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Promoting Climate Change Mitigation & Supporting NGOs: Converging the Theory of Planned Behavior & the Elaboration Likelihood Model

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PROMOTING CLIMATE CHANGE MITIGATION & SUPPORTING NGOs: CONVERGING THE THEORY OF PLANNED BEHAVIOR & THE ELABORATION LIKELIHOOD MODEL

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Abstract

In the 21st century, public opinion's attention in developed nations has increasingly been directed to climate change and the urgency for humanity to take action. The main discourse is that climate change would have devastating consequences on a global scale, threatening humanity's existence. However, in most developing countries climate change is generally not regarded as an important topic and climate change messages suffer from poor public engagement. Most recent research has investigated climate change communication efficiency in developed countries. The novelty of this study lies in understanding the effectiveness of climate change messages in the Egyptian context. More specifically this thesis focuses on how appeal types in climate change messages can increase Egyptians' engagement with climate change messages and promote positive intention towards supporting non-governmental initiatives to mitigate climate change. This study has two objectives. Firstly, it aims at understanding the effectiveness of communication appeals, such as rational, hope, and fear appeals on audiences' engagement with climate change advertising messages. Secondly, the study examines the effectiveness of attitudes, subjective norms, and perceived behavioral control on participants' behavioral intention toward climate change mitigation initiatives by non-governmental organizations. To achieve these objectives, a two-pronged data collection method was applied. An online experiment was carried out using the Facebook AB testing tool to examine the effectiveness of climate change messages' appeals type on audience engagement. Findings from this experiment show that fear appeal leads to a higher engagement than ads using rational or hope appeals. In parallel, an online survey was also conducted to examine how Egyptians' attitude toward climate change, peer pressure, and perceived behavioral control impact Egypt's citizens intention to support NGOs' climate change initiatives. Using convenient sampling, 516 responses were collected. Results from the online

survey show that attitude and perceived behavioral control are statistically significant and positively correlated to respondents' intention to support climate change initiatives. It was also found that subjective norms significantly contribute but to a lesser degree to climate change advocacy. The findings of this study provide practitioners and academics with a novel insight into climate change message effectiveness in the Egyptian context. Importantly this study suggests effective methods to raise awareness about the urgency of climate change in developing countries; a region that is predicted to become severely impacted by climate change.

Keywords: climate change, communication appeals, Facebook advertising, pro-environmental behavior, behavioral intention, attitude, subjective norms, perceived behavioral control, non-governmental organizations.

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"It always seems impossible until it is done."

– Nelson Mandela

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Chapter One

Introduction

"We are the first generation to feel the effect of climate change and the last generation who can do something about it" (Barack Obama, Former U.S. President. The White House, 2015)

From the 31st of October to the 13th of November 2021, the UN Climate Change Conference of the Parties (COP26) was held in Scotland to discuss current climate change problems (*What is a cop*, 2021). For around 30 years, the UN has been in charge of arranging the Climate Summit "Conference of the Parties" in an attempt to get climate change under control. This year, the UK is the host country for the 26th COP in collaboration with great majority of the world's nations to build an effective strategy for climate change mitigation. Discussions centered around carbon emissions targets for 2030, promoting renewable energy resources, and switching to electricity-powered means of transportation as soon as possible (*What is a cop*, 2021). The conference is a call to the world – governments, organizations, companies, and societies – to collaborate in tackling the critical issue of climate change. Egypt was one of the participating countries in the 26th COP. Abdel Fatah Al Sisi, Egypt's President, stated that the African region will suffer from serious risks due to climate change. He also discussed future projects such as using clean transportation and energy resources that aim to reduce the effects of climate change (State Information Service, 2021)

This attention given to climate change is due to its broad and devastating consequences across many areas of society. Climate change has harmed agricultural output, driven varied economic issues, and led to the increased incidence of forest fires, which have destroyed homes, farmland, livestock, and even human lives. In 2020, Australia witnessed severe wildfires that killed millions of native animals and destroyed thousands of homes (Oxfam, 2021). From 2019 to 2021, climate change-induced floods in Nepal, India, and Bangladesh claimed numerous lives (Oxfam, 2021). In 2019, Africa suffered from extreme drought wiping out crops due to the unusual increase in the sea temperatures (Oxfam, 2021). In light of these, and many other similar events, the scientific communities at large agrees that climate change is an urgent matter today, deserving action from governments, non-governmental organizations, businesses, and individuals.

Though numerous studies have focused on climate change as it impacts Western countries such as the United States, (di Giusto et al., 2018) the African continent is one of the areas most vulnerable to the effects of climate change due to its already hotter climate and its economies' major dependency on the agricultural industry. Selwin Hart, Special Adviser to the UN Secretary-General, announced early in 2021 that Africa's exposure to the impacts of climate change is greater than that of other regions (El Tawil, 2021). In particular, the Intergovernmental Panel on Climate Change (IPCC) considered Egypt's Nile Delta region to be among the areas most threatened by climate change (*National adaptation plan process in focus*, 2018). To this end it is important to understand the climate change communication strategies in Egypt.

To date, the main efforts dedicated to control climate change risks have been carried out by global and local non-governmental organizations (Doyle, 2009). Non-governmental organizations (NGOs) form the front-line when it comes to raising awareness about the costs of climate change. They have been promoting strategies for adapting to its consequences since the

20th century (Doyle, 2009). They serve as the dominant linkage between scientists and civil society. NGOs attempt to inform and educate the public by communicating climate science in streamlined ways (McNaught et al., 2014). NGOs have played an important role in emphasizing the effects of climate change on agriculture in Africa (Ford et al., 2015). They have focused their effort on communicating the effect of anthropogenic climate change. Sociologists posit that human behavior is a significant driver of many environmental problems (Williams & Cary, 2002) and that raising awareness about the danger of climate change can promote eco-friendly behaviors and prevent further deterioration of the environment (Liu, Teng, & Han, 2020). Several studies have focused on the relationship between raising awareness about environmental problems and environmentally conscious behavior (Barr et al., 2011; Hynes & Wilson, 2016). Prior research suggests that persuasive messages about green behavior can alter audience attitude and lead to pro-environmental behavior (Kyu Kim et al., 2020).

Liu, Teng, & Han (2020) define pro-environmental behavior as an act that benefits the environment and unlikely to cause any damage to it. Scholars find a positive correlation between environmental awareness and pro-environmental behavior (Liu, Teng, & Han, 2020). Several scientists have highlighted different factors that contribute to shaping human pro-environmental behavior. According to the theory of planned behavior, individuals' behavioral intention is modeled by three main dimensions: People attitudes toward a given object, subjective norms, and perceived behavioral control (Ajzen & Fishbein, 1985). This theory was used successfully to model various pro-environmental behavior (Yuriev et al., 2020). As previously mentioned, human behavior is a key factor contributing to climate change. It is therefore essential to understand how Egyptians perceive the urgency of climate change, to find how to best communicate with the

Egyptian public and identify the factors most likely to promote pro-environmental behavior in the country.

To date, Egypt has for the most been ignored by scholar studying pro-environment behavior. This study attempts to shed light on potential links between environmental awareness and pro-environmental behavior in the Egyptian context. This thesis investigates how organizations can promote climate change mitigation and effectively communicate the urgency of the issue to the Egyptian public. The theory of planned behavior is used to model pro-environmental behavior with respect to attitude, subjective norms, and perceived behavioral control. There are two main objectives of this study. First, it aims at investigating which communication strategies is most effective at raising awareness about and nurturing a constructive attitude with respect to climate change. Second, it aims at providing an understanding of the factors contributing to Egyptians' willingness to support NGOs' initiatives to mitigate climate change. To achieve these aims, this study will leverage two types of data collection: an experiment using a social media campaign to test environmental ads appeal effectiveness and a survey to assess Egyptians' attitude toward a pro-environmental behavior.

Chapter Two

Literature Review

This chapter discusses various aspects of climate change history, its communication to the public, how individuals perceive the urgency of climate change, and how this shapes their behavior in terms of its mitigation. It also explains why Egypt is a critical area that deserves academic attention. The first section of the literature review provides an overview of climate change, its risks and consequences, and the most prominent catastrophes it has provoked thus far in the 21st century. The second section reflects the efforts of world leaders and public actors in raising awareness about climate change and how non-governmental organizations are often the key players and focal points between governmental leaders and the public. The study highlights that non-governmental organizations are carrying out significant efforts, including communication campaigns, to promote climate change mitigation and environmentally conscious behavior. It then demonstrates the importance of social media and online advertising as effective tools to communicate to a wide range of audiences with different cultural backgrounds and preferences. The study explores the most common appeals in climate change communication: rational and emotional appeals to persuade the public to interact with climate change messages, gain knowledge about the issue, and form a constructive attitude towards supporting initiatives to reduce climate change risks. Persuasive communication is the first step in creating attitudinal change, and attitudinal change is the first step in achieving behavioral change. The following section explores internal factors such as attitudes and perceived behavioral control, and external factors such as social influences in shaping pro-environmental behavioral intention such as supporting initiatives for climate change mitigation by NGOs.

Climate Change Overview

Environmental problems are rightly perceived as a global concern that requires international attention and cannot be adequately addressed through national policy alone (Boulianne et al., 2020). International institutions, governmental and non-governmental organizations are all responsible for finding solutions to environmental problems such as climate change (Fisher & Green, 2004). Earlier studies have found that climate change is one of the environmental problems which has drawn the greatest global efforts due to the growing list of disastrous events it has caused (Ballew et al., 2019; Brulle, Carmichael, & Jenkins, 2012). According to the United Nations, climate change is the shifts in temperature levels that take place over the long term due to the burning of fossil fuels including gas and oil. Daily human activities cause changes in weather patterns and impact climate change. The global level of fear from climate change has gradually increased due to its recent consequences. These consequences have ranged from extreme increases in temperature, ice melting, and the rising of sea levels to fatal floods, droughts, and deforestation (National Climatic Data Center, 2014; Olausson, 2009).

Although climate change is a fatal environmental concern, individuals do not perceive its threat to be directly affecting them. The principle reason why the urgency of climate change is lost on many is that its most devastating consequences are expected to materialize later on (Moser, 2010). Past studies have supported this theory when studying Westerners' perspectives toward climate change. Surveyed individuals believed they were less likely than upcoming generations to be affected by climate change (Ahern, 2011; Poushter, 2016; Spence, Poortinga, & Pidgeon, 2012). Scannell and Gifford (2013) asserted that climate change – from a scientific point of view - is relatively distant issue. Vu. et al. (2021) supported the same argument. They claimed that climate change ramifications on the ecological system are often perceived by the public to be

far away. The cause of this perception is that scientists in the environmental field have failed to communicate its urgency to the public in an understandable way (Howarth & Morse-Jones, 2019). Another reason is the existence of various counter-movements that promote the uncertainty and denial of climate change all around the world (Dunlap & McCright, 2011). The existence of these movements only increases the need to promote awareness about climate change through comprehensible and persuasive messaging, especially given that mainstream western news media has tended to focus more on scientific debates over climate change rather than highlighting its consequences and urgency (Moser, 2010).

Climate Change in the Public Discourse

Communication of climate change in the global mainstream media has been largely limited to scientific findings and data provided by the Intergovernmental Panel on Climate Change (IPCC) (Moser, 2010). Public concern about anthropogenic climate change only began to increase significantly in the 1980s. Anthropogenic climate change refers specifically to climate change that occurs as a result of human activities. At that point, scholars and public speakers started to explore convenient methods to effectively explain anthropogenic climate change (Moser, 2010). The past twenty years have seen great progress on climate science, and numerous new agreements relating to the management of climate change (di Giusto et al., 2018). Today, this scientific progress is no longer the focal point in climate change communication to the public. Media coverage of climate change has shifted from scientific exploration to conferences and public awareness campaigns which have taken place in several developed countries over the past few years (Moser, 2010). The transition in climate change discourse allowed for more of a two-way conversation, accessible by the general public through different messages communicated using a variety of channels and frames. Controversial public discourse on measures to combat climate change and adapt to the

risks it poses have become commonplace (Moser, 2011). This discourse arguably helped generate the political momentum for negotiations in Copenhagen in 2009 on an international agreement to coordinate efforts in the battle against climate change (Moser, 2010). On this front, Western nations carried out intensive campaigns with objectives ranging from education, to spreading awareness, to targeting behavioral change in the United States, United Kingdom, Canada, and Australia. These campaigns were pursued under the supervision of the United Nations Development Program (UNDP) and the European Union (EU) (Moser, 2010). As it became more common, climate change communication started to pique social scientists' interests and studies of climate change communication began to proliferate. Today, climate change communication is viewed by academia as a serious, timely, and important subject of study (Moser & Dilling, 2006; Whitmarsh, O'Neill & Lorenzoni, 2010).

Considering climate change mitigation, there are actions to be taken to reach that goal. Initiatives to reduce gas consumption and greenhouse gas emissions could help retard the pace of climate change. Also, focusing on the communication tactics about adaptation strategies to the public to shape their attitude towards climate change is essential. Most of the prior research interested in climate change communication focused on Western countries with particular attention given to the United States (di Giusto et al., 2018).This study, on the other hand, tackles climate change communication in Egypt. Scholars had the chance to analyze public interest and engagement in climate change discourse in the developed countries but provided very little insight into the practice of climate change communication in developing countries. This gives an opportunity for this study to explore how the public perceives climate change and how institutions can promote pro-environmental behaviors in developing countries such as Egypt.

Climate Change Consequences in the 21st Century

From another perspective, there were several extreme consequences of climate change in the last few years that makes the topic one of the most challenging issues in the world. In 2020 the countries and regions which have faced the most devasting destruction as a result of climate change were Australia, India, Europe, South Asia, and Pakistan. Events ranged from heatwaves and flooding to wildfires, and led to the death or injury of hundreds of people (Oxfam, 2020). For instance, in the beginning of 2020 Australia was hit by one of the most severe wildfires in its history. Over 10 million hectares were burnt out, killing 25 people and countless animals. This natural disaster was devastating, and its impacts are sure to be felt for many years to come. Moreover, climate change events increased tremendously in the past three years. Also, since 2006, the sea-level has risen almost twice as fast was as it did during the 20th century, forcing millions of people to flee their home countries. As mentioned earlier, Africa has been one of the regions most vulnerable to the adverse impacts of climate change in recent years. Between 2011 and 2019, extreme drought forced people in Kenya, Ethiopia, and Somalia to flee their countries. The drought decimated their food and water supplies (Oxfam, 2020).

The acute problems caused by the severe droughts sparked social initiatives and greater media coverage of climate change and its real consequences (Benegal, 2018; Brulle et al., 2012), which in turn increased interest in research on climate change communication, especially vis-à-vis Africa. This concern forces international organizations – governmental and non-governmental – to collaborate in mitigating its risks (Ferguson et al., 2016). It also affirms how decision makers, media outlets, national leaders, and the public ought to collaborate to mitigate climate change and manage its consequential risks (Mousa et al., 2019).

NGOs' Efforts in the Global Sphere

Since the 20th century, non-governmental organizations (NGOs) have been in the leading position when it comes to fighting climate change (Doyle, 2009). NGOs attempt to bring countries together in fighting climate change (Betsill & Corell, 2001; Doyle, 2009). They tend to increase the awareness of the public about climate change with the support of media outlets (Laestadius et al., 2013). NGOs tailor climate change messages to draw the public's attention on a global level towards the matter (Schäfer, 2012). Efforts of NGOs include collaborations with governments, carrying out offline campaigns and activities, publishing educational content, and leading social media campaigns to increase public awareness (Laestadius et al., 2013). Furthermore, multiple NGOs work together to jointly manage their social media messages and approaches (Vu et al., 2020). These collaborations such as NGOs collaborations in the Global North are important in the fight against climate change. In an effort to minimize environmental concerns including climate change, NGOs collectively created strong networks to influence national and international leaders and decision makers (Yanacopulos, 2005). As a result of their collaboration, NGOs increase their resources, allies, funds, and eventually address environmental problems in more cost-effective ways (Yankey & Willen, 2005). Takahashi et al. (2015) emphasize that previous literature highlighted how NGOs tailor their social media strategies for their own agendas to support specific policies and events especially those of the United Nations (Lück et al., 2018; Segerberg & Bennett, 2011). In order to achieve their goals, their messages on social media address three main topics. First topic is climate change impacts which highlights the devastating consequences of climate change on a global level. Second one is climate change actions which discusses what governments and decision makers need to do in order to mitigate climate change. Lastly, NGOs' social media messages tackled individuals' efficacy to reduce the effects of climate change. Meanwhile, Vu et

al. (2021) focused on how NGOs build their communication messages on Facebook to interact with audiences and raise awareness instead of focusing how NGOs leverage social media to advocate for their work. Their study focused on how NGOs stress climate change risks and make calls to action for change. Modern technology such as the internet has increased the opportunities for NGOs to communicate with the public affordably and at scale (Korda & Itani, 2013; Segerberg & Bennett, 2011). They were able to customize their messages towards different social groups according to the social media platform they use (Auger, 2013). On one hand, NGOs in China attempt to frame climate change as a concern that will affect Chinese people's daily lives, rather than an external threat that will make itself felt over the long term (Liu & Zhao, 2017). On the other hand, NGOs in Africa highlight climate change's devastating effects on agriculture, as well as society and economy more broadly, to bolster public concern over the effects of climate change (Ford et al., 2015). NGOs in Afghanistan tend to provide educational content to increase climate change awareness and provide solutions to adapt to climate change (McGregor et al., 2018). Additionally, NGOs rely on adopting educational programs in their awareness raising campaigns in areas that are most susceptible to climate change (Brüggemann & Rödder, 2020). For instance, Mahmud (2020) studied the role of NGOs in demonstrating climate change in a coastal area in Bangladesh. The results showed that in Bangladesh there were around 250 NGOs that ran climate change communication campaigns targeting farmers and fishermen in the area in an attempt to manage regional climate change crises. In research by De Wit (2020) about the efforts of NGOs to communicate climate change information in Tanzania, findings showed that there was a conflict between how climate change was framed by NGOs and the beliefs of Tanzanian citizens. The people of Tanzania believe that rain and drought represent God's power. When NGOs address rain and drought as a threat to the Tanzanian lives and homes, it was insulting to them. The locals

perceived some of the NGOs' messages as an assault on their religion, which emphasized to NGOs the importance of ensuring that their messaging is tailored to the cultural background of their audience (de Wit, 2020). Another study, on the Philippines, delved into NGOs' efforts to build educational curricula about anthropogenic climate change (Friedrich, 2020), and found that these efforts reinforced their pre-existing belief that climate change is an important concern. These findings indicate that the way NGOs framed climate change through educational activities emphasized strong beliefs about the discourse on climate change, so citizens grew up in a community that takes responsibility for anthropogenic climate change and perceives it as an immediate threat rather than a distant problem.

Generally, NGOs have proven more adept than local governments at building climate change communication strategies (Wozniak et al., 2015). Prior research investigated how environmental NGOs frame and incorporate scientific information into their messages to the public (Fähnrich, 2018). Moreover, the previously mentioned studies show how scholars were interested in exploring NGOs' efforts in different parts of the world. This indicates how NGOs play the primary role in climate change communication in most of the vulnerable regions. Also, NGOs are able to target different communities using a wide range of communication approaches such as personalized messages and educational content. Their contribution in raising awareness about climate change has been a result of their ability to develop communication methods tailored to different audiences, in different cultures, with relative efficiency as previously highlighted. For these reasons, this study supports non-governmental organizations in two ways. One way is by exploring different communication appeals to examine which appeal is the most effective in addressing a developing market such as Egypt. This provides first-hand findings on the most convenient methods for fitting climate change messages to the Egyptian audience. Another way is

by understanding individuals' willingness to perform pro-environmental behaviors through non-governmental organizations.

Area of Study

On a national level, Egypt is one of the countries that significantly suffers from climate change (Mostafa et al., 2021). Schilling et al. (2020) suggested that Egypt, Morocco, Tunisia, and Algeria are expected to face a severe temperature increase which will lead to dryness and water shortage. Also, Driouech et al. (2020) anticipated extreme climate changes in the MENA region. Similarly, last March, Selwin Hart, Special Adviser to the UN Secretary-General, stated that Africa is impacted by the global warming more than the global average, leading to higher expected costs for its agriculture (El Tawil, 2021). The UNDP report "National Adaptation Plans in Focus: Lessons from Egypt" considers Egypt's Nile Delta among the three areas most susceptible to climate change threats (*National adaptation plan process in focus,* 2018). This sheds light on how climate change in Egypt will dramatically impact multiple aspects of life and underscores the indispensability of adaptation.

As previously mentioned, carbon dioxide emissions are one major cause of climate change. Global carbon dioxide (CO2) emissions have reached over 35 billion tons annually. About 25% of these emissions are produced by China, followed by the United States (15%) and Europe (10%) (Mostafa et al., 2021). Although developing countries are not among the top producers of CO2 emissions, they will be the most affected by the consequences (Mostafa et al., 2021). According to Al-Gerzawi, a researcher on environmental affairs at the Egyptian Initiative for Personal Rights, Egypt contributes only 0.6% of global carbon dioxide emissions, but Egyptians and residents of other developing countries will suffer disproportionately in health, food supply, and economy (Ezzat, 2021).

Some of the consequences of climate change include, rising sea levels, greater incidence of forest fires, and reduction in water resources (Oskamp, 2000; Claesson and Nycander, 2013). Though Egypt does not have a great many trees at risk of burning, it does have water resources which stand to be affected. Egypt relies majorly on the Nile River as a source of water for its large population. Because of climate change, the Nile flow is susceptible to inclination (Mostafa et al., 2021). This will jeopardize Egypt's water resources, and by extension certain industries, such as agriculture, and its economy more broadly (Mostafa et al., 2021). Literature studying climate change in Egypt has focused primarily on its consequences with respect to water resources, economic vulnerability, and agricultural industries (Mostafa et al., 2021). Though less predominant, some literature focused on the roles of Egyptian and non-Egyptian corporations in raising awareness about climate change and helping the country adapt to its consequences.

Local and Global Initiatives Relating to Climate Change in Egypt

Over the past few years, there has been an initiative by governmental and non-governmental institutions in different areas of Egypt, including Giza, Alexandria, and the Nile Delta, with the support of the Egyptian Ministry of Environment, to plant a million new trees all across Egypt (Egypt Today Staff, 2019). One NGO called "Greenish," which hosts events and workshops related to addressing climate change, helped spread awareness of the initiative through these gatherings. (Ezzat, 2021). Greenish is a start-up company that was founded in 2017. Its aim is to raise awareness in Egypt about current environmental concerns including climate change (Greenish, 2017). Greenish is not the only organization which has taken steps toward dealing with climate change in Egypt. Egypt's Environment Minister, Yasmine Fouad, announced in July 2021 that Egypt has sent a proposal to the UN to host the 27th Climate Change Conference (MENA,

2021). In November 2021, it was officially confirmed that Egypt will host the next COP in 2022 (Mourad, 2021).

Aside from national efforts, one of the major contributors to the Egyptian system to mitigate climate change is the United Nations Development Program (UNDP). The UNDP provides experts and financial support for Egyptian governmental organizations to advise on energy efficiency, risk management, and other issues relevant to climate change (Wodon, 2014). Also, the National Adaptation Strategy (NAS) of 2011 is considered a strong framework for Egypt to abide by its policies in an attempt to control ramifications of climate change on various Egyptian sectors (*National adaptation plan process in focus*, 2018). According to its "Vision 2030", the Egyptian government aims to implement a 'Sustainable Development Strategy' which will allocate more funding for the reformation of environmental resources and for planning projects, with the goal of mitigating the effects of climate change on Egypt's fundamental resources (*National adaptation plan process in focus*, 2018). The Ministries of Planning and Environment are setting an agenda that sets climate change adaptation as a priority in their annual financial and strategic plans (*National adaptation plan process in focus,* 2018).

