%) was that there is no incentive to act more environmentally friendly. For this there are a number of reasons. Firstly, in Abu Dhabi, water and electricity are available for very low prices and there are no rules or regulations for consumers that aim at promoting pro-environmental behavior. As people do not feel the immediate impacts of environmental pollution yet, there is no immediate reason to act upon it. The extremely low fuel price might add to the problem.

Finally, 7.9% of respondents said that the biggest obstacle to changing behavior is a difficulty to change their habits. While this was the option that was chosen the least often, I would expect that, once facilities for supporting environmentally friendly behavior would be present, the factor of habit would be more important. People will have to relearn their consumption behavior and get used to new routines. Habits are likely to play an important role in this process.

In addition, respondents stated that they have a lack of knowledge on how to recycle, that no example is set by leaders, that they have a lack of control on environmental problems, that they are not conscious of their behavior at all times, and that they do not have a sense of commitment for the environment.
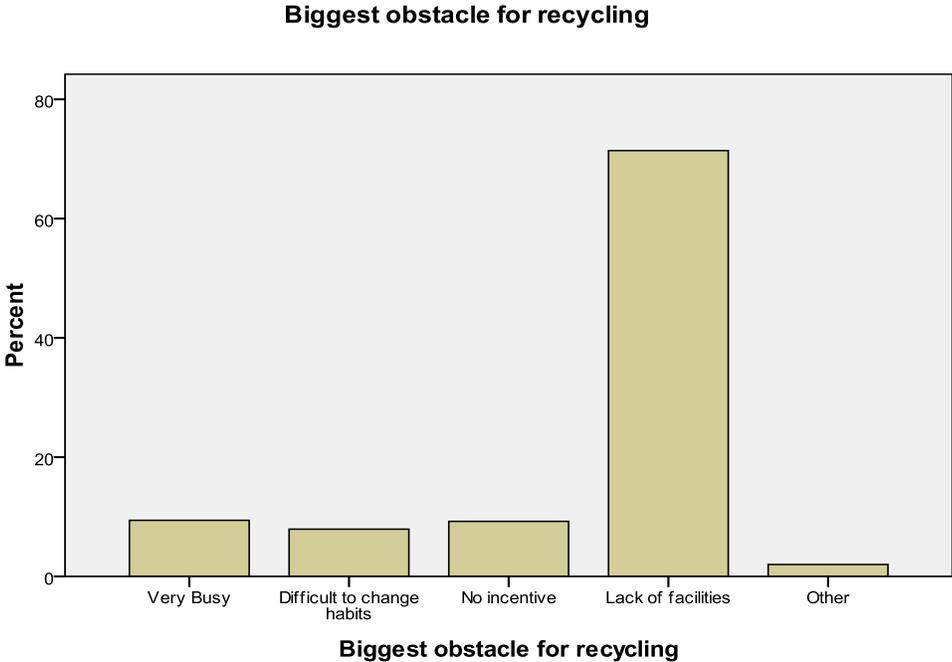
FIGURE 17: PERCENTAGES FOR CHIOCES OF OBSTACLES FOR ACTING MORE ENVIRONMENTALLY FRIENDLY

Finally, based on the findings in section 6.4 the next section will develop categories (or market segments) with similar environmental behavior.

6.9. Behavioral Categories

The third aim of this study was to develop categories with similar behaviors in the sample. Based on the findings in section 6.4, region of origin, age group, Income level, highest level of education and gender are significant categorical variables for environmental behavior. Given the sample size of 1292, in order to develop meaningful categories, the variables need to be summarized into fewer similar groups. In order to do that, the top performing half of each variable and the lower performing half of each variable are added together. The resulting categories and the mean scores of environmental behavior are shown in table 17.

TABLE 17: CATEGORICAL VARIABLES FOR ENVIRONMENTAL BEHAVIOR

Category	Mean
N. America, Southeast Asia, Europe, India	3,13
Emirates, Arab Region, North Africa	2,49
40 or older	3,15
39 or younger	2,64
$2001 - $8000	2,94
less than $500 - $2000 and $8001 or more	2,67
Masters – PhD	3
Primary School - Bachelors Degree	2,76
Male	2,85
Female	2,75

In order to create categories with more dimensions, the three variables with the highest effect size (region with an eta squared of 0.11, age group with an eta squared of 0.02, and income group with an eta square of 0.02) have been selected, in order to create a 'matrix' of categories. The results are shown in table 18.

Region	Mean	Age Group	Mean	Income Group	Mean	N
North America, Southeast Asia, Europe, India	3.13	40 years or older		$ 2001 - $8000	3,4797	106
				$0 - $2000, $8001+	3,3400	76
		39 years or younger		$ 2001 - $8000	2,984	144
				$0 - $2000, $8001+	2,9679	143
UAE, Middle Eastern Countries, North Africa	2.49	40 years of older		$ 2001 - $8000	2,9312	55
				$0 - $2000, $8001+	2,7581	57
		39 years or younger		$ 2001 - $8001	2,5612	140
				$0 - $2000, $8001+	2,2687	203

From table 18 a number of conclusions can be drawn. Firstly, within both regional categories, older age groups score higher on environmental behavior than younger age groups. Secondly, independent of region and age groups, people in middle income groups, on average, always score higher in environmental behavior than people from very low and very high income groups. As far as it is possible to generalize from this sample, it seems that age and income play an important role in environmentalism independent of the region of origin. Nevertheless, more in depth research is necessary to confirm this conclusion and to identify reasons for why this might be the case.

7. Conclusions

The first aim of the study was to evaluate the current level of pro-environmental behavior. The findings show that the level of environmental behavior in the sample seems to be relatively low. The most common behaviors are looking for ways to reuse things, recycling of newspapers and the purchase of products in reusable or recyclable containers. The least often performed behaviors are composting of food scraps, volunteering time to help an environmental group or project and writing letters supporting environmental issues.

The next step of the study was to evaluate which factors predict environmental behavior in order to evaluate differences in behavior and to identify reasons for these differences by demographic groups. Contrary to the theory presented in section 4, the only psychological variables found to be significant predictors of environmental behavior in Abu Dhabi were 'ascription of responsibility', 'perceived behavioral control', and 'willingness to sacrifice'. Furthermore, viewing the environment as spiritual but not created by god is positively related to environmental behavior. A reason for the disagreements

between the findings of this study and the theory may be that in Abu Dhabi there is a great lack of infrastructure supporting environmental behavior (such as public transport and recycling facilities). Therefore the physical barriers to act more environmentally friendly in many cases might be so large that the psychological factors play a subordinate role.

Furthermore, the score of pro-environmental behavior has been analyzed by demographic variables. It was found that environmental behavior significantly increases with age and education, that there are moderate to large differences in behavior score between people from different regions in the world (where developing regions generally scored lower than developed regions), and that the middle income groups tend to score higher than the low and high income groups. The significant predictors of behavior have been used to explain these differences and there seemed to be a relatively good fit between the scores of behavior and the scores of willingness to sacrifice, perceived behavioral control and ascription of responsibility. Other obstacles for acting more environmentally friendly behavior were indicated as a lack of facilities, lack of incentive, difficulty to change habits, lack of time, and 'proneness to luxury'.

Finally, categories with similar behavioral scores were developed and it was shown that in general, younger groups scored lower than older groups and low income groups and very high income groups scored lower than middle income groups regardless of the region of origin.

From a policy perspective, a number of recommendations can be made from these findings. Firstly, there is a great need to improve the infrastructure that supports environmental behavior in Abu Dhabi. This includes providing and promoting the use of suitable and sustainable public transport, recycling facilities, energy saving electronic devices and water saving technologies. The findings indicate that this might be one of the most important factors for improving environmental issues

Secondly, there needs to be a deeper change in the attitudes and values of the society. As shown, higher scores for willingness to sacrifice, perceived behavioral control and ascription of responsibility can lead to higher scores for environmental behavior. Information campaigns, education programs, media campaigns and leadership that aims at changing the attitude of the population of Abu Dhabi, away from greatly focusing on material wealth towards a more 'green' culture may be very beneficial.