Although these efforts to adapt to climate change look promising, huge demolitions of wide grassy spaces have taken place over the past two years. The years 2020 and 2021 witnessed massive destruction of green areas in several Egyptian cities, driven by efforts to extend and widen roads in order to address traffic problems (*The Egyptian authorities continues destruction of urban areas*, 2021). These projects have included the construction of bridges in Cairo's oldest and most popular communities (*The Egyptian authorities continues destruction of urban areas,* 2021). Critical though the traffic problem may be, these projects have cost over USD$45 million and entailed the destruction of over 350,000 feddans of trees and green areas (*The Egyptian authorities*

continues destruction of urban areas, 2021). Residents of affected cities in Egypt filed complaints against these acts of demolition and started movements to fight against removing the greenery in their areas (Khaled, 2021). Around 14,000 people signed online petitions calling for the government to reconsider the projects (Khaled, 2021). Citizens started to propose substitutes to the original plans which might preserve existing trees and plants. These recent events highlight the urgency of climate change communication and raise awareness about it. They also demonstrate how some Egyptians perceive the urgency of adapting to climate change and the importance of planting trees, even if these events are anecdotal, and cannot necessarily be considered to reflect national trends.

Transportation is among the human behaviors which contribute most to climate change; general consumption levels are quite relevant as well (Schmidt et al., 2013). According to Capstick and Pidgeon (2014), climate change has received attention from the general public in many different nations. Scholars have found that public attitudes and perceptions with respect to the urgency of climate change is a key factor in the success of climate change mitigation efforts (Whitmarsh, 2009). Those actions are dependent on daily human activities including purchasing decisions, consumption decisions, eating habits, and transportation habits (Shiva, 2016). Many scholars directed their research about climate change towards the United States (Dunlap et al., 2000; Mostafa, 2016), Canada (Edgell and Nowell, 1989; Mostafa, 2016), and the UK (Norris, 1997; Mostafa, 2016). Nevertheless, most of these academic efforts overlooked individualistic differences (Mostafa, 2016). Also, with the great focus on the Western communities, past studies concluded that communities which value self-expression more than economic and materialistic goals are the communities that are likely to have a high level of concern for the environment (Inglehart, 1995; Mostafa, 2016). Inglehart (1995) added that once economic satisfaction is

achieved in a community, the public shifts their interest to environmental concerns. Accordingly, developed countries tend to be more concerned by climate change than developing countries, which is the main thrust of Inglehart's 'affluence hypothesis' (Abramson and Inglehart, 1995). In the same vein, Franzen found that greater prosperity leads to greater demand for environmental quality (Franzen, 2003). As environmental attitudes vary among nations, and most of the research on these attitudes has focused on individualistic communities and Western countries, the attitudes and behavior of populations in the MENA region have received less attention. This study aims to fill this gap in the literature. In fact, past research did not focus on studying the connection between public perception and behavior on the one hand, and climate change communication in developing countries such as Egypt on the other. The role of citizens and the importance of raising awareness about climate change was only mentioned in passing.

Furthermore, the majority of the research is directed towards governmental strategies with very minimal attention being paid to the importance of climate change communication to the public. Nor is there much work focusing on strategies to promote awareness of methods for reducing energy consumption, and to mitigate climate change in Egypt. This study will explore the optimal methods to communicate climate change information to the public and the factors which influence the public's response to initiatives on climate change mitigation and adaptation in Egypt.

Climate Change Communication

Because of its uniquely high stakes, climate change is the most important environmental issue for the public to understand (Moser & Dilling, 2006) Scholars of the life sciences have been the primary investigators of climate change communication heretofore, and they have paid little consideration to social science angles in their work (Moser, 2010). Although there have been some

marketing and advertising campaigns to promote pro-environmental practices in developing nations in the last decades, there has been no major focus in the media of developing nations on climate change, as they have focused more on political, economic and social events (Stamm, Clark, & Eblacas, 2000). With respect to global warming, prior literature has illustrated the ability of intense coverage of pro-environmental issues to positively impact audience awareness levels (Sampei & Aoyagi-Usui, 2009). In a study that was carried out in Japan, Sampei and Aoyagi-Usui (2009) analyzed media coverage of global warming from 1998 to 2007. The results showed that the more coverage of the matter in the media, the more concerned the citizens are about climate change. Specifically, the number of articles published about global warming significantly impacted the audience awareness of the importance of global warming. At the same time, the specific media messages used to communicate climate change significantly contribute to understanding of the importance of the issue. Studies concerned with how the public comprehend climate change find that the main barrier to success is the nature of the communication strategies, rather than the quantity of communication (Stamm, Clark & Eblacas, 2000). Results showed that the general media coverage could be damaging, or at least not improving public understanding of key climate change information (Stamm, Clark, & Eblacas, 2000). This may help to explain the gap between the general public's perception of the importance of climate change, and that of the scientific community. Climate change is a more ambiguous and abstract issue for those without scientific backgrounds who have not personally experienced a major incident caused by climate change This demonstrates the key role which must be played by news media in promulgating relevant, interesting, and easily comprehensible information on climate change (Dietz & Stern, 2002; Bak, 2001).

Meanwhile, several studies highlighted the audience's confusion about the scientific causes of climate change (Brechin, 2003; Bord et al., 1998). These studies also mentioned that understanding scientific information about climate change is highly dependent on other factors as well. For example, individuals' level of education and culture, and their personal traits are likely to correlate with their level of understanding of media messages about global warming (Aoyagi-Usui et al., 2003; Ester et al., 2003).

Hence, the level of public knowledge of a matter is often tied to the level and type of media coverage afforded to it (Stamm, Clark, Eblacas, 2000). How media messages are articulated, the information they contain, and the context in which they are delivered shape how they will be received by their audiences. While it is clear that the general public still has much to learn about climate change, it would be incorrect to treat it as fully illiterate with regard to these issues (Moser, 2010). This study examines how individuals interact with diverse media communication messages in efforts to discern the optimal approach for organizations and institutions to communicate climate change messages to the public, paying special attention to developments in the media space over the past several decades, including the emergence of the internet and the new media forms which have sprung up.

Role of New Media in Climate Change Communication

The Evolution of New Media

According to O'Neill and Boykoff (2012) the transition from traditional media to new media such as the internet has allowed consumers to be exposed to new information through two-way communication instead of one-way communication – conversations and interactions, instead of just reading or hearing. The internet, as the most prominent example of new media, has enhanced the communication process by allowing users to send personalized messages to

audiences and permitting them to control access and sharing options of that information with specific people (O'Neill and Boykoff, 2012). With billions of active users on social networking sites, social media has become one of the most powerful communication tools of the current era (Dwivedi, Kapoor, & Chen, 2015). There is no wonder that thousands of institutions and organizations rely on social media to affordably reach users worldwide (Kulkarni et al., 2020). According to The eMarketer (2011), companies in the United States prefer to reach customers via social media than via Google. Around 70% of businesses use Facebook as their primary social media channel to connect with their audience. As a result of their efficacy and popularity in marketing and communication, social networking sites have become an interesting object of study for both academics and practitioners in the media and communications fields, as well as in other areas of business (Alalwan, 2018; Alalwan et al., 2017;). Over the past decade, social scientists have gradually developed an interest in the space as well (Pearce et al., 2019). This is due to several reasons which demand further analysis from an academic perspective, such as the fast growth of social networking sites (SNS), the strong involvement of the public with such platforms, the ease of two-way communication without gatekeepers and multiple flows, and the huge quantities of data provided from such platforms that are ultimately interesting to social scientists (Pearce et al., 2019).

Engaging Climate Change in Online Media

When environmental issues began to be discussed online, scientists began studying these communications. In the years 2016 and 2017, studies about climate change communication on social media increased (Pearce et al., 2019). The main focus was on Twitter and other social media platforms). Although Facebook dominated the top usage rankings in the social media world (Kemp, 2017), the majority of the literature about climate change communication focused on

Twitter, with very little focus on Facebook or YouTube (Pearce et al., 2019). A study by Kemp (2017) found that there were only 5 articles in the climate change literature which focused on Facebook as a social media communication channel at that time. As a result, this was an opportunity for future scholars to explore a wide range of popular platforms such as YouTube (O'Callaghan et al., 2015) and Instagram, as well as Facebook (Pearce et al., 2019). Twitter was very common for scholarly analysis due to the focus on text-based messages that are easy to analyze (Pearce et al., 2019). As such, several non-textual communication platforms are ripe for exploration in the field of climate change communication.

One feature of social media that allows organizations to reach thousands of people all around the globe is online advertising. Studies examining media effects have concluded that media platforms that individuals are most attached to are the platforms where users are most susceptible to advertisements (Calder, Malthouse, Schaedel, 2009). Generally, social media campaigns evolved and became a strong replacement for standard advertising campaigns. This is due to the flexibility of social media tools which allow advertisers to create customized, personalized, persuasive, and interactive green advertising messages (Barger et al.,2016). On a micro level, this digital space has allowed observation and interaction with siblings' posts and comments, which is relevant because as previous studies have highlighted, green behavior is highly influenced by family and friends (Goldsmith & Goldsmith, 2011; Srinivasan et al., 2009), and because people are more likely to trust things they perceive to be trusted by their family and friends (Kyu Kim et al., 2020). Furthermore, the results of a survey analyzed by Mintel Report (2014) has shown that teens and youth become more alerted when they are exposed to green advertising campaigns. The explanation for this finding is that audiences do not initially trust organizations' intentions in promoting eco-friendly behaviors, services, or products (Kyu Kim et al., 2020). This issue remains

a major concern for practitioners when promoting green campaigns (Kyu Kim et al., 2020). This study asserts the importance of social media advertising as a tool for promoting climate change mitigation and raising climate change awareness. In this day and age, it is the most fertile communication channel, allowing for a wide range of personalized and elaborate messages about global warming. Nevertheless, some scholars question the benefits of using social media for these purposes because of how skeptic the audience can be when they are exposed to green advertising messages as previously claimed by some researchers.

Despite the broad variety of efforts to communicate information on climate change and environmental preservation to the public via social media, academic studies have thus far been limited to analyzing corporate social responsibility messages and leveraging social media for that purpose (Byrum, 2019; Kesavan et al.,2013; Minton et al.,2012; Reilly & Hynan, 2014; Kyu Kim et al., 2020). Research on traditional media advertisements has focused on the effectiveness of communication to audiences which are already environmentally conscious (Green & Peloza, 2014). According to Kyu Kim et al. (2020), there have been only minimal efforts to cover pro-environmental communication through social media advertising despite social media's clear potential to shape the future of green behavior. With their study, these researchers tried to fill this gap in literature by focusing on social media advertising and the best ways to communicate green messages to users. They examined two types of appeals: concrete and abstract, testing these types of appeals to assess their effectiveness in persuading audiences and generating attitudinal change

Climate Change Mitigation Advertising Appeals

In order to promote positive environmental attitudes, this study presents an analysis of the appeals used in messages by several companies, agencies, organizations, and public figures to

convince audiences to embrace certain ideologies or behaviors (Matz et al., 2017). Research found that the more a message is customized to audience preferences and psychological traits, the higher its influence will be on audience behavior. Kulkarni et al. (2020, p.328) defined an appeal as "a persuasive statement, directed either towards logic or towards emotion." The most common appeals for practitioners in the marketing field to communicate with their customers are rational and emotional appeals (Kulkarni et al., 2020). The rational method tends to be direct, clear and informative (Kulkarni et al., 2020). It communicates what the audience needs to know about the product or service's function, advantages, and disadvantages (Han et al., 2019). Meanwhile, the emotional method aims to trigger users' feelings rather than their rational considerations (Stewart & Furse, 1986; Kulkarni et al., 2020). Emotions triggered could be a sense of pleasure, hope, fear, or others (Stewart & Furse, 1986; Kulkarni et al., 2020). Previous studies highlight that effects of advertising appeals on target audiences vary from study to study and from approach to approach (Holbrook, 1978; Kulkarni et al., 2020). Although these studies were developed many years ago, they were adapted in recent research by Kulkarni et al. (2020) who studied ad appeals on consumers' behavioral intentions to share viral ads.

Among the various types of emotional appeals, appeals to fear have long been a topic of interest in literature on climate change communication (Ettinger et al., 2021). Scholars have consistently questioned the effectiveness of messages which trigger fear and evoke negative emotions in order to highlight the costs of climate change. Other studies have measured the effectiveness of messages aiming to evoke feelings of hope and aspiration on pro-environmental behavior (Ettinger et al., 2021). On one hand, Mann et al. (2017) suggest that the intensity of negative, fear-provoking messages about climate change could actually cause audiences to be demotivated from performing a climate action. Ettinger et al. (2021), on the other hand, finds

negative framing of climate change messaging to be effective. According to him, these and many other climate change communication studies focused on analyzing texts and visuals to measure the effectiveness of appeals. Before Ettinger et al.'s studies (2021), Skurka et al. (2018) carried out a study to measure the influence of hopeful and fearful videos about climate change on behavioral intention and risk perception. The findings showed that the appeals' impacts on behavioral intention were largely similar, but that only the fear appeal increased subjects' risk perceptions (Skurka et al., 2018). Despite all of the studies focusing on the use of emotional messages to shape audience attitude and behavior with regard to climate change, Bloodhart et al. (2019) claim that objective rational messages are the most effective in climate change communication.

Rational Appeal. What Bloodhar et al (2019) describe in their study as an objective and rational approach is described by Alniacik and Yilmaz (2012) as a concrete claim. It is an approach that prioritizes message objectivity and information-richness (Alniacik & Yilmaz, 2012). Information in concrete claims could be numeric data intended to describe an eco-friendly product (Kyu Kim et al., 2020). There were common assumptions that concrete claims were perceived as more effective and memorable than abstract claims (Chan & Lau, 2004; Davis, 1993; Yang et al., 2015; Kyu Kim et al., 2020). Abstract claims are messages which are less detail-oriented, and more focused on concepts and principles than on figures or tangible things (Davis, 1993; Kyu Kim et al., 2020). Some scholars find that within the realm of green advertising, concrete claims more strongly influence attitude and behavior than abstract claims (Davis, 1993; Chan & Lau, 2004; Kyu Kim et al., 2020) because; as mentioned previously; consumers over-worry about green campaigns so they tend to seek more knowledge about them (Ford et al.,1990). Nevertheless, Alniacik and Yilmaz (2012) maintain that there is not enough evidence to support this theory. Even

more, a study by Yang et al. (2015) suggests that abstract appeals have a stronger influence on green purchase intentions than do concrete claims.

Fear Appeal. Explanations of the precise dynamics of fear appeals vary in the literature. Ruiter et al. (2014) state that the purpose of fear appeals is to make subjects feel threatened to prompt them to take preventative measures (the behaviors which the designers of the message want to encourage, ideally) to counter those threats. This relationship between fear appeals and stimulating precautionary attitude and behavior has been the focus of several studies conducted over the course of multiple years (Ettinger et al., 2021). According to Witte (1992), fear is a natural human response triggered by alarming information or other stimuli. Fear appeals are used to communicate messages that require audience to act accordingly as it triggers human response (Ettinger et al., 2021). Several scholars assert the effectiveness of fear appeals in changing attitudes and behavior (Witte & Allen, 2000; Tannenbaum et al., 2015). Some scholars explain the emotional processing stage of fear appeal messages like de Hoog et al. (2008) who suggests that audiences assess received messages, evaluate the risks, and then respond accordingly. Other scholars such as Meijnders et al. (2001) review fear approaches in the context of pro-environmental behavior. The results of this study show that fear-inducing messages are highly effective in promoting low energy consumption. In addition to this, Van Zomeren et al. (2010) examine fear appeals that stress the consequences of global warming and found them to be effective in positively shaping subjects' behavior.

Hope Appeal. Until 2016, a limited number of studies correlated hopeful appeal to climate change (Hornsey & Fielding, 2016). Then, Ettinger et al. (2021) claimed that voices asserting the efficacy of optimistic approaches to persuasive communication have gradually grown louder over the past decade. For instance, a study by Morton et al. (2011) showed that positive appeals were

more effective than negative appeals in shaping people's willingness to reform their behavior in light of climate change. Chadwick (2015) supports the same claim about the influence of hopeful messages on motivating positive behaviors. Also, Ojala (2012) and Marlon et al. (2019) argue that reasonable hope has a significantly greater impact on behavioral intentions than false hope. Relatedly, Van Zomeren et al. (2008) explain that efficacy in hopeful messages gives individuals a sense of capability to perform the required behavior. Greenaway et al. (2016) associate the positive outcome of hopeful messages to behavioral change.

Some of the studies on the positive approach supported the effectiveness of the hope appeal while others did not. Hornsey and Fielding (2016) argue that hopeful messages reduce individuals' interest in moderating greenhouse gas effects. They carried out a study on more than 500 Americans to examine the impact of hopeful appeals in raising awareness about arresting the growth of carbon emissions rates. The results did not confirm that the hopeful approach is effective in increasing awareness about climate change consequences (Hornsey & Fielding, 2016; Hart & Feldman, 2014). Lastly, a study by Smith and Leiserowitz (2014) found that both hope and fear appeals could positively influence individuals' likelihood to support climate action.

Merging Appeals

Findings from studies that examine the effectiveness of hope appeals are as complicated and mixed as the findings of studies on the effectiveness of fear appeals (Ettinger et al., 2021). Witte and Allen (2000) claim that individuals' responses are inconsistent and remarkably different when presented with emotional appeals alongside messages that call on respondents to take action, especially if the emotional appeal leverages fear. Smith and Leiserowitz (2014) suggest that it is important to understand whether the emotional response to climate change messages is generated by a general concern over climate change consequences or by a specific alarming message relating

to climate change. Generally, there are several findings that support or refute the effectiveness of emotional appeals – both fear and hope based –in changing individuals' behavioral intention to engage in initiatives to mitigate climate change. Clearly, there is no consensus in the literature on the optimal way to communicate climate change information to the general public, or to encourage the general public to adopt environmentally- friendly practices (Ettinger et al., 2021). The discussions in Ettinger et al.'s (2021) study on Americans reflected a wide range of findings from previous scientific studies that highlighted climate change communication appeals to citizens in developed countries. Ettinger et al.'s work (2021) was not the only study in literature that focused on the developed and individualistic communities. Empirical research has found that studies about pro-environmental behavior are majorly concerned with the Western countries (Pearson & Schuldt, 2015). To fill this gap, scholars began to explore other nations' approaches to pro-environmental advertising (Kim & Ahn, 2019). For instance, in a comparison between individuals in the United States and India, messages about reducing carbon consumption were more effective on Americans than on Indians when emphasizing individual responsibility (Rattan et al., 2015). Individualistic countries such as the US are more reactive than collective communities such as South Korea to messages with call-to-actions (Kim & Ahn, 2019). Hence, this study aims to explore the relative effectiveness of different types of appeals in collective communities, to be able to make recommendations for approaches which are suitable for Egypt, which has more of a collective than an individualistic culture.

Chapman et al. (2017) reject the notion that one emotional appeal is necessarily more powerful than another. Furthermore, it is highly unlikely that one particular approach can significantly change an audience's attitude and behavior while another will not (Ettinger et al., 2021). There are multiple factors that impact audiences' responses, especially if a message is

delivered through a mix of visuals, audio and text. This was concluded by Ettinger et al. (2021) when evaluating the impact of video-based climate change messages. They suggested that the efficacy of emotional appeal is ultimately dependent on the objective of the communication process. Each type of appeal evokes a different response to the message. Individuals make decisions and behave according to their evaluations of a wide range of different messages that they are exposed to daily.

This study will focus on the relative efficacy of different types of appeals in social media-based climate change communications in Egypt. It will follow previous scholars' approaches in studying appeals by adopting the Elaboration Likelihood Model: the dual processing model for understanding routes of persuasion and one of the most cited models in literature examining attitudinal change (Kitchen et al., 2014).

Influential Factors on Behavior & Behavioral Intention

As discussed earlier, the road to climate change mitigation starts with raising awareness through persuasive communication. A strong message using the appropriate appeal can lead to attitudinal change towards pro-environmental behavior. Once the public acknowledge their role in the devastation of natural resources, they will be persuaded to accommodate new, more sustainable daily habits (Rodríguez-Barreiro et al., 2013). In previous research, scholars interested in studying public behavior and perception relating to environmental issues were also keen to explore how attitudes towards the environment are shaped (Dunlap et al., 2000). Studies about attitudes often fall within the realm of social science. Researchers usually associated environmental behaviors with analyzing attitudes and beliefs (Rodríguez-Barreiro et al., 2013). Namely, Laroche et al. (2001) established a connection between attitude and green consumption. He found that customers who have a positive environmental attitude are more likely to purchase eco-friendly products than

non-green products and keen on reducing energy consumption. Many theories have been built on top of this basic idea (Schwartz, 1977; Fishbein & Ajzen, 1980, 2000; Rodríguez-Barreiro et al., 2013). According to Rodríguez-Barreiro et al. (2013), for example, one of the most cited theories in the literature was the theory of reasoned action developed by Fishbein and Ajzen in 1980. A few years later, in 1985 Ajzen developed an extension to their theory called the theory of planned behavior. This study will adopt Ajzen's (1985) theory as its theoretical framework. Along with attitudes, these theories highlighted the importance of other internal and external factors that influence behavioral intention. These factors will be discussed in the upcoming sections.

Environmental Behavior

These theories are built on the premise that intention indicates likely future behavior. Previous work by researchers such as Armitage and Conner (2001), Bamberg and Schmidt (2003), Webb and Sheeran (2006), and Bamberg and Möser (2007) demonstrates the relationship between behavioral intention and actual behavior. These scholars provide first-hand evidence in defense of the validity of using of behavioral intention - the motivational component of the actual behavior (Ajzen & Fishbien, 1980) - as a predictor for environmental behavior (Rodríguez-Barreiro et al., 2013). Stern (2000) actually defines pro-environmental behavior based on intent – as behavior which is intended to be sustainable. Stern (2000) adds that intent-oriented environmental behavior is an outcome of individuals' beliefs and interests. In fact, several studies of individual pro-environmental behaviors have been developed based on this definition (Huang, 2016). Past studies have explored environment-related social activities such as learning about climate change from the media or other people with a view toward benefiting the environment in the future. Stern (2000), on the other hand, conceptualizes pro-environmental behavior more narrowly, as "environmentally significant behavior" which produces demonstrable impacts. This behavior can

be either of the following three approaches. The first one represents individuals' efforts to involve themselves with and actively support environmental organizations. The second represents a passive behavior which is accepting pro-environment public policies. Finally, the third is personal behavior such as recycling, reducing personal energy consumption, or purchasing green products. This study adopts the former definition of pro-environmental behavior since it examines the individuals' support for and engagement with the climate change initiatives of NGOs. These findings in previous literature are lent credibility by their citation in the work of Paul C. Stern, a senior scholar and the President of Social and Environmental Research Institute, who has in turn been cited extensively.

Attitude

With respect to the factors that influence behavior and behavioral intention, researchers such as Stern (2000), Juárez-Nájera et al. (2010), and Lin and Huang (2012) expounded factors that directly or indirectly influence environmental behavior. They divided influential factors into internal factors such as values, knowledge, and level of involvement, and external factors including cultural and social factors. Several scholars emphasized the importance of attitude in shaping human behavior within different contexts. For example, Bamberg & Moser (2007) and Kim, Jeong, & Hwang (2013) concluded that attitude is a strong predictor of eco-friendly behaviors and purchasing decisions. Another study supported the same argument when examining the relationship between attitude and climate-conscious behavior in the United States and Korea (Kim, Jeong, Hwang; 2013). This study found a correlation between citizens' attitudes towards the importance of climate change prevention and their intention to engage in a pro-environmental behavior. More recent studies also support the importance of attitude in explaining behavior (Rajapaksa et al., 2019; Taufique & Vaithianathan, 2018). Attitude has been defined in numerous

ways in previous literature. This study will adopt the definition used by Hogg and Vaughan (2005) who describe attitude as a combination of beliefs, emotions, and behavioral patterns towards a specific object or event. This combination is referred to as the "ABC Model of Attitude," describing the three components of attitude: affective, behavioral, and cognitive (McLeod, 2018).

Ajzen (2001) is one of the leading scholars connecting attitude, with its emotional, behavioral, and cognitive elements, to environmental behavioral intention. Crano and Prislin (2006), also top scholars in the field, have advanced similarly structured research in the same space. There are two dimensions to the affective component of attitude: the individual's positive or negative emotional response to the situation or the object, and their interest in the situation or object – which depends on their knowledgeability (Svenningsson et al., 2021). This is an indirect involvement of cognitive dimensions in the affective component (Svenningsson et al., 2021). The cognitive component represents the thoughts, information, and logical interpretation of an individual about an issue or an object (Fishbein & Ajzen, 1975). It may be brought into play, for example, by knowledge an individual has about an issue. The importance of behavioral knowledge in shaping pro-environmental behavior is debated in the literature. On the one hand, Frick et al. (2004) and Bartiaux (2008) found that environmental knowledge has a weak influence on behavior. On the other hand, Wiek et al. (2011) and Paço and Lavrador (2017) highlighted that environmental knowledge is important when accompanied by beliefs in building pro-environmental behaviors. Also, Liu, Teng, and Han (2020) noted that the more environmental knowledge people have, the more they tend to lead eco-friendly lives. Carmi et al. (2015) supported the same notion in their analysis of pro-environmental actions. With respect to climate change in particular, scholars such as O'Connor et al. (2002), and Gram-Hanssen (2010) affirmed that knowledge about factors affecting climate change is an important determinant of pro-

environmental behavior (Howell, 2011). In the same way, Masud et al. (2015) asserted the importance of knowledge about climate change in the formation of a positive attitude toward the issue. The level of awareness of individuals about how climate change can directly impact their lives substantially impacts the seriousness and responsibility of their attitudes towards it (Akhtar et al., 2018). Less individually-oriented, though in the same vein, Bradley, Waliczek, and Zajicek (1999), and McMillan, Wright, and Beazley (2004) found that higher levels of environmental knowledge lead to more positive attitudes toward the environment and result in more disciplined environmental behavior (Dijkstra & Goedhart, 2012), which is known in the literature as strength of attitude (McLeod, 2018).

Ajzen and Fishbien (2000) explained these dimensions when they defined attitude and its correlation with behavioral intention. They concluded a relationship between attitude with its components that are built on emotions, beliefs and knowledge, and behavioral intention as a predictor of actual behavior (Svenningsson et al., 2021). These scholars provided a solid ground for this study to adopt the three components of attitude as indicators for pro-environmental behavior. It is also important to mention that the relationship between the cognitive and affective components of attitude is not hierarchal, but rather more complex and parallel (Pe'er, Goldman, & Yavetz, 2007).

This study is built on measuring attitudes towards climate change and their impact on individuals' intent to support environmental initiatives and organizations dedicated to mitigating climate change. It also refers to behavioral intention as a strong indicator of future behavior as previously concluded by social scientists.

Perceived Behavioral Control

One other factor which influences people's pro-environmental behavior, and has been mentioned in the literature, is self-efficacy (Lee et al., 2014; Tabernero &Hernández, 2011). This refers to people's perceived ability to perform a particular action (Huang, 2016). The level of self-efficacy impacts individuals' environmental behaviors as well as their responses to environmental messages in media. A higher level of self-efficacy results in a greater impulse to acquire information about a given issue to be able to act according to that information (Huang, 2016). Self-efficacy is an internal factor that contributes to building individuals' pro-environmental behavior. Gifford and Nilsson (2014) use the term "locus of control" to convey a similar meaning – the extent to which individuals perceive themselves to have control over surrounding events. While self-efficacy is the perceived ability to accomplish a certain objective, locus of control refers to a person's perception of their overall control of external events. Gifford & Nilsson suggest that locus of control impacts how people behave. In fact, Schwepker and Cornwell (1991) associated a higher sense of control to a higher intent to consume eco-friendly products in the United States. Similarly, the research of Ando et al. (2010) supported locus of control's effect on pro-environmental behavior in Japan and Germany, and that similar conclusion was made with respect to Australia as stated by Gifford and Nilsson (2014). The importance of individuals' perceived control was considered a linkage between their values and beliefs and their actual behavioral (Gifford & Nilsson, 2014). Generally, for a person to carry out a particular action, they must perceive that they have the ability to perform it and in control of what they can do. This is the rationale employed by Ajzen (1985) in introducing "perceived behavioral control" as another factor that influences behavioral intention within their theory of planned behavior.

Ajzen's concept of perceived behavioral control is essentially a combination of the concepts of self-efficacy and locus of control. It refers to the external and internal factors that determine the extent to which the behavior is perceived by a person to be doable or undoable (Hansmann et al., 2020). Ajzen (1985) suggests that perceived behavioral control will boost one's motivation to perform a behavior. Kaiser and Gutscher (2003), however, argue that perceived behavioral control does not effectively predict general behaviors. This study provides a good opportunity to contribute to this debate over the importance of perceived behavioral control, especially in its juxtaposition of collective and individualistic communities.

Subjective Norms

Social influences are among the external factors described by Stern (2000), Juárez-Nájera et al. (2010), and Lin and Huang (2012). Relatedly, Kim, Jeong, and Hwang (2013), Hinds & Sparks (2008), and Whitmarsh & O'Neill (2010) concluded that an individual's intention to engage in an eco-friendly behavior is influenced by the way in which their social circle perceives that behavior. Being social creatures, human beings are usually influenced substantially by their communities and social interactions. For years, theories about social norms have explored the effects of social activity on behavior (Park & Lessig, 1977; Kim, Jeong, & Hwang; 2013). The literature identifies two types of social norms: descriptive and injunctive (Cialdini et al., 1990; Kim, Jeong, & Hwang; 2013). Descriptive norms reflect what significant others – a person's close family members and friends – are likely to do and what behavior they usually perform. Injunctive norms reflect the behaviors that the social circle either approves and prefers or disapproves and rejects. The influence of these two types of social norms on influence how individuals behave has been empirically supported through previous experiments set within different contexts (Cialdini et al., 1990; Schultz et al., 2007; Kim, Jeong, & Hwang; 2013). The nature and degree of the impacts

of descriptive and injunctive norms usually vary from one study to another (Melnyk et al., 2011), yet in the field of pro-environmental behavior, past studies have found that the stronger the effects of both norms are on a person, the more likely that person will be to pursue the approved behavior (Thøgersen, 2008; Kim, Jeong, & Hwang; 2013). That is why Fishbein and Ajzen (1980; 1985) refer to the two norms as "subjective norms" and highlighted their impact on the behavior in question through their theories of reasoned action and planned behavior. They highlighted the influence of social pressure and significant others on pro-environmental behavior. Knowing the extent to which many people can be influenced in their behavior by their social circles, it is important to assess the variables which impact the amount of weight people place on the way their social circles perceive them. These variables are numerous, but include culture, lifestyle, and social class. Cultural background impacts how people abide by subjective norms (Kim, Jeong, & Hwang; 2013). This is why previous studies juxtaposed environmental behaviors in collective and individualistic communities (Cho et al., 2013). Members of communities with deeper cultures of collectivity are more likely to be influenced by the opinions of their social groups, while members of more individualistic communities are more likely to behave more independently. That being said, it is noticeable that most of the studies sampled the United States as an example of an individualistic nation, and countries in Latin America (Cordano et al., 2010), and South Korea, (Cho et al., 2013; Oliver and Lee, 2010) as examples of more collective nations (Hofstede et al., 2010; Kim, Jeong, & Hwang; 2013). This study will add depth to the literature by providing an understanding of social factors influencing environmental behaviors in a collective, and heretofore under-covered North African community.

Chapter Three

Theoretical Framework

Elaboration Likelihood Model (ELM)

This study adopts the Elaboration Likelihood Model to understand how audiences process communication messages. Before the Elaboration Likelihood Model (ELM) was developed, the studies about persuasive communication faced multiple limitations and methodological errors (Kitchen et al., 2014). Also, there was a deficiency in the understanding of the complexity of attitudinal change (Kitchen et al., 2014; Petty & Cacioppo, 1983). Then Petty and Cacioppo (1981) introduced the Elaboration Likelihood Model to social science. Prior to the ELM, social science relied on the definitions and conceptual frameworks presented by Fishbein and Ajzen (1972; 1980; 2011) to understand the formation of opinions and attitudes.

Since the model was introduced, it has been used extensively to measure advertising effectiveness in persuasion communication (Kitchen et al., 2014). It has been a reliable framework for studying attitudes and behaviors in more than 120 studies for over four decades in the marketing and communication fields (Schumann et al., 2012) and it has been one of the most cited models in this literature (Pasadeos et al., 2008). The model was described as remarkably effective by Szczepanski (2016) and as a valuable addition to the literature by Karson and Korgaonkar (2001). The reason this model has been so widely praised is that it is comprehensive, well-constructed and defines the routes of the persuasion process. Moreover, it covers all of the primary routes to persuasion and attitudinal change (Kitchen et al., 2014). The Elaboration Likelihood model is a well-suited framework for measuring the effectiveness of digital communication on shaping consumers' green attitudes and behavior (Pittman et al., 2021).

Furthermore, the Elaboration Likelihood model describes a dualistic process of persuasion. The two routes – one central, the other peripheral – lie at opposite ends of a continuum. Individuals' cognitive abilities and motivations determine which route is more effective in the persuasion process (Petty & Cacioppo, 1983). Firstly, the motivational level of an individual depends on the relevance of the message to that individual, and upon the comprehensibility of the message. The second relevant variable is an individual's general ability to comprehend arguments, which depends on their level of distraction at the time of the communication process, frequency of exposure to the same message, and prior knowledge (Petty and Cacioppo, 1983).

As previously highlighted, Cacioppo and Petty (1984) defined the two routes leading to persuasion by studying the intellectual and personal differences between individuals which impact their choices. The difference between the central and the peripheral routes is the requisite level of elaboration. The cognitive processing route is defined by high levels of elaboration; to the extent that individuals are persuaded in this way, it is through the presentation of credible information and sound argumentation (Pittman et al., 2021). On the other hand, the peripheral route is determined by emotional and physical factors such as feelings and appearance; the level of elaboration is low (Pittman et al., 2021). Petty and Cacioppo (1984) claim that individuals can process messages through either route, but that their receptiveness depends on the message's relevance to them. Several factors define individuals' levels of involvement with a message. One of them is the degree to which the message is customized to be personally relevant. If an individual perceives that a message does not involve or concern them, and they are not engaged by it, they can be said to have a low level of involvement with that message, and vice versa. A high level of involvement is an indicator of a high level of motivation to process the message. According to Schuhwerk and Lefkoff-Hagius (1995), a high level of involvement leads to processing

information through the cognitive route (central route). They add that in processing the message, respondents' original thoughts and pre-existing attitudes are generally reinforced. In this case, the persuasiveness effect is more durable than in the case of peripheral processing (Petty, Haugtvedt, & Smith 1995). Meanwhile, audiences with low involvement and low motivation are more likely to rely on emotional stimuli in interpreting a message. Low-involvement individuals will search for heuristic cues and form attitudes based on them (Matthes, Wonneberger, & Schmuck 2014). In adopting the Elaboration Likelihood model, this study will group rational and emotional climate change messages into the two information processing routes laid out in the framework. As such, individuals responding to information and logic will be grouped under the "central route," and individuals responding to hope or fear will be grouped under the "peripheral route." This study will compare various climate change appeals and assess which are most effective in conveying information and shaping people's thoughts and attitudes.

Theory of Planned Behavior (TPB)

Communication affects attitude, and attitude affects behavior. That is the rationale behind using the theory of planned behavior as the second theoretical framework for this study. Environmental consequences are highly dependent on individuals' behavior and their ability to reduce energy consumption (Chen, 2016). Although several studies showed that audiences can perceive climate change threats (Dunlap, 1998; Kempton, 1997; O'Connor et al., 2002), very few studies highlighted audiences' behavioral intention to act upon climate change prevention and perform pro-environmental behaviors (Brody et al., 2012). According to Chen (2016) a pro-environmental behavior is an activity that preserves environmental resources whether directly or indirectly.

In past studies, the theory of planned behavior was one of the most used theories when studying human behavior. There are over 90,000 citations of the theory in literature since 2019 (Yuriev et al., 2020). There is an enormous number of previous studies which adopted the theory of reasoned action along with the theory of planned behavior to study pro-environmental behaviors (Hinds & Sparks; 2008; Whitmarsh & O'Neill, 2010; Bamberg & Moser, 2007; Bamberg & Schmidt, 2001). These studies relied on measuring the variables of TPB that affect individuals' behavioral intention (Ajzen, 1991). For more than 30 years the TPB has been adapted to a wide range of pro-environmental behaviors including the use of carbon-efficient transportation (Muñoz et al., 2016), recycling (Echegaray & Hansstein, 2017), efficient use of energy (Allen & Marquart-Pyatt, 2018) and much more. Since 1995, the theory of planned behavior has been the preferred framework among scholars studying pro-environmental behavior (Yuriev et al., 2020).

The theory of planned behavior, as introduced by Ajzen (1991), was an extended model of theory of reasoned action that explains the variables affecting behavioral intention. The original

model, the theory of reasoned action; is a framework to measure performing a behavior based on psychological and social factors such as attitudes and subjective norms (Kim, Lee & Yoon, 2015). According to Wang et al. (2018) and Whitmarsh and O'Neill (2010) there is no substantial measurement for pro-environmental behaviors, so studies tend to rely on behavioral intentions as strong predictors of behaviors. Likewise, Yuriev et al. (2020) stated that scholars need to focus on analyzing the relationship between intention and behavior in their studies about pro-environmental behavior. The analysis of their findings showed that the average difference between intentions and behaviors did not exceed 23% (Yuriev et al., 2020). This means that around 77% of individuals' behavioral intentions are strong predictors of their future behavior. The gap between intentions and behaviors was explained by Knussen and Yule (2008) as the result of the intervention of individuals' habits.

Ajzen (1991) suggests that behavioral intention is an indicator to the willingness of an individual to perform a specific behavior. He assumed that our consciousness is partly involved in building our behavioral intentions. The theory of planned behavior is primarily developed to assess social behavior in the US, a developed independent and individualistic country (Taufique & Vaithianathan, 2018). On the other hand, the model was applicable as well on studying social behaviors in developing and collective communities (Lee & Green, 1991) like India (Kumar et al., 2017; Paul et al., 2016) and Taiwan (Chen, 2016). Also, previous scholars asserted the applicability of theory of planned behavior to studying eco-friendly behaviors within different contexts (Taufique & Vaithianathan, 2018). For instance, Park and Ha (2014) studied recycling behavior, while Ha and Janda focused on low-energy consumption behavior (2012) and both referred to TPB as their theoretical framework.

Fishbein & Ajzen built the theory of planned behavior to determine the factors affecting behavioral intentions (Kim, Jeong & Hwang, 2013). These factors are attitude, subjective norms, and perceived behavioral control.

Attitude

According to Ajzen (1991), an individual's general judgement of an issue as pleasant or unpleasant is referred to as "attitude". Attitudes can be defined as a person's evaluation of a behavior; such an evaluation can be positive, negative, or neutral. According to Ajzen & Fishbein (1980; 1975), an attitude reflects an individual's intention towards a behavior. In the *theory of reasoned action* and *theory of planned behavior*, attitudes were commonly defined as one's overall consideration of the consequences of performing a behavior (Kim, Jeong & Hwang, 2013; Cordano et al., 2010). Several definitions were additionally applied to attitude, and academic scholars constantly engaged in debates about the exact meaning of the concept (Dijkstra & Goedhart, 2012). Social scientists highlighted how theories of social behavior conveyed different descriptions of attitude (Francis & Greer, 1999; Germann, 1988; Osborne, Simon & Collins, 2003). Oskamp and Schultz (2005) introduced another definition of attitude that is adopted in this study. They defined attitude as an individual's "*affective reactions toward, behavioral responses to and evaluative beliefs about an attitude object*". It is based on individuals' reactions, behaviors, and beliefs towards a subject matter. This description was used in previous social studies about environmental actions to draw a connection between pro-environmental behavior and attitude with its cognitive, behavioral, and affective components represented in one's beliefs, knowledge, habits and experiences. This approach was originally inspired by Fishbien and Ajzen's (1975) long journey of understanding opinions and attitudes where an individual evaluates an issue as good (leads to a positive attitude) or bad (leads to a negative attitude). Along with attitude, a number of scholars

confirmed there are other factors that influence pro-environmental behavior (von Borgstede et al., 2013).

In the same context, scholars found that social favoritism of a certain behavior indicates to a higher intention for performing that behavior (Kim, Jeong & Hwang, 2013). This argument was supported by prior studies on online behaviors (Chu, 2011; Lee & Lee, 2011): such as health behaviors (Roberto et al., 2011), and pro-environmental behaviors (Bamberg & Moser, 2007; Kim, Jeong, & Hwang, 2013). The revealed social favoritism falls under "subjective norms" as per the theory of planned behavior.

Subjective Norms

The concept of subjective norms was extensively discussed in the literature, being defined as the perception of one's surrounding peers of whether to perform a specific behavior or not (Fishbein & Ajzen; 1975). It relates to the pressure of "significant others", including family and friends, on an individual's decision to perform a behavior (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975; Kim, Jeong & Hwang, 2013). At the same time, Karnowski, Leonhard & Kümpel (2018) referred to it as the approval or disapproval of one's social circle to perform that behavior. Subjective norms include injunctive and descriptive norms. Interis (2011) referred to the injunctive norm as the social pressure to perform a particular behavior. This reflects an overall approval or confirmation of the behavior by an individual's family and friends (Kim et al., 2015), while the descriptive norm is one's need to engage in a behavior that others are performing **(**Karnowski, Leonhard & Kümpel, 2018). Another group of scholars highlighted that the descriptive norms reflect the extent to which the concerned behavior is popular or familiar to an individual's social circle (Kim et al., 2015).

Results of the majority of social studies demonstrated that subjective norms have a positive correlation with shaping behavioral intention (Perkins, 2003). The preferences of family members, peers, and the close social circle guide individuals in the evaluation of behaviors (Taufique & Vaithianathan, 2018). Generally, scholars supported the influence of subjective norms on behavioral intentions in several contexts including health behaviors (Roberto, Krieger, Katz, Goei, & Jain, 2011) and pro-environmental behaviors (Bamberg & Moser, 2007; Kim, Jeong, & Hwang, 2013; Taufique & Vaithianathan, 2018). Also, studies by Biswas & Roy (2015b) revealed the impact of subjective norms on an individuals' eco-friendly consumption behaviors, while Verma & Chandra (2018) shed light upon the positive relationship between subjective norms and consumers' intentions to book in green hotels, in an expression of supporting green initiatives. Yet, Taufique & Vaithianathan (2018) mentioned that subjective norms influence on behavioral intentions is based on cultural differences. India and china, for example, are collective communities inspired by social and relative behaviors more than other independent countries (Lee and Green, 1991; Tang et al., 2011). Hence, they are more likely to be influenced by opinions of their surrounding community than people from individualistic communities. Several studies confirmed effectiveness of subjective norms – injunctive and descriptive - on behavioral intention within different contexts (Chen, 2016; Hinds & Sparks, 2008; Knussen et al., 2004; Park, Levine, & Sharkey, 1998; Whitmarsh & O'Neill, 2010).

In particular, few studies on green behavior examined the effect of subjective norms in collective communities like India (Taufique & Vaithianathan, 2018), which are similar to that in Egypt. These studies showed consistency with results from prior studies that analyze green consumer behavior in individualistic communities. It was also explained by Taufique & Vaithianathan (2018) that differences between communities are no longer significant due to the

uprise of improved education and resources. As such, the effectiveness of subjective norms was not different in collective communities from individualistic communities. On the other hand, subjective norms were perceived as having a weak influence on behavioral intentions according to some scholars in literature (Cialdini & Trost, 1998; Trafimow & Finlay, 1996; Kumar et al., 2017; Paul et al., 2016). Therefore, we cannot eliminate such an important factor in Fishbein and Ajzen's model (1975). We tend to examine whether this study will support or refute the importance of subjective norms on Egyptians' pro-environmental behavioral intention.

Perceived Behavioral Control (PBC)

The difference between the theory of reasoned action and theory of planned behavior lies in the addition of perceived behavioral control. This variable reflects one's own perception of their ability to perform a behavior. According to Ajzen (1985), the theory of reasoned action is limited when considering external factors underlying the individual's ability to perform a behavior. Consequently, the theory of planned behavior was developed to consider perceived behavioral control when predicting one's behavioral intention (Ajzen, 1985). This perception reflects an individual's belief of whether such a behavior falls under their full control or there are other factors that may hinder performing the behavior. Ajzen; by adding this factor, increased the explanatory power of TRA (1985). This model was successfully applied to several studies aimed at explaining an individual's pro-environmental behavior (Chen, 2016). One example is a study in Taiwan using Fishbein and Ajzen's scale (1972) to measure the theory of planned behavior variables against citizens' willingness to perform a pro-environmental behavior. The results confirmed that attitudes, subjective norms, and perceived behavioral control positively influence individual's intentions to mitigate climate change (Chen, 2016). Nevertheless, it should be highlighted that

Chen (2016) provided first-hand data showing minimal contribution of perceived behavioral control as an indicator of behavioral intention.

Critics of the Theory

Reviewers of the theory of planned behavior criticized the theory for not being inclusive of different personal traits, morals, and situations (Yuriev et al., 2020). To overcome these limitations, this study adopted an in-depth definition of attitude; as previously mentioned, that includes beliefs, affective and cognitive components that reflect one's knowledge, habits, and values. Another concern that was raised by the reviewers of the theory that it does not consider the impact of workplaces, organizations, or different social contexts that may weaken the effect of the theory of planned behavior (Yuriev et al., 2020). Regarding this contextual concern, this study does not deal with a specific context or examine behaviors within a specific organization. On that basis, the theory of planned behavior remains a powerful predictive of pro-environmental behavior in this research. The power of TPB lies in the direct predictors of behavior (attitude, subjective norm and PBC) which are measured by strong validated statements developed by Ajzen (2002) and severally used in previous studies that dealt with TPB as their theoretical framework (Yuriev et al., 2020).

Proposed Model

This study aims to provide first-hand data through quantitative methods that could be useful for academics and practitioners. First, this study was developed to measure the impact of climate change communication appeals on audience-engagement with climate change messages. RQ1 aims to discern the effect of hope, rational, and fear appeals on audience engagement with climate change messages:

> *RQ*: Which ad appeal generates the highest audience engagement when promoting climate change mitigation on social media?

Second, the study investigates the relationship between attitudes, subjective norms, and perceived behavioral control on individuals' intention to engage in climate change initiatives. In order to explore this relationship, this study will adopt the post-positivism paradigm. It is the best/optimal model for the following reasons:

- In the 20th century, post-positivism emerged as a rejection of positivism. While positivists "accept" hypotheses to be the definite truth, post-positivists seek to "falsify" hypotheses in order to discern the truth (Guba & Lincoln, 1994). As such, this study will reject or accept the null hypotheses that there is no relationship between the independent variables and the dependent variables instead of insisting upon proving the veracity of some alternative hypothesis.
- Positivists claim that observations made through science are not subject to error. On the other hand, post-positivists believe that any method of inquiry is subject to error (Carpiano & Daley, 2006). Post-positivism is built on the notion that evidence is always imperfect and that conclusions derived from it are therefore liable to be inaccurate and may later be

overturned. This study recognizes that its methods are subject to error and that further evidence and further research may reframe some of its conclusions.

- The post-positivism approach claims that findings are limited to the context of the study, meaning that they cannot be generalized, or applied to other situations (Phillips, Phillips & Burbules, 2000; Guba & Lincoln, 1994). As such, this study purports only to shed light on climate change-related behaviors, and only in Egypt.