Finally, programs aimed at promoting environmental behavior should be targeted towards specific demographic groups. There are a number of reasons for that. Firstly, different cultural groups might respond differently to these programs. This would require that the content of the programs is tailored in such a way that it reaches the desired group. Secondly, various groups perform differently with regards to environmental behavior. Possibly more weight should be put on the lower performing groups such as younger people, very low and very high income classes, and people from developing nations. The categories that have been developed in section 6.9 could serve as a starting point for developing target groups for environmental programs.

8. Appendixes

8.1. Appendix 1: Frequency Distribution for Country of Origin

Nationality

	Frequency	Percent	Valid Percent	Cumulative Percent
Afghani	1	,1	,1	,1
Algerian	6	,4	,5	,6
American	20	1,4	1,7	2,3
Australian	7	,5	,6	2,9
Bahrani	3	,2	,3	3,1
Bangladeshi	2	,1	,2	3,3
Belgian	1	,1	,1	3,4
Brazilian	1	,1	,1	3,5
British	56	3,8	4,7	8,2
Bulgarian	1	,1	,1	8,3
Cameroni	1	,1	,1	8,4
Canadian	27	1,8	2,3	10,7
Columbian	2	,1	,2	10,9
Costa Rican	1	,1	,1	10,9
Ecuadorian	1	,1	,1	11,0
Egyptian	44	3,0	3,7	14,8
Emirati	293	20,1	24,9	39,6
Eritrean	1	,1	,1	39,7
Filipino	46	3,1	3,9	43,6
French	14	1,0	1,2	44,8
German	3	,2	,3	45,0
Ghanaian	1	,1	,1	45,1

	Frequency	Percent	Valid Percent	Cumulative Percent
Greek	1	,1	,1	45,2
Indian	392	26,8	33,2	78,5
Indonesian	1	,1	,1	78,5
Iranian	3	,2	,3	78,8
Iraqi	1	,1	,1	78,9
Irish	1	,1	,1	79,0
Italian	4	,3	,3	79,3
Ivorian	1	,1	,1	79,4
Japanese	1	,1	,1	79,5
Jordanian	43	2,9	3,6	83,1
Kazakh	1	,1	,1	83,2
Kenyan	1	,1	,1	83,3
Lebanese	20	1,4	1,7	85,0
Libyan	3	,2	,3	85,2
Marrocan	5	,3	,4	85,7
Mexican	1	,1	,1	85,8
New Zealandish	3	,2	,3	86,0
Norwegian	2	,1	,2	86,2
Omani	3	,2	,3	86,4
Pakistani	28	1,9	2,4	88,8
Palestinian	37	2,5	3,1	91,9
Portuguese	2	,1	,2	92,1
Romanian	4	,3	,3	92,5
Saudi	2	,1	,2	92,6
Serbian	1	,1	,1	92,7
Somali	8	,5	,7	93,4
South African	3	,2	,3	93,6

	Frequency	Percent	Valid Percent	Cumulative Percent
Spanish	1	,1	,1	93,7
Sri Lankan	1	,1	,1	93,8
Sudanese	10	,7	,8	94,7
Swiss	2	,1	,2	94,8
Syrian	20	1,4	1,7	96,5
Taiwanese	3	,2	,3	96,8
Dutch	1	,1	,1	96,9
Tunesian	6	,4	,5	97,4
Uzbekistani	1	,1	,1	97,5
Yemeni	11	,8	,9	98,4
Zimbabwean	1	,1	,1	98,5
Qatari	1	,1	,1	98,6
Other	17	1,2	1,4	100,0
Total	1179	80,7	100,0	
Missing 0	282	19,3		
Total	1461	100,0		