In light of the above, the study provides an analysis of the relationship between different variables and behavioral intention in the context of climate change mitigation in Egypt by rejecting or failing to reject the following null hypotheses:

NH01: There is no relationship between individuals' attitude towards climate change and their intention to support climate change initiatives of NGOs.

NH02: There is no relationship between subjective norms and the intention to support climate change initiatives of NGOs.

NH03: There is no relationship between individuals perceived behavioral control and their willingness to support climate change initiatives of NGOs.

These null hypotheses are measured against their alternative hypotheses:

H11: There is a relationship between individuals' attitude towards climate change and their intention to support climate change initiatives of NGOs.

H12: There is a relationship between subjective norms and the intention to support climate change initiatives of NGOs.

H13: There is a relationship between individuals perceived behavioral control and their willingness to support climate change initiatives of NGOs.

The following table represents the independent & dependent variables' operational definitions:

Table 1

Operational definitions of variables

Construct	**Operational Definition**	**Academic Reference**
Communication Appeal	"A persuasive statement targeting individuals' cognitive or emotional involvement". The emotional appeals in this study are hope, which reflects positive emotions, and fear, which reflects negative emotions. The rational appeal is represented through informative content.	Kulkarni et al. (2020)
Audience Engagement	Engagement with the ads including link clicks, post reactions, shares, comments,	Orazi & Johnston (2020) Calder, Malthouse, & Schaedel (2009)

	as reported by Facebook Ads Manager.	
Attitude	An evaluation of the three attitudinal components: affective, behavioral, and cognitive components. 1. Beliefs towards climate change: This variable represents the affective component. It is measured using a 5-points Likert scale of 5 items developed by Berberoglu and Tosunoglu's (1995) 2. Eco-friendly Behavior: This variable represents the behavioral component. It is measured using a 5-	Fishbein & Ajzen (1975) Oskamp and Schultz's (2005) Dijkstra & Goedhart (2012)

	points Likert scale of 7 items developed by Stern, Powell, and Ardoin (2008) 3. Knowledge of causes and effects of climate change: This variable represent the cognitive component and it is measured using 6 items on a nominal scale (yes, no, I don't know) developed by Dijkstra and Goedhart (2012)	
Subjective Norms	The perception of one's social circle of a particular behavior. In this study, the behavior is supporting climate change initiatives by NGOs. Subjective norms consist of injunctive and	Fishbein & Ajzen (1975) Ajzen & Fishbein (1980) Ajzen (1991)

	descriptive norms. Descriptive norms reflect what significant others will likely do and what behaviors they usually perform. Injunctive norms reflect the behaviors that one's social circle either approves and prefers or disapproves and rejects. Subjective norms are measured using a 5-points Likert scale of 4 items	
Perceived Behavioral Control	One's own perception of their ability to support/engage with climate change initiatives by NGOs This variable is measured using a 5-points Likert scale of 3 items	Ajzen (1985) Ajzen (1991)

Behavioral Intention	Individuals' willingness to perform a behavior. In this study, behavioral intention is an indicator to the willingness of an individual to support/engage with climate change initiatives by NGOs. This variable is measured using a 5-points Likert scale of 3 items	Fishbein & Ajzen (1975) Ajzen (1991)

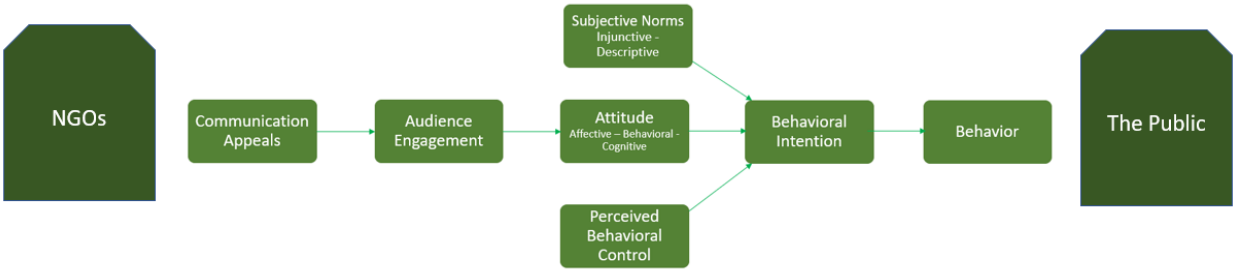
The proposed model connects between the impact of communication appeals on audience engagement to generate a positive attitude towards climate change mitigation using the elaboration likelihood model and the adaptation of the theory of planned behavior to examine the impact of attitude – along with other factors such as subjective norms and perceived behavioral control – on individuals' behavioral intention. In this way, the study builds an effective communication funnel that starts with delivering an appropriate message and ends with pro-environmental behavior.

Ultimately, the two goals of the study are as follows: (1) to understand how NGOs can effectively communicate climate change to the public to form a positive attitude towards climate change mitigation, and (2) to understand the factors, including attitude, that affect the public's behavioral intention to support climate change initiatives by NGOs. The constructs of the study are developed based on previous studies to achieve those goals. Based on previous literature, the

elaboration likelihood model and the theory of planned behavior, the operational definitions of the independent and dependent variables in this study are developed and the following model is proposed:

Figure 1

Proposed Model



Based on the Elaboration Likelihood Model by Petty and Cacioppo (1981) and the Theory of Planned Behavior by Ajzen (1991).

Chapter Four

Methodology

This study adopts a mixed methodology to answer the previously proposed research question and hypotheses. The two methods used are an online experiment and a survey. First, this study aims to understand the effectiveness of ad appeals on audience engagement. Second, it aims to explore the relationship between attitude, subjective norms, and perceived behavioral control and behavioral intention. In this way, the methodology is an attempt to merge science with practice and provide a statistical analysis of the results. It also aims to connect between an effective communication process and the ultimate goal to build a pro-environmental behavior.

Method 1 - Experiment

The first method is an online field experiment using Facebook AB testing to examine and compare the performance of ad appeals: the fear appeal, the hope appeal, and the rational appeal. Facebook AB testing is a tool developed by Facebook to run experiments and compare between pre-determined variables. The variables in this experiment are the previously mentioned ad appeals, and the dependent variable is audience engagement with the ad appeals. User-engagement is measured based on the number of clicks, reactions, comments, and shares. On that basis, Facebook provides a report with the results of the AB testing. The table below shows how each performance term is defined and calculated according to Facebook Ads Manager (a tool developed by Facebook for advertisers to create their advertising campaigns).

Table 2

How performance is calculated as per Facebook Ads Manager

Performance Term	**Definition**
Campaign Objective	Facebook asks advertisers to set the campaign objective to know what they want to achieve from the advertising campaign. Campaign objectives include generating traffic, page likes, conversions, or to increase awareness about the advertised product or service. Once an advertiser selects a campaign objective, Facebook suggests different goals to achieve the selected objective.
Reach	The next step after setting a campaign objective is choosing a campaign goal. If an advertiser selects "Awareness" as the campaign objective, Facebook provides some options for the campaign goal such as "reach" or "brand recall". In this study, the campaign goal is "reach". By selecting "reach" as the advertising goal, the advertiser directs the Facebook algorithm to show the ads to the maximum number of individuals within the target audience. The number of users reached varies depending on the ad relevance to the audience, the allocated budget to the campaign (The more budget allocated for the campaign, the wider is the

	reach radius), and the bidding auction (competition between similar ads with different budgets and quality scores).
Impressions	The count for all the times that an ad is displayed on a Facebook user's page.
Frequency	The number of times that one person has been exposed to an ad
Clicks	A count for all the clicks on an ad including clicks that redirect to the Facebook page, clicks of reactions, clicks of shares, and link clicks.
Unique Clicks	The count for a click per one person (1 unique click=1 person)
Link Clicks	The total number of clicks on the call-to-action button only
Cost per Click	Calculated when dividing total spent over total number of clicks
Cost per Unique Click	Calculated when dividing total spent over total number of unique clicks to know how much a click from one person costs
Cost per Link Click	Calculated when dividing total spent over total number of link clicks to know how much it costs to redirect users to the landing page
Click-through-rate (CTR)	Calculated when dividing total reach over total number of clicks.

Unique Click-through-rate (CTR)	The percentage that shows how many users who were exposed to the ad clicked on it. Calculated when dividing total reach over total number of unique clicks
Ad Spent	The total amount of money spent over the whole duration of the ad
Post Engagement	The sum of link clicks, reactions, post shares, post comments, post saves, and page likes. In this study, the responses generated from the feedback form on the landing page is also added to post engagement

The online experiment is appropriate because it examines climate change communication appeals made through social media advertising, and Facebook AB testing is the most convenient and effective instrument for gathering first-hand results and high-level, valid data. The sampling method of the experiment is random sampling because this is the best way to achieve a representative sample of Egypt's Facebook-using population, which will boost the external validity of the study's results.

Facebook Experiment

The field experiment is deployed through Facebook AB testing to compare between the effectiveness of emotional (fear and hope appeals) and rational appeals. It is a single factorial design experiment since the ads are representing three versions of the same variable (ad appeal). Facebook for Business designed a tool called AB testing to test one variable whether the variable is the allocated budget, target audience, or 'creative'. In this study, the independent variable falls under the creative content – 'creative' for short – which is the term for the section that includes

the ad's design and text. The dependent variable is the ads' performance, which is determined by post engagement – as shown in table (2) – which is provided in Facebook results report at the end of the experiment. In this section, the study provides a detailed overview of setting up a Facebook advertising campaign and how to interpret the results; before that, though, the next section will summarize the evolution of AB testing and its integration into academic research.

Before 2017, Facebook was criticized for its deficiency in random assignment of target audience and ad delivery. Critics mentioned that Facebook distributed ads unequally (Eckles et al., 2018). This criticism no longer stands, however, since the launching of Facebook AB testing tool in November 2017 (Orazi & Johnston, 2020). This option was created to allow researchers and advertisers to pre-test their campaigns and conclude the top performing variable (Facebook, 2021). AB testing is built to randomly assign several versions of one particular variable (ad creative) to the target audience (Facebook, 2021). Thus, it helps researchers compare the effects of different experimental variables. As previously mentioned, experimental constructs could be visuals (images or videos) or text (Orazi & Johnston, 2020).

Facebook AB testing was the most suitable approach for this study for the following reasons:

- AB testing eliminates any of the algorithm optimization bias previously mentioned by critics (Orazi & Johnston, 2020).
- AB testing provides a natural online field setting in which participants are aware of neither the hypothesis being tested nor the variable being manipulated.
- There is a slight chance of bias in results since the target population is randomly assigned (Facebook, 2021) and since there is no influence by the researcher on the results, unlike in other lab experiments.
- There is no hidden incentive or risk of cheating (Orazi & Johnston, 2020)

- The sample of the Facebook AB test is generally highly representative, highly externally valid (Eckles et al., 2018), and may be generalized due to the random assignment and the ability to reach any population (Orazi & Johnston, 2020).
- Facebook AB testing is designed to avoid audience overlapping and ensure even splits and comparable statistics among the different versions of the measured variable (Facebook, 2021)

Campaign Settings

Table 3

Illustration of the three levels of creating a Facebook paid campaign

Campaign Level	The highest level of the campaign settings where advertisers are requested to set the campaign objective. In this study the campaign objective is "Reach"
Ad Set Level	The second level of the campaign settings. In this pane, advertisers are requested to set the daily budget – campaign duration – target audience demographics & geographics – ad placement.
Ad Level	Represents the creative pane of the campaign. Advertisers are requested to select a Facebook page from which the ads will be promoted. Also, Facebook requests from advertisers to select visuals, text, call-to-action (CTA), and

	the URL of the landing page to redirect audience to after they click on the CTA.

Campaign Level. From Facebook Ads Manager, the researcher created one campaign with 3 ad sets. In the campaign settings, the campaigns' objective was set to "reach". This goal lies under the first stage of any promotional campaign on Facebook which is "awareness". Since this study aims to understand raising awareness about climate change through persuasive communication on social media, the most appropriate objective was "Awareness". The goal was set to "reach" because this would instruct Facebook to optimize the campaign performance to reach as many people as possible within the target audience. In other words, it would reach the maximum number of Facebook users in Egypt and analyze their responses to the study's ads. Other goals Facebook offers include "brand awareness," which increases repetition effects, and "conversion" which prioritizes reaching and converting the convertible instead of maximizing overall campaign reach.

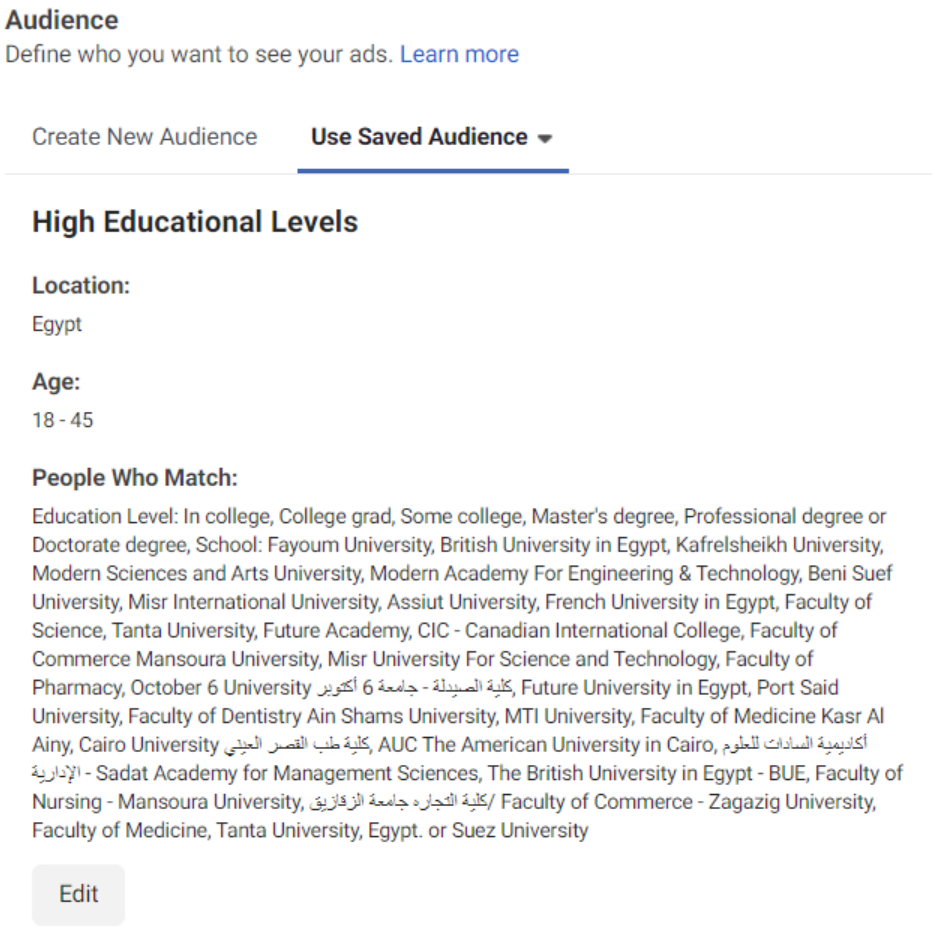
Ad Set Level. In the ad set level, 3 ad sets were created. All settings were toggled identically in the 3 ad sets. This includes the daily budget, age, gender, language, geographics, and ad placement. Each of these are set as follows:

- Daily Budget: $10 per ad set
- Duration: 13 Days (31st of October – 12th of November)
- Age: 18-45 years old
- Gender: Males & Females
- Language: All Languages
- Geographics: Egypt

- Educational Level/ School: In college, College grad, Some college, Master's degree, Professional degree or Doctorate degree. Study at Cairo University, Helwan University, MSA University, Banha University, The American University in Cairo, Fayoum University and other universities.
- Ad Placement: Facebook placements (News Feed, Videos Feed, Facebook Marketplace, Facebook Groups Feed, Facebook Stories, Facebook Search Results, In-Article)

Figure 2

Campaign's Target Audience



The target audience was significantly broad because the study aims to reach users generally, with no specific behavior, employment status or interest. The age range was from 18 – 45 years old since millennials and Gen Z are the most active users on social media. All languages and both genders were included in the target audience as well. The educational level was set to reach people who had completed, or were in the process of completing higher education. Facebook recognizes this information based on the educational details that users set on their Facebook profiles.

The rationale behind setting an educational level is that:

1. Users with unspecified education levels are more likely to be fake or poorly educated, which could jeopardize, respectively, the validity of their data or their ability to understand the ad content.

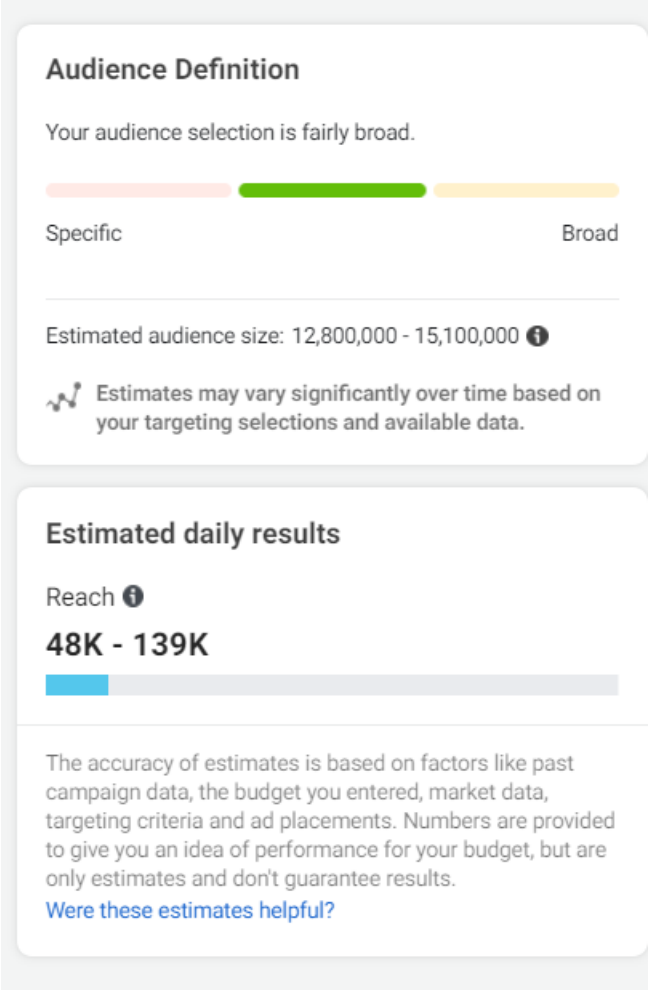
3. A person must possess a decent amount of advanced knowledge, interpretational skill, and education to be able to understand the scientific terminologies related to climate change. This level of education is provided through universities and colleges more than schools.

4. Ad delivery is limited by budget. Accordingly, given a fixed budget, the more specified the target audience, the wider the potential reach within that specified segment.

In summary, the AB test total duration was 13 days, from October 31, 2021 to November 12, 2021, with a $10 daily budget for each ad set. Hence, the total budget allocated daily for the campaign was $30 split equally between the 3 ads. Also, in the ad set level, Facebook highlights the potential reach for the campaign based on the targeting settings and campaign budget. According to this calculation, the potential audience size for this study ranged from 12 million to 15 million users and the potential daily reach for each ad set ranged from 48,000 to 139,000 users.

Figure 3

Estimated audience size and potential daily reach by Facebook

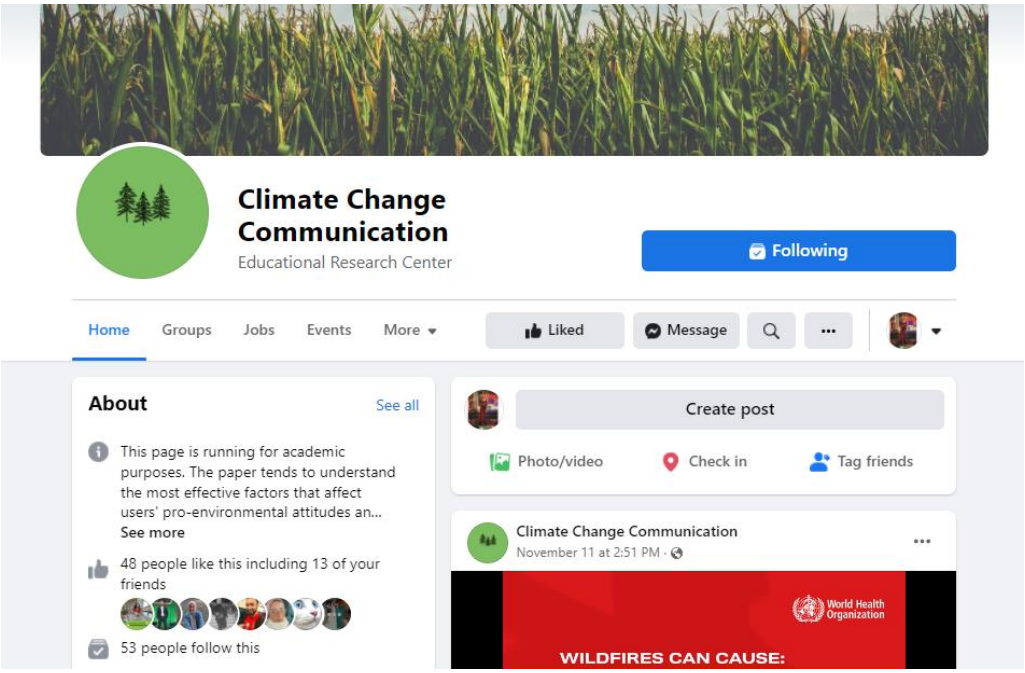


Ad Level

Facebook Page Set-Up. Firstly, the advertiser is asked to set up a Facebook page from which the Facebook ads are sponsored. For the purpose of this study, a Facebook page called "Climate Change Communication" was created.

Figure 4

The Facebook Page created to promote the Facebook ads



Note. Page Link https://web.facebook.com/Climate-Change-Communication-109169468213471/

The Facebook page was set up with a description of the study and a consent debriefing, a contact email, as well as appropriate content relevant to promoting climate change mitigation.

Ads Text & Design (Appeals). In the ad pane, the 3 ads are different as each ad set has one appeal. One ad reflects the hope appeal, one reflects the fear appeal, and one reflects the rational appeal.

As mentioned in the literature review, this study seeks to measure the effectiveness of emotional appeals such as fear and hope appeals representing one positive emotion (hope) and one negative emotion (fear) against the effectiveness of the rational appeals of the informative and objective approach.

Designs used were created using www.pexels.com, www.canva.com, and maxpixel.net. The photo used in the hopeful approach was captured by Keira Burton and used from www.pexels.com (Figure 5), while the rational design was created using www.canva.com to reflect no emotions (Figure 6), and the photo in the fearful appeal was downloaded from www.maxpixel.net and modified using canva.com (Figure 7).

Figure 5

Desktop preview for the hopeful appeal ad

Figure 6

Desktop Preview for the rational appeal ad

Figure 7

Desktop preview for the fear appeal ad

The fear-based appeal endeavored to convey a sense of loss, threat, damage, and of course fear. This was accomplished through the portrayal of a damaged landscape. In the hopeful appeal, the design hero is a smiling child to stimulate human interest and invoke the future. As for the text for each appeal, the fear approach used words that inspire fear and threat; whereas, the hopeful approach sought to inspire thoughts of hope, compassion, empathy, and the future. This was based on a study by Ali et al. (2011) which investigated how Arabic terms imply negative, positive, or objective meanings. According to their study, the Arabic synonyms for the words "loss, fear, grief, damage, weakness, [and] optimism" reflect negativity. On the other hand, the Arabic synonyms for the words "giving, hope, quality, beauty, [and] sympathy" reflect positivity. Accordingly, the designs' text and ad captions were developed to ensure that they would convey the intended stimuli. The rational appeal was developed using design and text that would not trigger emotions, but rather deliver information and statistics about climate change through neutral colors and landscape.

Call-to-Action (CTA). The CTA is a featured button by Facebook that is attached to the ad so that it highlights the action required from the target audience. In this case, the call-to-action is "Learn More". Facebook provides a dropdown menu of call-to-action (CTA) options. "Learn More" is the CTA most suitable for the objective of the study which is promoting climate change mitigation and awareness. Also, there was a request to answer the survey attached to the designs to encourage users to fill out the 4-question form in the landing page to provide their feedback on the ad.

Landing Page Set-Up. Users who clicked on the ad's "Learn More" call-to-action were redirected to a landing page containing a debriefing form, a small article about how to reduce climate change, and a set of 4 questions asking for their feedback on the ads. The landing page was created so the audience could read an article about how to reduce the effects of climate change resulting from human activities which was attached to a feedback form. The feedback form consisted of four questions polling the audience's opinion of the ads. The first question – "Did you understand the ad" – was evaluated using a nominal level of measurement. The second question – "How did you find the ad" – sought to assess whether users understood the appeal of the ad. Participants were asked to choose whether they found the ad "cheerful – informative – or threatening". The third question was measured on a 5-point Likert scale ranging from strongly disagree to strongly agree so that participants could indicate the extent to which they felt involved with the ad. The final question, also measured using a 5-point Likert scale, asked participants to reflect on how they perceived the importance of climate change. The goal of this final question was to assess the effectiveness of the different appeals on the audience response to climate change advertising messages. All the content in the landing page was translated into Arabic to be consistent with the ads and accessible to all Egyptians.

Method 2 - Survey

The second methodology is a survey, distributed using convenient online sampling, which gathered self-reported answers to measure attitude, subjective norms, perceived behavioral control, and behavioral intention. Previous literature measuring the Theory of Planned Behavior variables constructed surveys to investigate the correlation between them. In addition to that, Ajzen and Fishbein (2011) explained the items to be used in a survey to measure the constructs affecting behavioral intention. This study follows the same approach of conducting a survey and basing its findings upon it. The following parts will explain comprehensively the steps which were taken in setting up and analyzing the survey.

Data Gathering and Sampling

The survey was distributed online using social media platforms such as Facebook and LinkedIn, and it was circulated between workmates and referrals. There were follow up calls to assure the maximum number of responses. Overall, 516 responses were collected in two weeks.

The survey had a consent form attached to highlight that participants are filling out the survey voluntarily and that there is no possible breach to any private information. Also, there was no questions that required contact information such as emails, names, and phone numbers to assure anonymity.

Measures

The Theory of planned behavior (TPB) has been cited in literature many times which makes it a reliable asset to measure variables affecting behavioral intention. Fishbein and Ajzen (2011) explained the construction of the theory and the methods to measure its variables in their book “Predicting and Changing Behavior: The Reasoned Action Approach”. The scales introduced by them was used previously in measuring subjective norms and behavioral intention especially

with respect to pro-environmental behaviors (Kim et al., 2013). Accordingly, this study adopts the scales developed by Ajzen and Fishbein considering their reliability and validity.

As such, the *subjective norms* were measured using 4 items on a 5-points Likert scale where (1) is 'strongly disagree' and (5) is 'strongly agree'. Items included "people who are important to me think I should help in planting trees initiatives", "It is expected of me to raise awareness about climate change", and "most people like me engage in a climate change prevention activity" as suggested by Ajzen and Fishbein (1972).

Also, Ajzen (2002) composited a few statements to measure *behavioral intention* through using "I intent" and "I am willing to". Consequently, behavioral intention is defined as the intention or willingness to participate in a pro-environmental behavior in the future and was measured through "I would support a trusted NGO's initiative that fights against climate change", "I intend to donate (give money) to an NGO initiative to prevent climate change", and "I am willing to volunteer with an NGO to prevent climate change". These statements are measured using a 5-points Likert scale where (1) is 'strongly disagree' and (5) is 'strongly agree'.

To measure *perceived behavioral control*, Ajzen's (2011) scales were adopted. Perceived behavioral control is defined as the degree or extent that an individual is confident that he/she has full control over performing a specific behavior. The following items are added using a 5-pionts Likert scale: "I am confident that I could support an initiative to prevent climate change", "For me, to support an environmental act/initiative is extremely an easy behavior", and "The decision to take part in a climate change prevention initiative is entirely up to me".

Considering *attitudes*, this study measures the three attitudinal components to reflect an in-depth illustration of attitude. Participants' beliefs represent the affective component while their

knowledge represent the cognitive component, and their eco-friendly behaviors represent the behavioral component.

To measure these three components, this study used the following items which were proven to be reliable with an alpha value no less than 0.70 according to Dijkstra & Goedhart (2012).

The first component of attitude is *belief*. It is measured using Berberoglu and Tosunoglu's (1995) scale to reflect on individuals' beliefs of climate change. A 5-points Likert scale ranging from totally disagree to totally agree were used to measure five items including "Climate change should be given top priority", and "People worry too much about climate change" as a reversed question to assure attentiveness.

Additionally, a set of five items were extracted from 'Environmental Citizenship' by Stern, Powell, and Ardoin (2008) to measure participants' *behavioral component*. These items included "I am careful not to waste water", "I am careful not to waste food", and "I am careful to plant trees/water plants". Along these statements, one more item was adopted from Hiramatsu et al.'s study (2016) for measuring environmental consciousness in daily activities. The item is "When purchasing, I care about the environment".

The third section represents the last component of attitude: *cognitive component*. A set of 6 items were adopted to measure the participants' knowledge of the causes and effects of climate change (Dijkstra & Goedhart, 2012). These items included "most of the current climate change is due to greenhouse gases generated by human activity", "If my city will have a heat wave this summer, it means climate is changing", and "Climate change is a result of the ozone layer becoming thinner".

Finally, the last section of the questionnaire assesses the demographics of participants such as their gender, educational level, city, and age.

All the previous items were translated into Arabic so that the survey is understood by all individuals from different communities and cultural backgrounds in Egypt.

Pretest and Manipulation Check

An average of 30 people participated in giving feedback on the survey and the Facebook advertisements. Feedback was collected face-to-face, through online discussions, or through phone calls.

Individuals who completed the survey had minor comments such as that there are some questions have given the same meaning or looked repetitive to them, some words needed to be less complex and clearer, and a few commented on the section measuring subjective norms to be irrelevant. They highlighted that they found it unusual to ask about family and friends' opinions. Accordingly, complicated words were replaced, and possible repeated questions were omitted. Some questions giving the same meaning were not eliminated because repetition was intended for reliability. Besides, the subjective norms section is still included in the survey because it is essential variable in predicting behavioral intention as per the theory of planned behavior. Other than what was previously mentioned, participants found the survey simple, understandable, and does not consume too much time to be completed.

Regarding the advertisements, there were two samples of each appeal (fear appeal, hope appeal, and rational appeal). All participants were exposed to the 6 versions. Participants were divided into two groups: one group chose their favorite ad that they are most likely to click on, mentioned how do they feel about the message (fearful, hopeful, rational) and answered the survey based on their choice. The second group was asked to determine the appeal of each ad to measure the internal validity of the ad appeals, and they were accordingly asked a few questions such as: will they click on any of these ads, do they find the message fearful, hopeful, or objective, do they

find the text complementary to the designs, and finally whether they liked the artwork and the heroes in the ads and how they feel about them.

According to the results of this pilot study, out of the 6 designs tested (2 designs for each appeal), the three designs that clearly portray the fear, hope, and rational appeals, as per the participants' feedback, are selected for the Facebook experiment. . Some amendments were done according to participants' comments. These amendments included changing the background color of the fear appeal to be less bright, changing the opacity of the background image in the rational appeal to be less dark, and adding keywords to the text of the three appeals that clearly address climate change mitigation.

Data Analysis

Experiment

The data was analyzed using Facebook Ads Manager to extract performance report of the experiment. The report provides insights on how audience responds to each ad appeal. These insights included reach, clicks, amount spent, and post engagement. Accordingly, audience engagement with the ad appeals was analyzed.

Survey

IBM SPSS software was used to analyze the descriptive and inferential statistics of the survey. All items per construct were analyzed to provide descriptive analysis of each variable. Afterwards, a regression analysis was carried out to reach a conclusion with respect to every research hypothesis, so that the study can highlight the effect of the independent variables on behavioral intention.

Chapter Five

Results and Analysis

This chapter displays the findings of the data collected to convey the results of the research hypotheses. Since this study adopted two quantitative methods, the findings section is divided to display results of one method (experiment) followed by the other (survey). Each section will present the demographics of participants as well as the findings of the data collected to support or refute the research hypotheses.

Method 1: Experiment

This study used Facebook AB testing to experiment and compare between communication appeals. As previously mentioned in the methodology section, 3 ads were created with 3 different appeals (fear, hope, rational) and the results of the AB testing were exported from the Facebook Ads Manager report.

Campaign Distribution

Figure 8

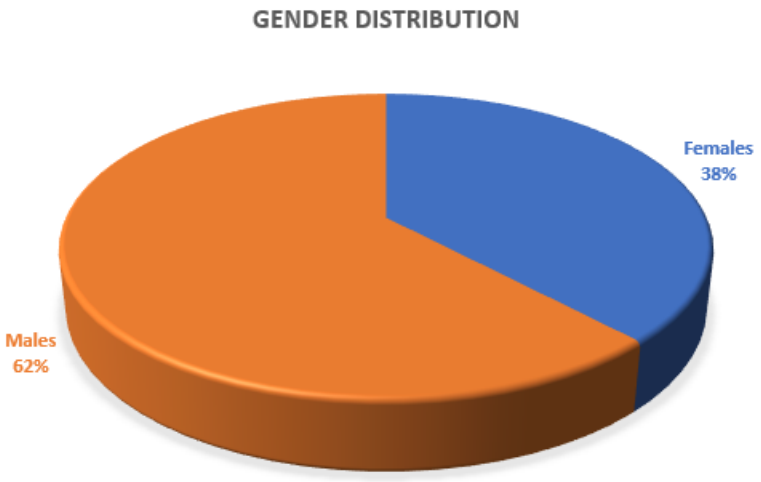
Campaign Performance Report from Facebook Ads Manager

Ad Set Name	Reach	Impressions	Amount Spent	Frequency
Hopeful - H	616,443	795,153	$125.67	1.29
Fearful - H	613,371	773,051	$125.79	1.26
Rational - H	595,055	768,753	$125.75	1.29
Results from 3 ad sets	**1,825,893** People	**2,336,957** Total	**$377.21** Total Spent	**1.28** Per Person

As shown in figure (8), Facebook provides the statistics needed to report each appeal's reach, impressions (number of times the ad was displayed), amount spent, and frequency. The analysis of the results is discussed in the following sections. Overall, the campaign reached a total of 1,825,893 Facebook users out of the total targeted audience. A total of $377 were equally divided on the 3 ad appeals. As previewed in figure (9), 690,000 females and 1,130,000 males have seen the ads.

Figure 9

The gender distribution of the total campaign reach



Campaign Interactions

Figure 10

Campaign appeals' performance from Facebook Ads Manager

Ad Set Name	Unique Clicks (All)	Cost per Unique Click (All)	Unique CTR (All)	Post Reactions	Post Shares	Post Saves	Post Comments
Hopeful - H	1,738	$0.07	0.28%	42	–	–	2
Fearful - H	1,755	$0.07	0.29%	28	4	–	–
Rational - H	2,026	$0.06	0.34%	58	4	1	–
Results from 3 ad sets	5,565 Total	$0.07 Per Person	0.30% Per Person	128 Total	8 Total	1 Total	2 Total

In figure (10), Facebook provides quantitative data of unique users who clicked, reacted to, shared, saved, or commented on each ad. When these insights are collectively measured against

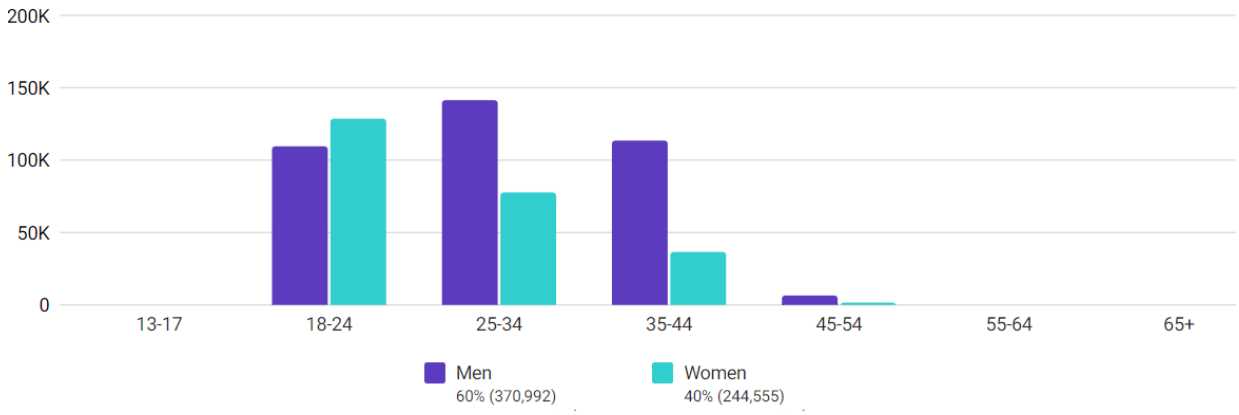
the reach per appeal, the appeal with the highest engagement level is the most effective appeal in terms of users' response to climate change messages.

Construct 1: Hope Appeal

Demographics

Figure 11

Demographic distribution of the hope appeal ad



According to the results reported by the Facebook Ads Manager, the hope appeal ad reached 370,992 men (60%) and 244,555 women (40%) out of the total reach which is around 616,000 users. In regards to the to the age range, 18% (n=109,544) of men and 21% (n=128,612) of women aged from 18 to 24 years old, while 23% (n=141,409) of men and 13% (n=77,679) of women aged from 25 to 34 years old. Moreover, there were 18% of men and 6% of women aged from 35 to 44 years old, while only around 2% of both genders fell under the category of users aged older than 45 years old. To conclude, the ads have reached more men than women in the age groups (25-34) and (34-44). On the other hand, the ads have reached a higher percentage of women than men in the youth age groups. The number of users reached per age group is based on the

Facebook algorithm. As previously noted in the methodology section, Facebook reach is based on ad relevance, budget, and quality score. It means that Facebook optimizes the campaign reach based on users' behaviors and interests. As such, Facebook displays the ads to users who may be interested in them. According to the demographic distribution of the ads, younger users are relatively more interested in climate change ads than elder users.

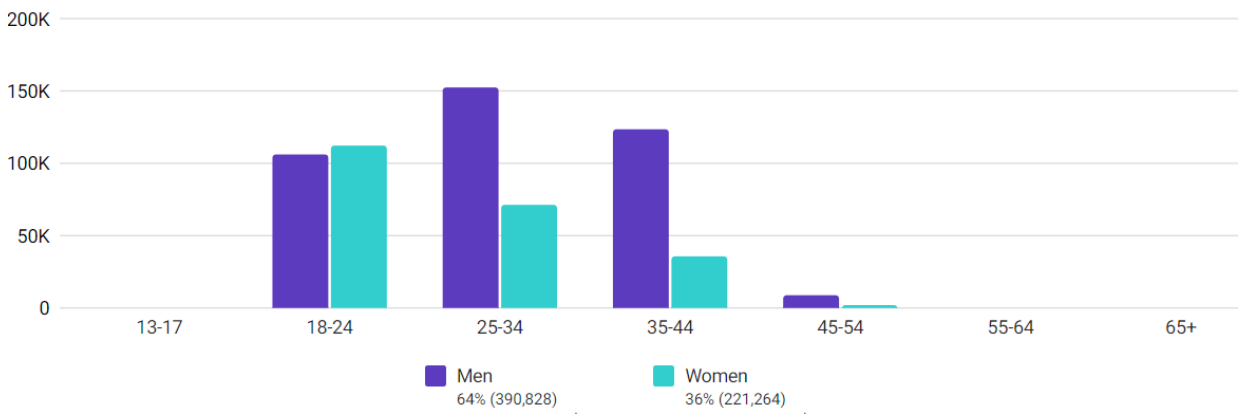
Performance. To provide an in-depth illustration of the previous figures, the ad with the hope appeal reached around 616,000 users from the target audience with an amount spent around $126. The average number of times a user was exposed to the ad is approximately 1.3 over the total duration of the campaign. The ad with the hope appeal had a total of 1,773 clicks, from which there were 1,738 unique clicks (one click per person) and 1,044 link clicks (total number of clicks on the call-to-action). As a result, the cost per click (CPC) is $0.07, cost per unique click is $0.07, the cost per link click is $0.12, and the unique click-through-rate (CTR) is 0.28%. Moreover, there were 44 post reactions on the hopeful ad and these reactions included 'like' and 'love' reactions. The post was neither shared nor saved by any of the users who got exposed to the ad, yet there were 2 comments on it.

Construct 2: Fear Appeal

Demographics

Figure 12

Demographic distribution of the fear appeal ad

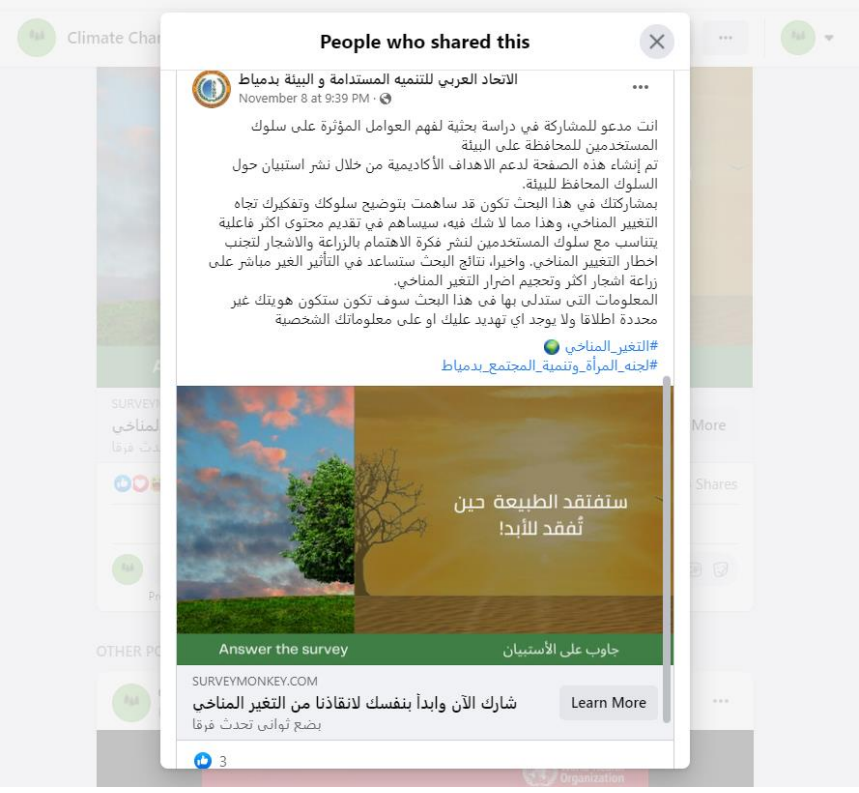


Reporting the fear appeal ad, out of the 613,000 users reached, total men reached is around 390,000 users from which 17% (n=106,089) aged from 18 to 24 years old, 25% (n=152,415) aged from 25 to 34 years old, 20% (n=123,493) aged from 35 to 44 years old, while the rest aged above 45 years old. On the other hand, out of the total women reached (n=221.264), 18% (n=112,232) aged from 18 to 24 years old, 12% (n=71,281) aged from 25 to 34 years old, 6% aged from 35 to 44 years old, while the rest aged above 45 years old. There is a significant difference between the total number of men and women reached in the age groups (25-34) and (35-44) where the total number of men reached is higher than women. On the contrary, the percentage of men in comparison to women in the age group (18-24) is slightly different (Figure 12).

Performance. As shown in the above figures, the ad promoting the fear appeal has reached over 613,000 users. The total spent in the fear appeal ad is as equal as the total spent in the hope appeal, which is $126. The ad frequency is 1.26 with around 773,000 total impressions. Regarding the clicks, the ad has 1,799 clicks, from which there are 1,755 unique clicks and 1,111 link clicks. As a result, the calculated cost per click (CPC) is $0.7, the cost per unique click is $0.07, and the cost per link click is $0.11. Dividing the total reach of the ad over the total unique clicks results in 0.29% unique click-through-rate (CTR). The fear appeal ad has 28 reactions and 4 post shares (figure 13).

Figure 13

An example of post shares by Facebook users for the fear ad appeal.

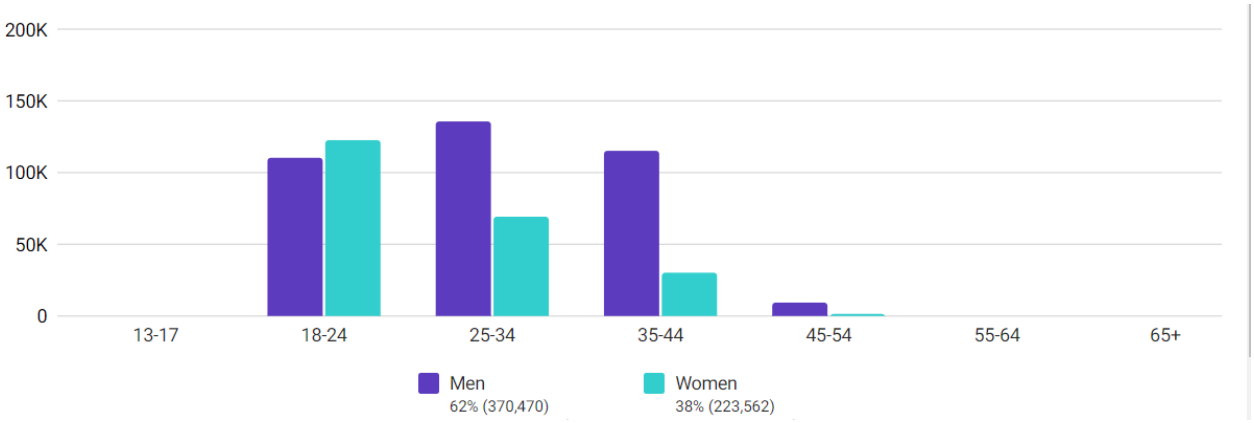


Construct 3: Rational Appeal

Demographics

Figure 14

Demographic distribution of the rational appeal ad



Regarding the rational appeal, the age group from 18 to 24 years old included 19% (n=110,309) men and 21% (n=122,594) women, while the age group from 25 to 34 years old represented men with 23% (n=135,647) and women with 12% (n=69,231). At the same time, 19% of men (n=115,172) and 5% of women (n=30,201) aged from 35 to 44 years old. Around 2% from the total users reached aged above 45 years old.

Performance. 595,055 users were exposed to the rational ad appeal as shown in figure (14). Alike the other ad appeals, the rational ad appeal spent $126 and had a frequency rate of 1.29. There were 2,080 total clicks on the rational ad appeal, from which there were 2,026 unique clicks and 993 link clicks. Therefore, the cost per click is $0.06, the cost per unique click is $0.06, the cost per link click is $0.13, and the unique click-through-rate (CTR) is 0.34%. As a conclusion, the rational ad appeal has the highest number of post reactions (n=58), with 4 post shares and 1 post save.

As observed, the number of shares, comments, and post saves are less than the number of post reactions on all ads. These results are due to the fact that a post reaction is the easiest interaction; unlike comments and shares that require more effort, time, and involvement from the users. The same applies to the feedback responses on the landing pages of each ad appeal.