8.2. Appendix 2 : Complete Regression Output

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,766	,127		21,776	,000
	dum_20_29	,015	,106	,006	,144	,885
	dum_30_39	,219	,116	,078	1,886	,059
	dum_40_49	,490	,119	,168	4,118	,000
	dum_50_59	,606	,120	,205	5,065	,000
	dum_60	,696	,201	,098	3,461	,001
	dum_female	,103	,059	,048	1,734	,083
	dum_pschool	,383	,456	,021	,839	,401
	dum_secschool	,048	,116	,018	,413	,680
	dum_hschool	-,040	,082	-,014	-,493	,622
	dum_bachelors	-,002	,007	-,008	-,330	,742
	dum_masters	-,053	,083	-,018	-,635	,526
	dum_phd	,174	,156	,029	1,113	,266
	dum_500	-,286	,197	-,037	-1,455	,146
	dum_501_1000	-,308	,149	-,055	-2,071	,039
	dum_1001_2000	-,091	,106	-,024	-,862	,389
	dum_2001_4000	,092	,082	,033	1,120	,263
	dum_4001_8000	,186	,073	,074	2,559	,011
	dum_europe	-,036	,115	-,009	-,312	,755
	dum_arab	-,643	,085	-,223	-7,575	,000
	dum_emirates	-,461	,090	-,187	-5,119	,000
	dum_namerica	,019	,149	,003	,125	,900
	dum_nafrica	-,704	,159	-,115	-4,440	,000
	dum_seastasia	,236	,147	,043	1,610	,108
	dum_other	-,543	,121	-,124	-4,499	,000

	Model	Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
2	(Constant)	1,118	,283		3,946	,000
	dum_20_29	-,063	,103	-,026	-,612	,541
	dum_30_39	,091	,113	,032	,804	,422
	dum_40_49	,276	,117	,095	2,359	,018
	dum_50_59	,376	,119	,127	3,171	,002
	dum_60	,529	,195	,074	2,714	,007
	dum_female	,041	,058	,019	,706	,480
	dum_pschool	,734	,440	,040	1,668	,096
	dum_secschool	,119	,112	,046	1,059	,290
	dum_hschool	,014	,080	,005	,172	,863
	dum_bachelors	-,003	,007	-,009	-,368	,713
	dum_masters	-,019	,081	-,006	-,233	,816
	dum_phd	,172	,151	,029	1,141	,254
	dum_500	-,274	,191	-,036	-1,435	,152
	dum_501_1000	-,299	,144	-,053	-2,074	,038
	dum_1001_2000	-,096	,102	-,025	-,941	,347
	dum_2001_4000	,017	,080	,006	,212	,832
	dum_4001_8000	,115	,071	,046	1,622	,105
	dum_europe	,015	,115	,004	,128	,898
	dum_arab	-,482	,084	-,167	-5,706	,000
	dum_emirates	-,373	,090	-,151	-4,142	,000
	dum_namerica	,004	,145	,001	,027	,978
	dum_nafrica	-,643	,154	-,105	-4,181	,000
	dum_seastasia	,358	,143	,066	2,495	,013
	dum_other	-,449	,117	-,102	-3,852	,000
	avg_alt	,033	,046	,021	,730	,466
	avg_nep	,022	,052	,012	,422	,673
	wavg_perceived_ctrl	,090	,025	,094	3,653	,000

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
avg_pers_norms	,060	,056	,031	1,070	,285
avg_will_sacri	,192	,037	,151	5,152	,000
Ascription of Responsibility	,101	,031	,095	3,296	,001
avg_aware_of_con	-,061	,049	-,038	-1,242	,214
Postmodernism	-,001	,035	,000	-,037	,971
Nature is spiritual or holy in itself	,174	,077	,059	2,262	,024
Nature is improtant but not in a spiritual or holy way	-,036	,063	-,015	-,566	,571
Nature is there for humans to gain max benefit	-,144	,073	-,051	-1,954	,051

a. Dependent Variable: avg_beh. R squared = 0.199

9.   References

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