Feedback Form

With respect to the feedback form on the landing page of the hope appeal ad, out of the 1,773 clicks, 3 responses were submitted. Out of the total 1,111 link clicks on the fear appeal ad, 2 responses were submitted. Lastly, only one response was submitted on the rational appeal ad out of 993 total link clicks. Although the responses are considered respectively low, users at the awareness stage are not required to provide information as much as acquire knowledge. Usually, awareness campaigns' objective is to promote information rather than ask users to convert or perform an action. In this case, these results indicate that individuals, when exposed to climate change messages on social media during the awareness stage, are not likely to perform an action that require time and cognitive involvement.

Hope Appeal

Table 4

Responses from the feedback form of the hope appeal

Total Responses (3)	**Do you understand the ad?**	**I find the ad:**	**I feel involved with the topic when I saw the ad**	**Climate Change should be given top priority**
Response 1	May be	Informative	Agree	Strongly Agree
Response 2	Yes	Cheerful/positive	Agree	Agree
Response 3	Yes	Cheerful/positive	Agree	Strongly Agree

The results of the feedback form responses show that all respondents supported the importance of climate change based on their responses on the item “Climate Change should be given top priority”. Based on the responses on the items “Do you understand the ad?” and “I find the ad:”, only one respondent was not sure about her/his understanding of the ad and found it informative. On the other hand, respondents who were certain that they understood the ad found it cheerful and positive.

Fear Appeal

Table 5

Responses from the feedback form of the fear appeal

Total Responses (2)	**Do you understand the ad?**	**I find the ad:**	**I feel involved with the topic when I saw the ad**	**Climate Change should be given top priority**
Response 1	Yes	Cheerful/positive	Strongly agree	Strongly agree
Response 2	Yes	Threatening	Agree	Strongly agree

According to the above table, both respondents strongly agreed that climate change should be given top priority and felt involved when they saw the ad. Meanwhile, one respondent found the ad cheerful, while another found it threatening.

Rational Appeal

The rational appeal had only one response that stated that she/he understood the ad and found it informative. The respondent also chose ‘neutral’ when asked about her/his involvement level with the topic and if she/he agrees that climate change should be given top priority.

As a conclusion from the feedback responses, the ad appeal did not significantly influence the number of responses, although the ads reached 1.8 million users. However, the ad appeals resulted in different post engagements, which is the dependent variable of this study that is measured with respect to the feedback responses and other performance insights.

Construct 4: Post Engagement

Table 6

Components of measuring the post engagement level per ad

Factor	Hope Appeal	Fear Appeal	Rational Appeal
Link Clicks	1,044	1,111	993
Post Reactions	42	28	58
Post Shares	0	4	4
Post Saves	0	0	1
Post Comments	2	0	0
Feedback Responses	3	2	1
Total Engagement	1,091	1,145	1,057

Post engagement is a dependent variable in this study where the ad appeal that achieved the highest level of audience engagement is the most effective ad appeal in communicating climate change messages. As previously mentioned in the conceptual model and as defined by Facebook for Business, post engagement is the sum of link clicks, reactions, shares, saves, and comments. In this study, the post engagement is calculated based on the sum of these factors in addition to the number of feedback responses generated from each appeal.

Testing Research Question

The nature of the quantitative data produced from this experiment does not allow the application of inferential statistics. The aggregated data from the Facebook Ads report are clear enough to be interpreted. As displayed in table (6), the post engagement is calculated so that this study can build a conclusion to RQ.

> *RQ*: Which ad appeal generates the highest audience engagement when promoting climate change mitigation on social media?

Answering this research question, the fear appeal generates the highest audience-engagement in comparison with the hope and rational appeals. This result is presented through the total post engagement per ad. Fear appeal generated 1,145 post engagements, while hope appeal generated 1,091 and rational appeal generated 1,057.

Method 2: Survey

Reliability Statistics

Table 7

Reliability statistics of variables' scales

Scale	No. of items	Cronbach's alpha
Attitude	18	0.705
Subjective Norms	4	0.842
Perceived Behavioral Control	3	0.551
Behavioral Intention	3	0.711

Reliability score is an indicator of the consistency of results if the same items/survey questions were used under the same conditions. Therefore, a reliability analysis was set up to conclude the reliability of the scales used in this study. Scales used to measure attitude, subjective norms, and behavioral intention showed alpha values equal to 0.7, 0.8, and 0.7 respectively – all satisfactory values. The alpha value of perceived behavioral control, however, was only 0.6. There is more debate around the adequacy of alpha values of 0.6; some scholars find them workable, but others find them insufficient.

There are two considerations that can justify the reliability score of perceived behavioral control. Firstly, some researchers considered an alpha score less than 0.7 to be reliable. Cortina (1993) was one of the main scholars who addressed the importance of the value of alpha. He stated that an alpha value above 0.7 is great, but that as a reliability measurement, it is very sensitive and

should always be accompanied by contextual analysis to ensure that valid research is not unnecessarily excluded/struck down. Schmitt (1996) supported this notion when he denied that there is a general rule for an alpha score to be acceptable and that the value of alpha depends on the topic of the study. Subsequently, Taber (2017; 2018) in his analysis for the Cronbach's alpha score, proposed that alpha values of 0.5 or above are acceptable so long as the scores are convincingly explained. He also added that many scales can achieve an alpha score above 0.7 by repeating items with same meaning, leading to redundancy. Meanwhile, some scales can achieve an alpha score less than 0.7 because they consist of a limited number of items but can still be reliable (Taber, 2017; 2018). Secondly, the items used in this study to measure perceived behavioral control were adopted directly from the 2011 book "Predicting and Changing Behavior" by Fishbein and Ajzen, the creators of the theory of planned behavior used in this study. They are tested and reliable scales.

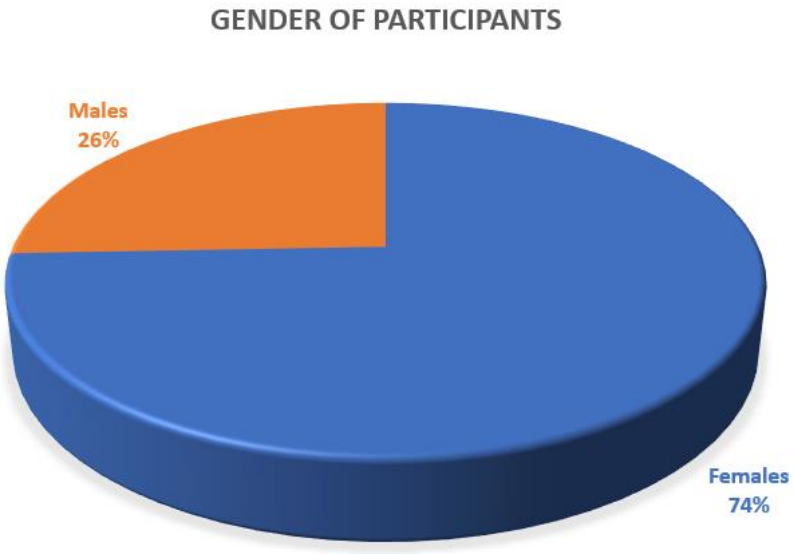
Description of the Sample

As highlighted in the methodology section, the survey was distributed online using convenient sampling. 516 participants filled out the survey with 100% completion of all survey questions. The data collected was analyzed using SPSS with the support of the Research Center at the American University in Cairo to provide the statistical analysis needed

Before exploring the relationship between the independent variables and the dependent variable, this section will display the age, gender, educational level, and geographics of the participants.

Figure 15

Gender of Participants



First, participants were asked to indicate their gender. The sample included 74.4% of females (n=384) and 25.6% of males (n=132) (Figure 15). Secondly, participants were asked about their age range. 68.8% (n=355) aged from above 20 to 35 years old, 17.4% (n=90) aged from 16 to 20

years old, while 9.1% (n=47) aged from above 35 to 45 years old, and finally 4.7% (n=24) aged more than 45 years old (Figure 16).

Figure 16

Age of Participants

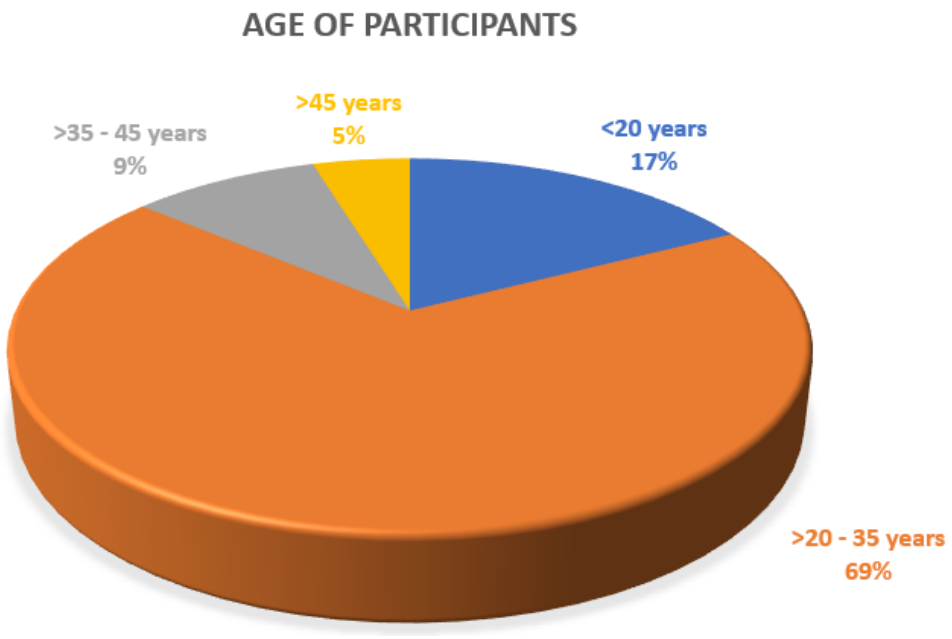
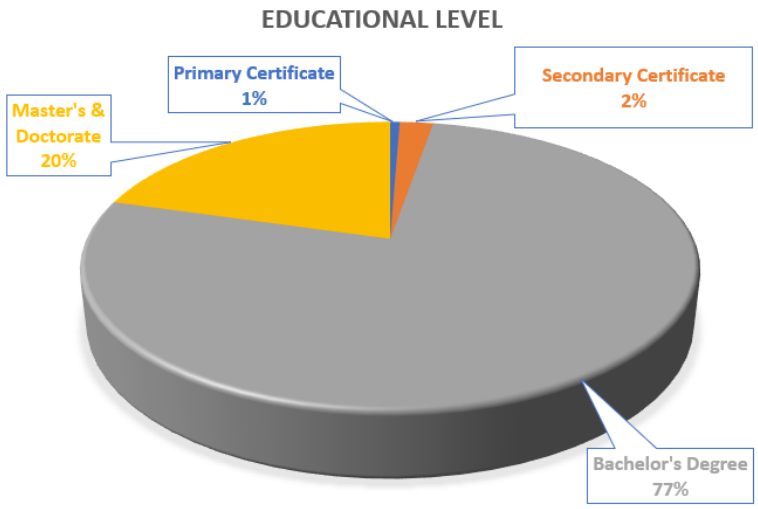


Figure 17

Educational level of participants



Regarding the participants' educational level, the majority stated that their highest educational level was a bachelor's degree with a contribution of 76.7% (n=396%) to the total sample, followed by 20.5% (n=106) who indicated their educational level as master's or doctorate. Only 2.7% chose Secondary Certificate or Primary Certificate (n=14) (Figure 17). The last question in the demographics section reflected the geographic distribution of the participants. 74.4% (n=384) stated Cairo as their governorate, 14.1% (n=73) stated Giza, 3.1% (n=16) stated Alexandria, 2.5% (n=13) stated 6th of October, and the rest of the sample were distributed among the remaining governorates. For example, the sample included participants from Monufia, Qalyubia, Dakahlia, Gharbia, Beheira, Kafr El Sheikh, Port Said, Beni Suef, Sharqia, Damietta, and the Red Sea. The latter set of participants contributed with 5.6% to the total sample of the study (table 8). The geographic distribution of the results indicates that the respondents are living in different areas across Egypt which emphasizes that the findings of this study are representative.

Table 8

Geographic distribution of participants

Governorate	Frequency	Percent
6 of October	13	2.5
Beheira	3	0.6
Dakahlia	4	0.8
Gharbia	4	0.8
Monufia	6	1.2
Qalyubia	7	1.4
Sharqia	1	0.2
Alexandria	16	3.1
Beni Suef	1	0.2
Cairo	384	74.4
Damietta	1	0.2
Giza	73	14.1
Kafr El Sheikh	1	0.2
Port Said	1	0.2
Red Sea	1	0.2
Total	516	100.0

Descriptive Statistics

Construct 1: Attitude. To measure this construct, the study adopted 3 sets of items. The first set consists of 5 items measuring the affective component of attitude (beliefs), the second set consists of 7 items measuring the behavioral, and the third set consists of 6 items measuring the cognitive component (knowledge).

Affective Component – Beliefs. The first question to measure the affective component was about participants' opinion whether people should care more about climate change. The majority of participants supported this statement where 51.4% (n=265) strongly agreed and 39.7% (n=205) agreed. This contributes by almost 91% to the total sample leaving only around 9% who chose ‘neutral’ (n=36), ‘disagree’ (n=6), and ‘strongly disagree’ (n=4).

The results of the previous item are similar to the results of the second item "Climate Change should be given top priority". The majority chose to agree with 42.6% (n=220) and strongly agree with 27.3% (n=141). However, the number of people who responded with ‘neutral’ was higher than item 1 representing 24.8% (n=128). The rest of participants selected ‘strongly disagree’ and ‘disagree’, representing a total of 5.2% of the total sample.

Likewise, participants supported the importance of climate change through agreeing and strongly agreeing on the following two questions. The first "It is annoying to see people do nothing for climate change problems" had 43.8% (n=226) agreed and 35.1% (n=181) strongly agreed on the statement, while 16.7% (n=86) were neutral regarding this statement. 3.5% (n=18) disagreed and only 1% (n=5) strongly opposed the statement. The second one which was "Climate Change is a threat to the world" was supported by 90.1% of respondents where 283 participants strongly

agreed, and 182 participants agreed to it. 34 participants chose ‘neutral’ representing 6.6% and the rest opposed the statement contributing with 3.3% (n= 17) to the total sample.

The last statement in this set is reverse coded to assure the attentiveness and consistency of respondents. The item stated, "People worry too much about climate change". The results showed consistency with the results of the previous items where 40.9% (n=211) strongly disagreed and 14.9% (n=77) disagreed. On the other hand, 14.3% (n=74) disagreed and only 2.5% (n=13) strongly agreed that people exaggerate in their distressing about climate change. The rest of participants represented 27.3% (n=141) being neutral about the subject matter.

Table 9

Descriptive statistics of beliefs (Mean – Standard Deviation)

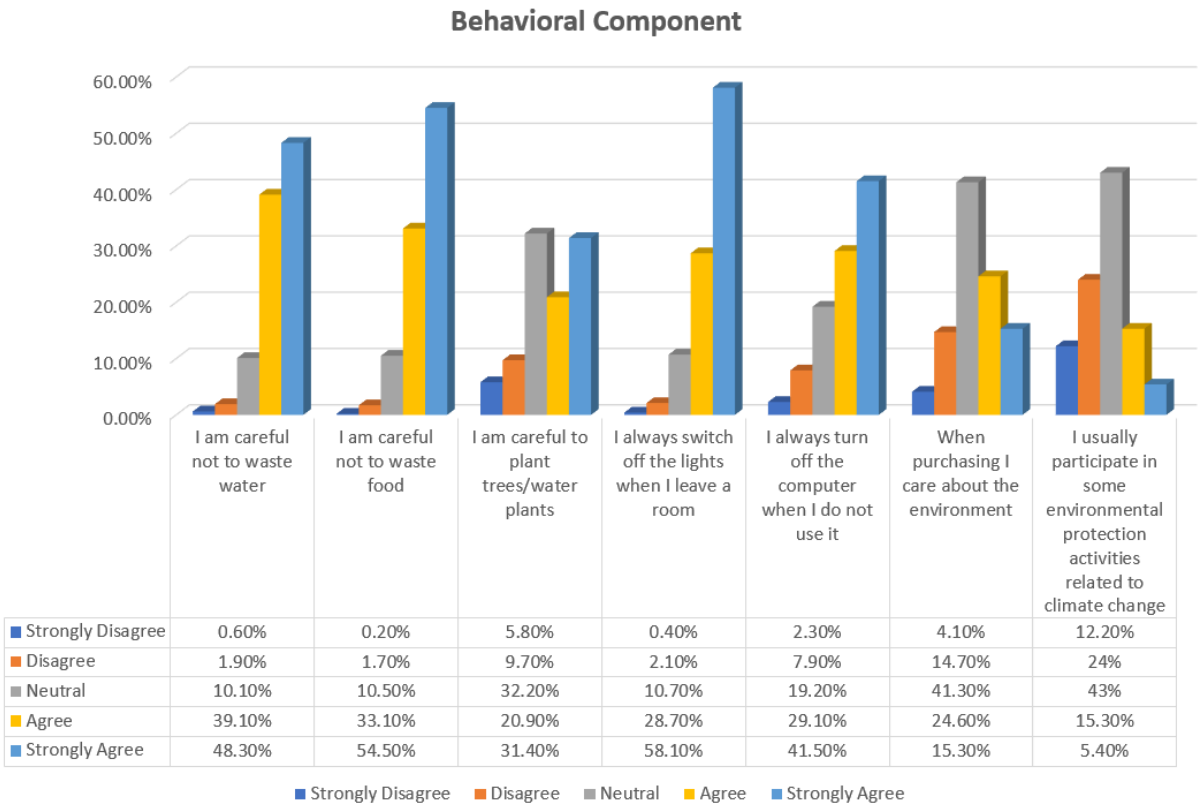
Items	N	Mean	Std. Deviation
People should care more about climate change	516	4.40	0.737
Climate change should be given top priority	516	3.91	0.868
It is annoying to see people do nothing for the climate change problems.	516	4.09	0.859
People worry too much about climate change.	516	3.51	0.994
Climate change is a threat to the world.	516	4.41	0.772

Overall, as shown in table (9), item 1 in the table achieved a mean score of 4.4 and SD=0.737, which is close to item 5 that had a mean score=4.41 and SD=0.772. The rest of the items in this set had a mean score of 3.51 for item 4 and 3.91 for item 2, and a SD ranging from 0.994 in item 4 and 0.868 in item 2. The mean scores and standard deviations of all items are similar with very slight differences between one item and another. This reflects consistency of participants' beliefs about climate change urgency.

Behavioral Component. The behavioral component includes 7 items to measure this component of attitude.

Figure 18

Results of Behavioral Component



	I am careful not to waste water	I am careful not to waste food	I am careful to plant trees/water plants	I always switch off the lights when I leave a room	I always turn off the computer when I do not use it	When purchasing I care about the environment	I usually participate in some environmental protection activities related to climate change
Strongly Disagree	0.60%	0.20%	5.80%	0.40%	2.30%	4.10%	12.20%
Disagree	1.90%	1.70%	9.70%	2.10%	7.90%	14.70%	24%
Neutral	10.10%	10.50%	32.20%	10.70%	19.20%	41.30%	43%
Agree	39.10%	33.10%	20.90%	28.70%	29.10%	24.60%	15.30%
Strongly Agree	48.30%	54.50%	31.40%	58.10%	41.50%	15.30%	5.40%

As previewed in Figure (18), most of respondents strongly agreed that they perform daily behaviors that help sustain the environment and reduce unnecessary consumption. These activities included not wasting water (strongly agreed=48.3%), not wasting food (strongly agreed=54.5%), switching off the lights (strongly agreed=58.1%), and turning off their computers (strongly agreed=41.5%). However, participants responded differently on the items that tackle behaviors which require higher level of involvement. The majority chose to be neutral when asked about their planting habits (neutral=32.2%), their green purchasing habits (neutral=41.3%), and their participation in environmental activities (neutral=43%).

Furthermore, total participants who strongly disagreed on performing an eco-friendly behavior did not exceed 5% across all items except for two: the first item tackles their planting habits (strongly disagree=5.8%), and the second item tackles their participation in pro-environmental initiatives (strongly disagree=12.2%). This result shows that the eco-friendly behaviors, which are least performed by participants required exerting more effort from participants as illustrated in figure (18). The rest of participants' responses were either ‘agree’ or ‘disagree’ with respect to the different items.

Table 10

Descriptive statistics of behavioral component (Mean – Standard Deviation)

Items	N	Mean	Std. Deviation
I am careful not to waste water.	516	4.33	0.780
I am careful not to waste food.	516	4.40	0.760
I am careful to plant trees/water plants	516	3.62	1.187
I always switch off the lights when I leave a room	516	4.42	0.795
I always turn off the computer when I do not use it	516	3.99	1.066
When purchasing I care about the environment (resources, energy, waste).	516	3.32	1.032
I usually participate in some environmental protection activities related to climate change	516	2.78	1.025

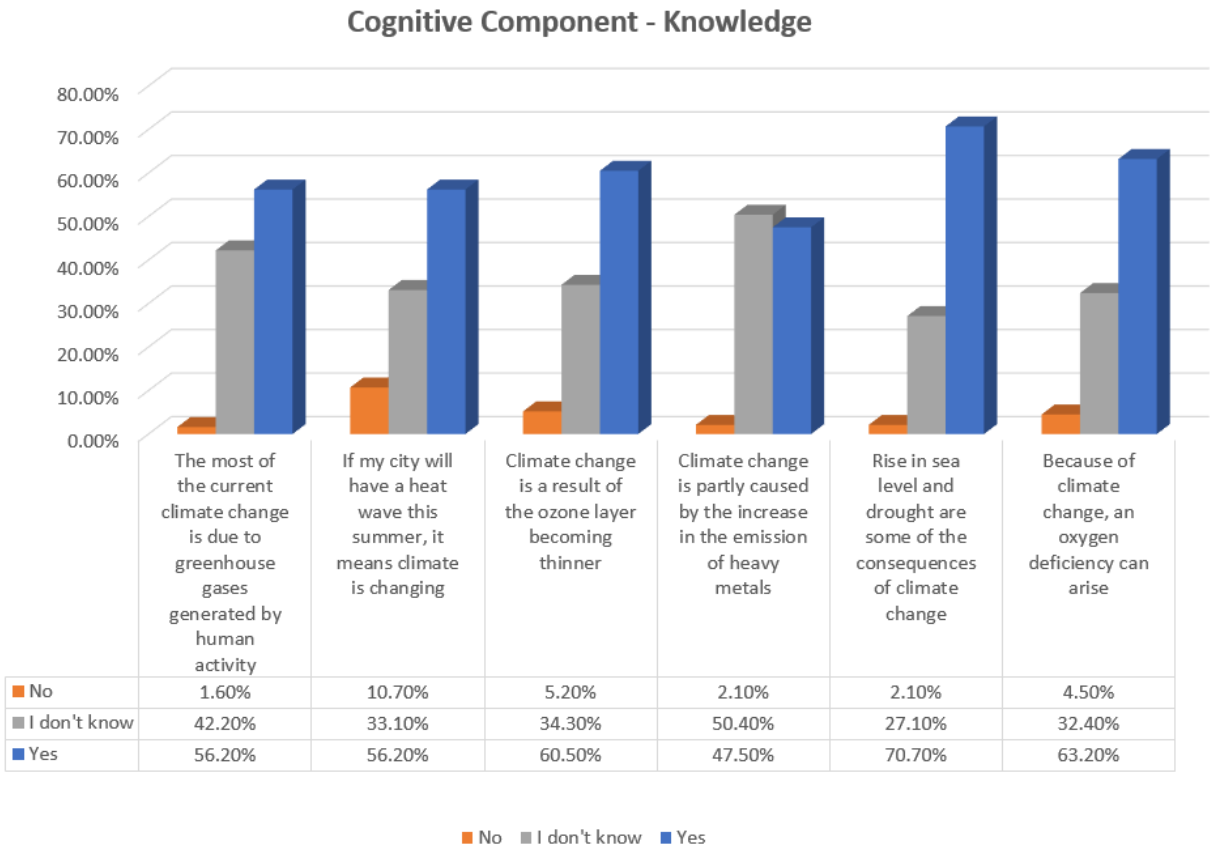
Table (10) presents the mean scores and SD of the items used to measure the behavioral component. It shows that the first, second, and the fourth items in the table have almost similar mean scores. The first item had a mean score of 4.33 with SD=0.780, the second item had a mean of 4.4 with SD=0.760, and the fourth item had a mean=4.42 with SD=0.795. The statistics reports that most respondents incline to not waste water, not waste food, and switch off the lights. On the other hand, the last item in the table had a mean score of 2.78 and SD=1.025. These scores show that participants are less likely to participate in environmental activities. The third item, the fifth

item, and the sixth item had mostly neutral responses. The third item had a mean score of 3.62 and SD=1.187, the fifth item's mean score=3.99 and SD=1.066, and the sixth item had a mean score of 3.32 and SD=1.032.

Cognitive Component – Knowledge. The cognitive component was measured using 6 items where participants reflect their knowledge about the causes and effects of climate change.

Figure 19

Results of Cognitive Component – Knowledge



	The most of the current climate change is due to greenhouse gases generated by human activity	If my city will have a heat wave this summer, it means climate is changing	Climate change is a result of the ozone layer becoming thinner	Climate change is partly caused by the increase in the emission of heavy metals	Rise in sea level and drought are some of the consequences of climate change	Because of climate change, an oxygen deficiency can arise
No	1.60%	10.70%	5.20%	2.10%	2.10%	4.50%
I don't know	42.20%	33.10%	34.30%	50.40%	27.10%	32.40%
Yes	56.20%	56.20%	60.50%	47.50%	70.70%	63.20%

The results of the cognitive component are complementary to the affective components. The beliefs that participants have about the importance of climate change were matching with their

knowledge about the matter. As shown in figure (19), the greater number of respondents know most of the causes of climate change including emissions of gases generated by human activities (yes=56.2%). Most participants are aware of some effects of climate change such as the increase in temperature during the summer (yes=56.2%), rising in sea level (yes=70.7%), and a possible deficiency in oxygen (yes=63.2%). However, about half of the respondents were not sure about the impact of the increase of emissions of heavy metals on climate change (I don't know=50.4%) and almost the other half responded correctly to the same item (yes=47.5%). Very few respondents chose "no" as an answer to any of the items in this section.

Table 11

Descriptive statistics of the cognitive component

Items	N	Mean	Std. Deviation
I am careful not to waste water.	516	4.33	0.780
If my city will have a heat wave this summer, it means climate is changing.	516	2.46	0.680
Climate change is a result of the ozone layer becoming thinner.	516	2.55	0.594
Climate change is partly caused by the increase in the emission of heavy metals.	516	2.45	0.539
Rise in sea level and drought are some of the consequences of climate change.	516	2.69	0.508
Because of climate change, an oxygen deficiency can arise.	516	2.59	0.576

In table (11), all items measuring the cognitive component have almost similar mean scores with close standard deviations. First item in the table has exactly the same mean score of the third item, which equals 2.55 with SD=0.529 and 0.594 respectively. The rest of the items have mean scores ranging from 2.45 to 2.69, and SD ranging from 0.508 to 0.680. Generally, the responses provided by participants are compatible.

Table 12

Descriptive statistics of attitude

	N	Minimum	Maximum	Mean	Std. Deviation
Attitude	516	1.39	3.00	2.5776	.21811
Valid N (listwise)	516				

As previewed in table (12), the results of three attitudinal components were combined into a 3-points scale to measure the mean score and the standard deviation of attitude. In summary, participants showed a moderate to strong positive attitude towards climate change.

Construct 2: Subjective Norms. This construct is an independent variable in this study that was measured using 4 items with a 5-points Likert scale. The construct tends to measure how the social circles of participants expected or approved a particular behavior. The behavior in this study is to promote, support or engage in climate change initiatives.

The first item is “Most of the people important to me think that they should engage in planting trees activities”. Most of respondents were undecisive, choosing to be neutral representing 32.6% (n=168) of total responses. Following that, 143 participants chose “agree” (27.7%), while 18.6% chose “disagree” (n=96). The rest chose ‘strongly agree’ (12.6%) or ‘strongly disagree’ (8.5%). With respect to raising awareness about climate change, 35.7% (n=184) mentioned that it is expected of them to raise awareness about it, 34.5% (n=178) chose to be neutral, 14% (n=72) strongly agreed, 12.6% (n=65) disagreed, and very few participants preferred to strongly disagree, representing only 3.3% of the total sample (n=17).

The third item in this set stated, "My family or friends think that I should engage with/support a climate change prevention activity/initiative". Most respondents (40.9%) were neutral. The rest of respondents were split between ‘disagree’ with 21.5% (n=111) and ‘agree’ with 22.5% (n=116). A few respondents were inclined to strongly disagree representing 7.2% (n=37) and strongly agree representing 7.9% (n=41%). The fourth and last item was "Most of the people like me engage in a climate change prevention activity/initiative". The majority preferred to respond with ‘neutral’ representing 40.7% (n=210), while ‘disagree’ and ‘agree’ received similar number of responses. 128 participants chose ‘disagree’ (24.8%) and 114 participants chose ‘agree’ (22.1%). Again, very few people responded with ‘strongly disagree’ (8.1%) and ‘strongly agree’ (4.3%).

Table 13

Descriptive statistics of subjective norms

Items	N	Mean	Std. Deviation
People who are important to me think I should plant/ help in planting trees	516	3.17	1.132
It is expected of me that I raise awareness about climate change	516	3.44	0.989
My family or friends think that I should engage with/support a climate change prevention activity/initiative	516	3.03	1.023
Most of the people like me engage in a climate change prevention activity/initiative	516	2.90	0.978

As shown in table (13), participants tended to be -more or less – neutral when they were asked about people's expectations of how they should behave regarding climate change mitigation. This indication could be concluded from the mean scores of the 4 items that are 3.17, 3.44, 3.03, and 2.90 respectively. Moreover, SD ranged from approximately 0.9 to 1.1, this means that the deviation from the mean score is very slight across all items.

Construct 3: Perceived Behavioral Control. The perceived behavioral control was measured using 3 items on a 5-points Likert scale. The first item was "I am confident that I could support an initiative to prevent climate change". 201 participants agreed that they are confident that they can engage in such an act (39%), while 187 participants chose “neutral” (36.2%). The rest of respondents were divided into 12.2% (n=63) who strongly agreed, 8.9% who disagreed (n=46), and 3.7% who strongly disagreed (n=19). The second item requested participants to indicate how easy it is to support an environmental initiative. The options 'neutral' and 'agree’ had almost the same number of responses. The former was chosen by 161 participants (n=31.2%) and the latter was chosen by 160 participants (n=31%). Meanwhile, 122 participants disagreed with the statement (23.6%), 47 participants strongly agreed (n=47), and only 26 participants strongly disagreed representing 5% of the sample. The last item had slightly different results, stating "The decision to take part in a climate change prevention initiative is entirely up to me". The majority of participants chose to agree with the statement (48.8%) and strongly agree with it (26.2%). Only 19.6% were neutral; unlike the results of the previous two items. The rest of participants, representing 28% of the sample, replied with ‘disagree’ (4.3%) and ‘strongly disagree’ (1.2%).

The results convey that the majority of participants has a high level of perceived behavioral control. They believe that supporting or engaging with climate change initiatives is a behavior that they are able to perform. Yet, some of the participants remained undecisive and the minority of participants admitted that they have no control over performing such a behavior.

Table 14

Descriptive statistics of perceived behavioral control

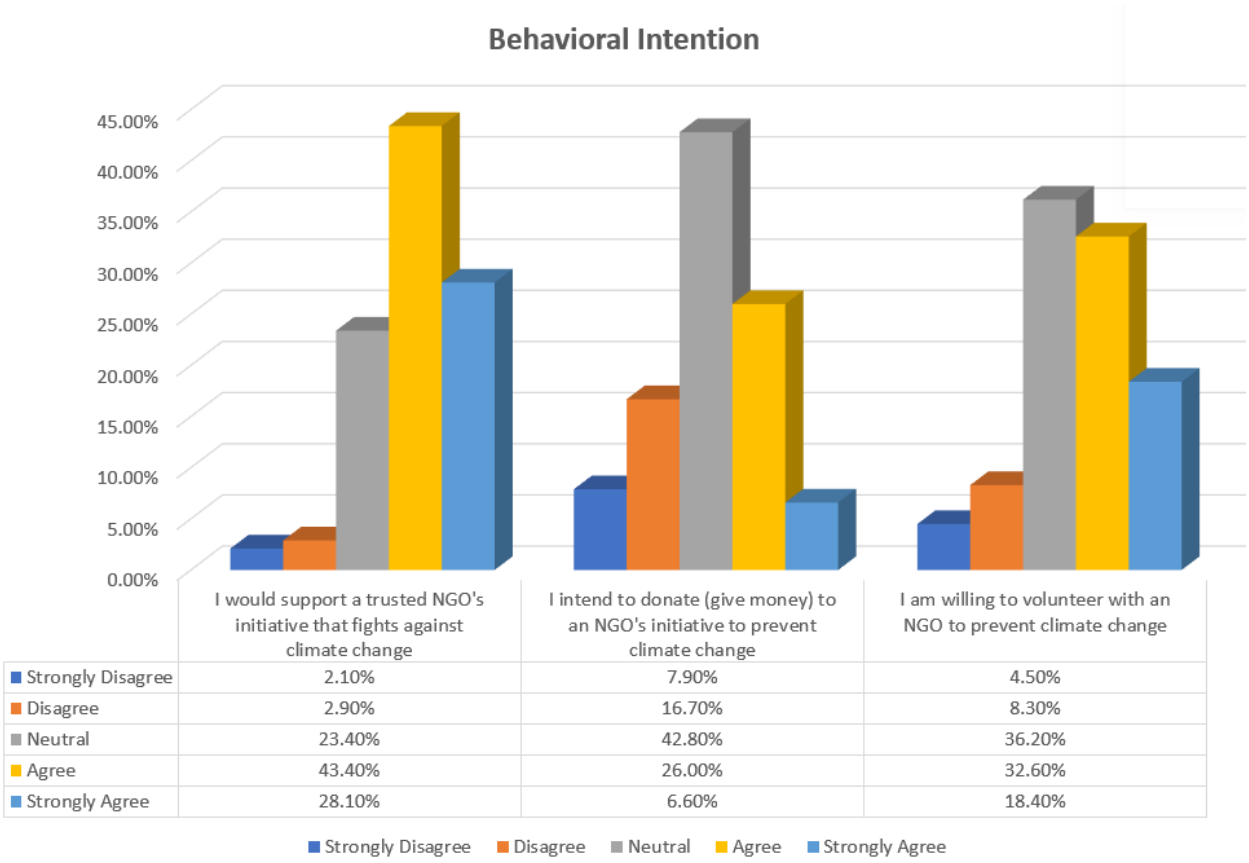
Items	N	Mean	Std. Deviation
I am confident that I could support an initiative to prevent climate change	516	3.47	0.946
For me, to support an environmental act/initiative is an easy	516	3.16	1.044
The decision to take part in a climate change prevention initiative is entirely up to me	516	3.95	0.855

As previewed in table (14), the first item in the table had a mean score = 3.47 with SD=0.946, the second item had a mean=3.16 with SD=1.044, and the third item had a mean=3.95 with SD=0.855. These figures show that there are no contradictions between answers of one item with another. Thus, these responses are reliable.

Construct 4: Behavioral Intention. The behavioral intention represents the dependent variable in this study. All previous constructs are measured with respect to participant's intention to engage or support climate change initiatives by NGOs. The behavioral intention was measured based on 3 items using a 5-points Likert scale.

Figure 20

Results of Behavioral intention to support NGO's climate change initiatives



	I would support a trusted NGO's initiative that fights against climate change	I intend to donate (give money) to an NGO's initiative to prevent climate change	I am willing to volunteer with an NGO to prevent climate change
Strongly Disagree	2.10%	7.90%	4.50%
Disagree	2.90%	16.70%	8.30%
Neutral	23.40%	42.80%	36.20%
Agree	43.40%	26.00%	32.60%
Strongly Agree	28.10%	6.60%	18.40%

As presented in figure (20), about 71.5% of participants intend to support climate change initiatives carried out by trusted NGOs; whereas those who agreed represented 43.4% and those who strongly agreed represented 28%. Nevertheless, when participants were particularly asked about volunteering or donating to climate change initiatives, they were inclined to be undecisive. 42.8% chose 'neutral' when they were asked about donating money to support climate change initiatives, and 36.2% chose 'neutral' when they were asked about volunteering with NGOs to mitigate climate change. This finding could be explained as participants are not sure whether they will engage in an activity to reduce climate change or not, although they are willing to express their support to NGOs' initiatives to mitigate climate change. In this case, most of participants are passive supporters rather than active supporters to NGOs' climate change mitigation initiatives.

Table 15

Descriptive statistics of behavioral intention

Items	N	Mean	Std. Deviation
I would support a trusted NGO's initiative that fights against climate change	516	3.92	0.905
I intend to donate (give money) to an NGO's initiative to prevent climate change	516	3.07	1.003
I am willing to volunteer with an NGO to prevent climate change	516	3.52	1.027

In table (15), the mean scores and SD of all 3 items were calculated. SD scores ranged from 0.9 to 1 across all items, while the mean score of the first item was 3.92, the second was 3.07, and the third was 3.52.

Regression Analysis

After analyzing the data collected, this section examines the relationship between the independent variables and the dependent variables to verify or reject the null hypotheses. The section is divided into two parts. First, a regression analysis is conducted to examine the relationship between each of the independent variables and the dependent variable (attitude and behavioral intention – subjective norms and behavioral intention – perceived behavioral control and behavioral intention). Second, another regression analysis is deployed to examine the collective contribution of the three variables on the dependent variable (attitude, subjective norms, perceived behavioral control and behavioral intention) to explore the effectiveness of the three variables to explain behavioral intention when they are measured collectively. Afterwards, conclusions are reached to reject or verify the null hypotheses of this study.

Attitude & Behavioral Intention. A regression analysis was undertaken to understand the nature of the relationship between attitude (independent variable) and behavioral intention to support climate change initiatives (dependent variable). As previously stated, the combination of the items of the three attitudinal components: the affective, behavioral, and cognitive represent attitude. Accordingly, the R square= 0.184 with $p<.001$, which conveys that the attitude contributes by 18% of understanding the behavioral intention to support NGOs' climate change initiatives. In addition, the regression analysis showed that $p<.001$, which indicates that the relationship between both variables is statistically significant. Hence, there is a relationship between attitude and the intention to support climate change initiatives.

Furthermore, it is worth mentioning that t= 10.779, the unstandardized b (*B1)* =1.535, while the standardized b (*SE B1)* =.429. This insight means that the effect of attitude (X1) on the behavioral intention (Y) is associated with a *B1* value of 1.535.

Table 16

Regression analysis and Coefficients of attitude and behavioral intention

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.429a	.184	.183	.70499
a. Predictors: (Constant), Attitude				

Coefficients						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	**(Constant)**	-.454-	.368		-1.231-	.219
	Attitude	1.535	.142	.429	10.779	.000
a. Dependent Variable: Behavioral Intention						

Subjective Norms & Behavioral Intention. Results of the regression analysis between the subjective norms and the behavioral intention showed that the R square=0.078 with p<.001. This finding indicates that the contribution of subjective norms to explain the behavioral intention is only around 8%. Furthermore, it means that the significance score is p<.001. Hence, there is a statistically significant relationship between both variables. In addition, it is important to highlight that the Unstandardized Beta (*B2*) equals 0.256 while the standardized Beta (*SE B2*) =0.279. The difference between (*B2)* and *(SE B2)* in the regression analysis refers to the alteration needed for the sample to reflect accurate results. In this case, the difference between (*B2)* and *(SE B2)* is very slight and does not need extreme alteration. Therefore, the effect of subjective norms (X2) on behavioral intention (Y) is associated with a value of *B2*=0.256.

Table 17

Regression Analysis and Coefficients of subjective norms and behavioral intention

Model Summary			
Model	**R**	**R Square**	**Std. Error of the Estimate**
1	.279a	0.078	0.74966
a. Predictors: (Constant), index3 Subjective Norms			

Coefficients					
Model		**Unstandardized Coefficients**	**Standardized Coefficients**	**t**	**Sig.**
		B	**Beta**		
1	**(Constant)**	2.702		21.414	0.000
	index3 Subjective Norms	0.256	0.279	6.582	0.000
a. Dependent Variable: index2 Behavioral Intention					

Perceived Behavioral Control & Behavioral Intention. Regarding perceived behavioral control, the regression analysis showed that the R square= 0.147 with p<.001. It also showed that t=9.400, Unstandardized Beta (*B3*) =0.433 and Standardized Beta (*SE B3*) = 0.383. Considering these results, it is concluded that perceived behavioral control (X3) could explain 15% of behavioral intention (Y) and that the relationship between the independent variable and the dependent variable is statistically significant where p<.001.

Table 18

Regression Analysis and Coefficients of perceived behavioral control and behavioral intention

Model Summary			
Model	**R**	**R Square**	**Std. Error of the Estimate**
1	.383a	0.147	0.72109
a. Predictors: (Constant), index4 Perceived Behavioral Control			

Coefficients					
		Unstandardized Coefficients	**Standardized Coefficients**		
Model		**B**	**Beta**	**t**	**Sig.**
1	**(Constant)**	1.980		11.982	0.000
	index4 Perceived Behavioral Control	0.433	0.383	9.400	0.000
a. Dependent Variable: index2 Behavioral Intention					

After analyzing the data collected, this section examines the relationship between the independent variables and the dependent variables to verify or reject the null hypotheses. The previously calculated statistics examined the effect of each variable separately on behavioral intention and showed that they have a statistically significant relationship with behavioral intention. Consequently, another regression analysis is deployed to provide an in-depth illustration of the collective effect of all variables on behavioral intention if they existed altogether.

Table 19

Regression analysis and Coefficients of the three variables and behavioral intention

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.502a	.252	.248	.67648
a. Predictors: (Constant), index4 Perceived Behavioral Control, Attitude, index3 Subjective Norms				

Coefficients						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	**(Constant)**	-.674-	.360		-1.875-	.061
	Attitude	1.174	.153	.328	7.692	.000
	index3 Subjective Norms	.037	.040	.040	.917	.360
	index4 Perceived Behavioral Control	.294	.048	.260	6.124	.000
a. Dependent Variable: index2 Behavioral Intention						

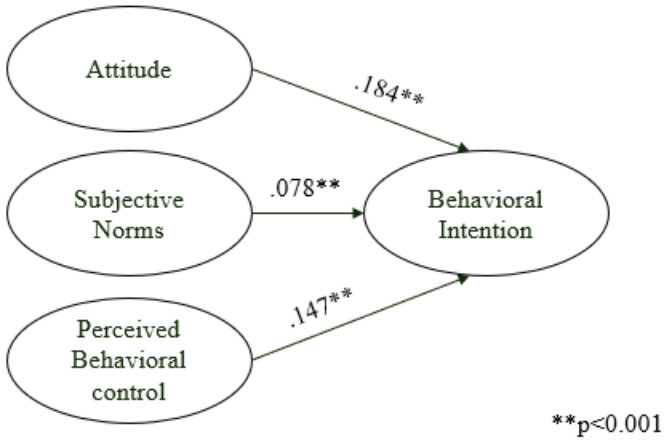
As illustrated in the above table (19), this study concludes that the total contribution of this model in explaining behavioral intention is around 25%, where R square=.252. This study assumes that individuals' attitude, subjective norms, and perceived behavioral control explain around 25% of their intention to support climate change mitigation initiatives. Furthermore, the regression analysis conducted to measure the relationship between the three constructs and the behavioral intention showed that there is no statistically significant relationship between subjective norms and behavioral intention in the presence of attitude and perceived behavioral control as independent variables as shown in table (19). Nonetheless, the relationship between subjective norms only and behavioral intention is statistically significant as previously mentioned in the above section.

The regression analysis also showed that attitude has a value of t=7.692, subjective norms have a value of t=.917, and perceived behavioral control has a value of t=6.124. The magnitude of T for each independent variable indicates to which extent the null hypothesis is rejected. In addition, the Standardized Beta indicates the strength of the effect of each variable in this model in explaining the dependent variable. For instance, attitude has the strongest effect on shaping behavioral intention (*SE B1*=.328) followed by perceived behavioral control (*SE B3=.260).*

Testing Hypotheses

Figure 21

Results of the regression analysis of the variables' effect on behavioral intention



NH01: There is no relationship between individuals' attitude towards climate change and their intention to support climate change initiatives of NGOs.

The results of this study show that there is a relationship between individuals' attitude towards climate change and their intention to support climate change initiatives of NGOs. Hence, the null hypothesis is rejected.

NH02: There is no relationship between subjective norms and the intention to support climate change initiatives of NGO.

This study reached two conclusions concerning the relationship between subjective norms and behavioral intention. Firstly, there is a statistically significant relationship between subjective norms and behavioral intention when subjective norms are measured individually. Secondly, there is no statistically significant relationship between subjective norms and behavioral intention when

subjective norms are accompanied by attitude and perceived behavioral control. In this case, we cannot verify the null hypothesis, because, in a particular condition, subjective norms affect behavioral intention. Thus, the null hypothesis is rejected.

NH03: There is no relationship between individuals' perceived behavioral control and their willingness to support climate change initiatives of NGOs.

Findings of this study confirmed that there is a statistically significant relationship between perceived behavioral control and explaining individuals' intentions to support climate change initiatives in Egypt. Therefore, the null hypothesis is rejected.

Chapter Six

Discussion and Conclusion

This study investigates the optimal methods of promoting an awareness of climate change mitigation and roots for a positive change in attitudes and behavior towards it. On the one hand, it aims at establishing an initial understanding of climate change communication appeals with the purpose of encouraging positive attitudes towards climate change mitigation. On the other hand, it strives to provide an analysis for the Egyptians' behaviors that support climate change initiatives launched by non-governmental organizations. This ultimately leads to finding an explanation for how both, dependent and independent variables relate to each other in the light of the *elaboration likelihood model* and the *theory of planned behavior*. Pondering over the findings of former studies, this work attempts to connect the dots and draw a conclusion, highlighting the importance of each variable in climate change communication and pro-environmental behavior in Egypt.

Communication Appeals

The study uses a Facebook advertising campaign to test the effectiveness of three main appeals: rational, hope, and fear appeals. The results show that each ad appeal was effective in tackling certain performance criteria. For instance, the hope appeal received the highest number of clicks versus fear appeals and rational appeals. Meanwhile, the rational appeal achieved the highest click-through rate. The most effective appeal is chosen based on the performance criteria targeted by the researcher or the practitioner. For this study, the target is to measure advertisement effectiveness with respect to the post engagement. Based on the results of the study, the fear appeal generated the highest post engagement in comparison with the hope and rational appeals. Post engagement is a sign of the audience's interest in responding to climate change messages, by

clicking on the link to learn more about climate change mitigation, or by expressing their positive attitude towards the subject matter using ‘like’ and ‘love’ post reactions. In fact, some of the previous literature that studied communication appeals conclude that fear appeal in climate change communication was effective in persuading audiences. Ettinger et al. (2021) noted that fear appeals play an efficient role in shaping attitudes and risk perception about climate change. Also, Tannenbaum et al. (2015) supported the impact of fear appeal on audience engagement.

Concerning other performance criteria, such as cost per click, the study shows that there is no significant difference between the cost per click for each (average CPC= $0.07). This cost per click is relatively low in comparison to the global average cost per click across different industries. According to WordStream (2021), a global market research company, the average CPC is $1.72. Meanwhile, ADCostly (2021), a Facebook ad cost analysis tool, reports that the average cost per click for promoting “Environmental Protection” on Facebook is $0.58. In consideration of both reports, the cost per click for the fear ad appeal is lower than the average CPC reported. This conclusion can help practitioners estimate the expenses of launching a Facebook advertising campaign and what the expected outcomes are. It also reflects the campaign performance level in comparison to the reported global advertising campaigns.

Generally, the results of the advertising campaign manifest the status quo in Egypt regarding climate change mitigation. They reflect the current level of the Egyptian users’ potential interest in interacting with climate change messages and present their preference of emotional or rational messages as well. Furthermore, they pave the way for establishing an understanding of the effectiveness of each appeal on ad performance. Creating user-engaging content is the first step towards raising awareness on the issue of climate change, building positive attitudes, and eventually altering pro-environmental behaviors.

Attitude

This study adopts the theory of planned behavior since it has firm foundations of describing the factors affecting behavioral intention. The findings of this study are consistent with the findings of previous studies interested in environmental behavior and adopt the theory of planned behavior. For instance, this study found that attitude is the most prominent predictive of behavioral intention towards supporting climate change initiatives. Likewise, most of the literature that addressed pro-environmental attitude and behavior promoted for the importance of attitude in affecting behavioral intention, which is an indicator of the actual behavior (Fishbein & Ajzen, 1985). As highlighted by Liu, Teng, & Han (2020), Rajapaksa et al. (2019), and Taufique and Vaithianathan (2018), attitude strongly contributes to the prediction of environmental behaviors. Also, Mobley et al. (2010) and Paço et al. (2010) supported the same notion. Secondly, as previously mentioned, the model in this study proposes an approach for measuring attitudinal components such as affective, behavioral, and cognitive components. They are measured to understand participants' positive or negative attitudes towards climate change mitigation. This study emphasizes their relationship with behavioral intention as prior scholars confirmed their importance in predicting behavioral intention. For instance, Paço and Lavrador (2017), and Wiek et al. (2011) emphasized the significance of combining beliefs and knowledge to identify pro-environmental behavior (Liu, Teng, & Han, 2020). This gives an opportunity to explore different dimensions of attitude and to strengthen the notion that attitude is a strong explanatory factor for behavioral intentions. Furthermore, the results of this study show that the relationship between attitude and behavioral intention is statistically significant. These results are similar to the conclusions of past scholars who explored the power of attitude regardless of the different approaches of measuring attitudes.

For example, Kim, Jeong, and Hwang (2013) have concluded that attitude is a statistically significant predictor of pro-environmental behavior of Americans and Koreans.

It is noteworthy that participants in Egypt realize the importance of climate change mitigation as per the survey responses. On measuring the cognitive component, responses of the participants indicate that they have an appropriate level of understanding of the importance of climate change mitigation and of how to reduce its effects. Participants were aware that climate change should be given top priority and believed that actions to mitigate it are required. Also, their responses show that they are conscious of many causes and effects of climate change.

Subjective Norms

In the literature review chapter, several debates on the effectiveness of subjective norms are highlighted (Cialdini & Trost, 1998; Culiberg & Elgaaied-Gambier, 2016; Kumar et al., 2017; Paul et al., 2016). This study proposes one more debate. On the one hand, subjective norms are statistically significant for shaping behavioral intention when they are the only independent variable measured against behavioral intention in the regression analysis. On the other hand, the contribution of subjective norms when added to attitude and perceived behavioral control was found not significantly impacting intention toward a green behavior. This indicates that subjective norms have the lowest impact, in comparison with attitude and perceived behavioral control, on behavioral intention. This is supported by the results of the regression analysis deployed on the whole model where attitude's SE B =.328, subjective norms' SE B= .040, and perceived behavioral control's SE B=.260. This shows that attitude has the highest impact on behavioral intention followed by perceived behavioral control, and subjective norms are the least influential on behavioral intention. In the literature, it was argued by Taufique & Vaithianathan (2018) that collective communities, such as India and China, and which are similar to Egypt, are driven by

social norms and others' opinions more than personal choices as in the independent communities. In that sense, it is expected that subjective norms were to be as significant when accompanied by attitudes and perceived behavioral control. On the other hand, such an outcome is sequential to the comments received on the items measuring subjective norms during the pretest phase. In the pretest section, it is clarified that participants found it strange to ask about the opinions of their families and friends towards an action that they may perform.

Meanwhile, the results provide some interesting insights, especially when comparing how participants replied to the items measuring "descriptive norms", such as: "It is expected of me….", and how they replied to the injunctive norms "Most of the people like me…". As discussed in the theoretical framework of this study, descriptive norms represent how people approve a behavior, and injunctive norms represent how that behavior can be popular within a group of people. As such, the mean score for the item: "It is expected of me to raise awareness about climate change" = 3.44, while the mean score for: "Most of the people like me engage in a climate change prevention initiative" = 2.90. Such an outcome can indicate that some norms are more influential on participants' behavioral intention than others. Participants mostly do not look forward to performing similar behaviors to those people like them. Yet, they aim at meeting the expectations of their families or friends. Connecting all findings together, it can be deduced that the uncertainty of the effectiveness of subjective norms in the model may be caused by the variance in results between descriptive and injunctive norms.

Perceived Behavioral Control

The results of this study confirm the significance of perceived behavioral control in predicting behavioral intention towards climate change initiatives. This supports Ajzen and Fishbein's modification of the theory of reasoned action, for adding perceived behavioral control

as a variable. The majority of participants in this study have a high level of perceived behavioral control to support climate action through NGOs initiatives. These results support the findings of studies carried out in different countries with various cultural contexts. For example, Schwepker & Cornwell (1991) emphasized the importance of self-perceived control in their study of eco-friendly behaviors in the United States, and Ando et al. (2010) had similar findings on studying pro-environmental behavior in Japan and Germany. This reveals that different cultural backgrounds do not make a difference on individuals' perceived behavioral control. Furthermore, results manifest that the majority of respondents chose "neutral" on the item "Supporting climate change initiatives is an easy behavior", while they agreed they had full control over what they do in response to other items. The said results indicate the presence of some existing barriers that relatively hinder supporting climate change initiatives in Egypt. The results of this item can be confirmed by the literature review, which previously highlighted that most climate change efforts have been directed towards governmental agencies and policy makers, while minimal attention was given to engaging the public in the climate change discourse; almost no initiatives focused solely on reducing human activities that lead toclimate change. Accordingly, it is assumed that participants expressed their unease to engage in such a behavior as a consequence of the minimal efforts exerted to engage the public. Another reason could be that they are not aware of such initiatives in the first place. Participants may not be well-informed about the available opportunities to engage in climate change mitigation initiatives in Egypt.

Behavioral Intention

The findings of this study support the existence of a statistically significant relationship between three constructs (attitude – subjective norms – perceived behavioral control) and the dependent variable (behavioral intention). The results demonstrate that each variable on its own is

statistically significant in explaining participants' intent to support NGOs' initiatives to reduce climate change effects as concluded from the R square of attitude and behavioral intention = 0.184, the R square of subjective norms and behavioral intention =0.078, and the R square of perceived behavioral control and behavioral intention = 0.147. This indicates the strength level of each variable in predicting behavioral intention. Additionally, their behavioral intent is a predictor of their actual future behavior, as asserted by several scholars including Bamberg and Möser (2007), Webb and Sheeran (2006), Bamberg and Schmidt (2003), and Stern (2000). The results of this study are similar to the findings of past studies exploring pro-environmental behavior in different regions. In a study that adopted the theory of planned behavior by Taufique and Vaithianathan (2018) in India, results showed that attitude is a dominant factor in shaping behavioral intention. Same results can be concluded from this study and are also established in similar studies by Chan and Lau (2002) and Ramayah et al. (2012). Even more, Taufique and Vaithianathan's (2018) study argued that subjective norms are insignificant in predicting pro-environmental behavior. This sides with the debate over the effectiveness of subjective norms raised in previous literature (Kumar et al., 2017; Paul et al., 2016) and proposed in this study as well. In another region, Taiwan, Chen (2016) concluded that the three variables (attitude – subjective norms – perceived behavioral control) in the theory of planned behavior model are statistically significant for explaining the behavioral intention of citizens in Taiwan to reduce climate change risks. However, He added that perceived behavioral control was statistically insignificant when the variable "moral obligation" was added to the model. This explains that the level of significance of each construct varies according to the presence of other factors. It also emphasizes the insights this study proposed.

In that sense, the three variables this study could explain 25% of the participants support to climate change initiatives as per the regression analysis deployed to evaluate the proposed

model. This is a reminiscent of the results of a similar study in Taiwan that adopts the theory of planned behavior model. The findings of that study revealed that the mentioned model accounted for 39.76% of the behavioral intention of participants to reduce carbon emissions, with the aim of reducing climate change effects in Taiwan (Chen, 2016). This finding is particularly important, since it sheds light on how human behavioral intention can be evaluated. Scientists interested in behavioral analysis concluded several internal and external factors, shaping human behaviors, other than attitude, social norms, and locus of control. Namely, Stern (2000), Courtenay-Hall and Rogers (2002), Juárez-Nájera et al. (2010), and Lin and Huang (2012) endorsed internal factors such as values, emotional state, psychological traits, and external factors such as economic status, cultural norms, and social background to predict environmental behavior. This means that the 25% presented through this model is a convenient and reasonable result in social science. Moreover, significant norms as previously stated are insignificant when it comes to shaping behavioral intention at the presence of attitude and perceived behavioral control. So, the results of this study weigh the value of each variable, individually and collectively, in predicting behavioral intention.

Lastly, results of the items used to measure behavioral intention provide an overview of what behaviors individuals tend to do or not to do. As demonstrated in the results section, most participants chose “agree” on the item “I intend to support climate change initiatives...” in the behavioral intention section. Nonetheless, most of them chose “neutral” when they were asked specifically about their intent to donate for climate change initiatives. Meanwhile, when participants were asked about their intent to volunteer, the options “agree” and neutral” received almost similar number of responses (33%, 36% respectively). This reflects the type of behavior participants are more willing to carry out. Participants are more likely to be passive supporters as observed from the responses on “I intend to support climate change initiatives...” rather than

engage in complex behaviors such as donating or volunteering to support climate change mitigation. They are willing to express their support (passive act) to reduce climate change effects, yet they are less likely to donate to initiatives that reduce the effects of climate change. Since donating is a behavior that needs intellectual thinking, a suitable economic status, and may involve physical participation, most participants were undecisive about their willingness to donate to climate change initiatives. This conclusion can be useful for non-governmental organizations when they build their communication messages. Based on the findings, individuals are likely to respond positively to NGOs awareness campaigns for climate change mitigation. However, they are unlikely to respond to NGOs request to donate or volunteer to mitigate climate change.

Conclusion

Messages promoting climate change mitigation that adopt the fear appeal is the most effective in generating Egyptian audience engagement on social media. Hope and rational appeals can be effective as well in engaging the audience but not as effective as the fear appeal. There is an opportunity for future researchers to analyze how users perceived advertising for climate change mitigation on Facebook. Regarding the behavioral analysis, the findings of this work show that the theory of planned behavior provide a statistically significant description of the Egyptian audience behavioral intention toward climate change mitigation. The results of this study are consistent with past studies in the field of analyzing environmental behavior. It also presented eye-opening results to how climate change mitigation is perceived in Egypt. Attitude is the most dominant predictor of behavioral intention, while subjective norms have the lowest impact on it. This shows that individuals' behavior in collective communities is not influenced by the expectations of people's family and friends. The findings of the study also demonstrate that individuals seek to be passive

supporters to climate change mitigation rather than being active supporters through volunteering or donating to climate change mitigation initiatives.

Managerial Implications

One part of this study focused on developing communication strategies to help non-governmental organizations promote awareness about climate change risks and how human activities can be altered to mitigate climate change. Results from the Facebook experiment show that fear appeal is most effective at engaging Egyptian public with climate change. Fear appeal rather than rational or hope appeals prompt the audience to better read, process, and interact with climate change messages.

Additionally, this study highlights some advantages of Facebook advertising campaigns which can help non-governmental organizations promote their messages. Social media and Facebook in particular seem to be a good way for NGOs to communicate climate change mitigation. Facebook offers precise audience targeting settings in term of location, demographic and audience interest which makes it easier to target large and diverse audiences with specific messages. Facebook ads also provide a wide range of performance insights such as click-through-rates, page likes, conversions, and several other options that allow practitioners to understand their audience behavior. Finally, Facebook AB testing tool allows advertisers to compare ad performances.

Other findings show that the action rate (estimated as the number of actions an ad received divided by the number of impressions (times the ad was shown on Facebook in the given time period) is rather low. Liking posts on Facebook compared to taking an action such as post sharing, donating money, filling a form or engaging in an action that require more effort is a non-sacrificial act of participation, in other words a less costly and lower-level form of participation (Gerodimos

& Justinussen, 2015). individuals tend to be passive supporters rather than active supporters of climate change mitigation as previously noted. Such conclusions would help practitioners and organizations develop the appropriate call-to-action of their communication messages.

Lastly, this research launched a Facebook advertising campaign that targeted all cities in Egypt in order to collect representative and externally validated data. This study encourages practitioners to focus on one city at a time to compare between how users from different locations interact with the ads.

Recommendations for Future Research

- This study encourages scholars to consider Facebook AB testing tool as a modern digital tool to be utilized for future experimental studies. This study sheds light upon some advantages and developments of the Facebook AB testing tool. It shows how Facebook AB testing tool has the potential to produce reliable insights for academic research.
- Since this study focused on measuring the relationship between communication appeals and users-engagement, future research could examine the relationship between ad appeals and other performance criteria such engagement measured by click-through-rate (number of clicks on the call-to-action button out of total reach). In addition, future research should also assess which ad resonate more effectively with the audience by measuring both ad recall and ad conversions.
- This study suggests that future scholars can investigate the effect of merging rational and emotional appeals on audience engagement. Since this study examined the effect of each appeal on its own, different results could be concluded if the communication message is a mix of logic, hope, and threat.

- This study highlighted the effectiveness of attitude, subjective norms, and perceived behavioral control in explaining behavioral intention. It showed that each variable is significant per se; yet, when measured altogether, subjective norms were found to have a non-significant impact on pro-environmental intention. Future studies could further test the effectiveness of subjective norms on behavioral intention. The theory of planned behavior proposed in this study should be further tested to assess pro-environmental intentions in Egypt. For example, more data could be collected, and social norm could test separately the influences of friends and family.

- The focus of this study is to understand the factors affecting individuals' intent to mainly support the initiatives of non-governmental organizations to mitigate climate change. Thus, there is an opportunity for further studies to examine the determinants of individuals' intent to support governmental efforts. An analysis of how citizens would support non-governmental organizations or governmental organizations can be very helpful to understand the optimal method to communicate climate change mitigation in Egypt.

Limitations

Facebook AB testing is not extensively used in the academic field as an instrument for experimental studies. Therefore, this study had a limited number of precedents that endorsed such an instrument. Moreover, Facebook optimizes campaigns' reach based on the bidding budget and machine learning, and this is based on account history, budget, and ad relevance to the audience targeted. As such, more accurate results can be achieved with a higher budget, longer campaign duration, and an ad account with previous advertising history because it helps improve the Facebook algorithm reach users interested in climate change mitigation. A further limitation is that the advertising campaigns were clearly labeled -as requested by the ethical committee - as being

for sole academic purposes; consequently, a number of Facebook users might have been discouraged to interact with the ad, believing the ads have no useful or practical purpose.

Moreover, the Facebook ads were in Arabic, and the Facebook campaign is set to target users who completed or currently in the process of completing their higher education. Therefore, the results of the advertising campaign do not apply to users with lower educational levels or users who do not understand Arabic.

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Appendices

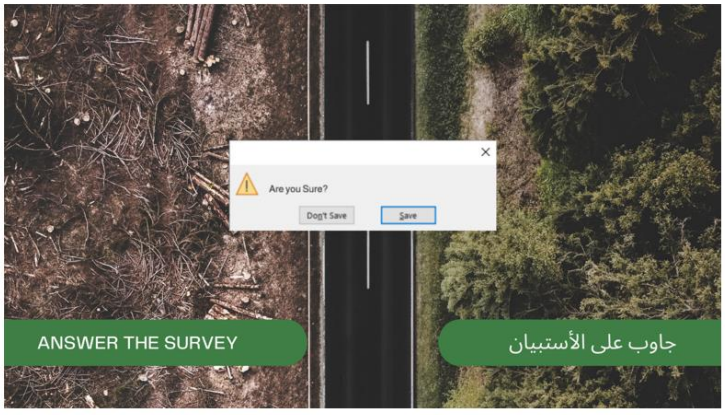
Appendix 1

Versions of the ad appeals (fear – hope – rational)

أليس هذا مخيفا؟ لا نستطيع فقدان المزيد من الأشجار، لا يوجد لدينا كوكب آخر .
ابدأ بنفسك لانقاذنا من التغير المناخي

Fear Appeal – Option 1

هل تعيش على حساب البيئة؟ حان دورك لتساعدنا في نشر الوعي
انضم إلى الجانب الأخضر و ابدأ بنفسك



Fear Appeal – Option 2

كل مُساهمة لمقاومة التغير المناخي تحُدث فرقا. ساعدنا في بناء مجتمع افضل لأطفالنا

ابدأ بنفسك لتوفير مستقبل افضل

Hope Appeal – Option 1

أغتنم الفرصة لتوفير بيئة انقى لمستقبل افضل. ساهم في نشر التوعية الآن و ابدأ بنفسك

Hope Appeal – Option 2

يجب زراعة ٦ اشجار كل شهر لتعويض ثاني أكسيد الكربون المنبعث. ابدأ بنفسك وشارك معنا لنشرالتوعية حول التغير المناخي

Rational Appeal – Option 1

ابدأ بنفسك وشارك معنا لنشرالتوعية حول التغير المناخي وتجنب اضراره

Rational Appeal – Option 2

Appendix 2

The Landing page from the ads

Appendix 3

Survey – English Version

First Section: Affective Attitudinal Component (Beliefs)

Using a 5 points-Likert scale ranging from strongly disagree (1) to strongly agree (5)

1. People should care more about climate change
2. Climate change should be given top priority
3. It is annoying to see people do nothing for the climate change problems.
4. People worry too much about climate change.
5. Climate change is a threat to the world.

Second Section: Behavioral Attitudinal Component

Using a 5 points-Likert scale ranging from strongly disagree (1) to strongly agree (5)

6. I am careful not to waste water.
7. I am careful not to waste food.
8. I am careful to plant trees/water plants
9. I always switch off the lights when I leave a room
10. I always turn off the computer when I do not use it
11. When purchasing I care about the environment (resources, energy, waste).
12. I usually participate in some environmental protection activities related to climate change

Third Section: Cognitive Attitudinal Component (Knowledge)

Using a 3 points-nominal scale (yes, no, I don't know)

13. Most of the current climate change is due to greenhouse gases generated by human activity.
14. If my city will have a heat wave this summer, it means climate is changing.
15. Climate change is a result of the ozone layer becoming thinner.
16. Climate change is partly caused by the increase in the emission of heavy metals.
17. Rise in sea level and drought are some of the consequences of climate change.
18. Because of climate change, an oxygen deficiency can arise.

Fourth Section: Behavioral Intention

Using a 5 points-Likert scale ranging from strongly disagree (1) to strongly agree (5)

19. I would support a trusted NGO's initiatives that fights against climate change
20. I intend to donate (give money) to an NGO's initiatives to prevent climate change
21. I am willing to volunteer with an NGO to prevent climate change

Fifth Section: Subjective Norms

Using a 5 points-Likert scale ranging from strongly disagree (1) to strongly agree (5)

22. People who are important to me think I should plant/ help in planting trees
23. It is expected of me that I raise awareness about climate change
24. My family or friends think that I should engage with/support a climate change prevention activity/initiative
25. Most of the people like me engage in a climate change prevention activity/ initiative

Sixth Section: Perceived Behavioral Control

Using a 5 points-Likert scale ranging from strongly disagree (1) to strongly agree (5)

26. I am confident that I could support an initiative to prevent climate
27. For me, to support an environmental act/initiative is an easy behavior
28. The decision to take part in a climate change prevention initiative is entirely up to me

Seventh Section: Demographics

Using multiple choice questions

29. Educational Level
30. Age
31. Gender
32. City

Appendix 4

Survey – Arabic Version

المبحث الاول: مكون الاتجاه الاول (المعتقدات)

بإستخدام مقياس ليكرت الخماسي (1= معارض بشدة ، 5= موافق بشدة)

1. يجب على الناس الاهتمام بالتغير المناخي
2. يجب إعطاء الأولوية القصوى لتغير المناخ
3. من المزعج ألا يبادر الناس لإيجاد حلول لمشاكل التغير المناخي
4. يقلق الناس من التغير المناخي أكثر من اللازم
5. التغير المناخي يشكل تهديدا للعالم

المبحث الثاني: مكون الاتجاه الثاني (السلوك)

بإستخدام مقياس ليكرت الخماسي (1= معارض بشدة ، 5= موافق بشدة)

6. أحرص على عدم إهدار المياه
7. أحرص على عدم إهدار الطعام
8. أحرص على زراعة النباتات\الأشجار
9. أطفئ الأنوار دائمًا عندما أغادر الغرفة
10. أحرص دائما علي إيقاف تشغيل الكمبيوتر عندما لا أستخدمه
11. أحرص علي أن أحافظ علي البيئة أثناء اختيار مشترياتي
12. أشارك عادة في بعض أنشطة حماية البيئة المتعلقة بتغير المناخ

المبحث الثالث: مكون الاتجاه الثالث (المعرفة)

باستخدام تعدد الخيارات (نعم، لا، لا اعلم)

13. يرجع تغير المناخ الحالي إلى الغازات الدفيئة التي تولدها نشاطات الإنسان
14. إذا شهدت محافظتي موجة حارة هذا الصيف ، فهذا يعني أن المناخ يتغير
15. يعتبر تغير المناخ نتيجة أن طبقة الأوزون أصبحت أرق
16. يرجع أحد أسباب التغير المناخي إلي زيادة انبعاثات المعادن الثقيلة
17. يعد ارتفاع مستوى سطح البحر والجفاف أحد عواقب التغير المناخ
18. قد يحدث نقص في نسبة الأكسجين بسبب تغير المناخ

المبحث الرابع: النية السلوكية

بإستخدام مقياس ليكرت الخماسي (1= معارض بشدة ، 5= موافق بشدة)

19. قد أدعم مبادرات لمنظمة غير- حكومية موثوقة لمكافحة التغير المناخي
20. أنوى التبرع (بالمال) لمبادرات منظمة غير- حكومية موثوقة لمقاومة التغير المناخي
21. أنا علي استعداد للتطوع مع إحدى مبادرات المنظمات غير- الحكومية الموثوقة لمقاومةالتغير المناخي

المبحث الخامس: المعايير الشخصية

بإستخدام مقياس ليكرت الخماسي (1= معارض بشدة ، 5= موافق بشدة)

22. يعتقد أهم الأفراد المقربون لدي أنني يجب أن أزرع / أساعد في زرع الأشجار/النباتات

23. من المتوقع مني أن أكون مشاركا في رفع مستوي الوعي بالتغير المناخي
24. تعتقد عائلتي وأصدقائي أنه ينبغي على المشاركة و دعم نشاطات / مبادرات منع التغير المناخي

المبحث الخامس: التحكم السلوكي المدرك

بإستخدام مقياس ليكرت الخماسي (1= معارض بشدة ، 5= موافق بشدة)

25. يشارك معظم الأشخاص أمثالى في نشاطات/ مبادرات منع التغير المناخي
26. أنا واثق من مقدرتى على توفير الدعم لمبادرات منع التغير المناخى
27. في رأيي، يعد دعم المبادرات البيئية سلوكا شديد السهولة
28. يرجع قراري بالمشاركة في مبادرات منع التغير المناخى إلىً تماما

المبحث السادس: الخصائص الديموجرافية

باستخدام تعدد الخيارات

29. المستوي التعليمي
30. العمر
31. النوع
32. المدينة