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Environmental Sustainability and the Anthropocene, A Dynamic Behavioral Approach

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ABSTRACT: Achieving environmental sustainability in our recent dynamic and complicated world requires a new thinking and innovative solutions, specially in the age of "Anthropocene" associated with damaging impacts of human practices on the global environment. Using a deductive qualitative appro ach, that is based on exploring the relevant literature and countries' experiences along with analysing the designed survey, the current study aimed at analysing the role of behavioral insights in shifting human behavior toward more sustainable lifestyles regarding environment protection and resources conservation in both of households' scale and organizational scale. The main conclusions of the study are supposed to be so helpful for policy makers in the context of improving environmental policies and maximising the expected outcomes of definite policy interventions.

KEYWORDS: Anthropocene, Behavioral Insights (BI), Environmental sustainability, Environmental policy interventions.

1. INTRODUCTION

Environmental sustainability is about an ethical and social need to guarantee similar opportunities for future generations to the ones previous generation have enjoyed, as it refers to protecting environmental resources and maintaining those resources for future generations (Torelli, R. ,2021). According to (Herman Daly, 1990), sustainability involves three dimensions: social sustainability, economic sustainability, and environmental sustainability. The last dimension is concerned with the use of both renewable and non-renewable resources, and pollution's rates. It is a joint responsibility for individuals, institutions, and governments to maintain natural resources, protect environment, and prevent threatening of the ability for future generations to meet their needs. Contemporary scientific research proved that the world is entering a new geological age called the "Anthropocene" referring to the damaging impacts of human practices on the global environment (Steffen et al. 2011). Anthropocene age represents an interaction between nature and society with its economic, political, and cultural dynamics. So, the challenges of Anthropocene force policy makers to pursue at changing human societies' mind-set and human being behavior in consistency with nature and the environment (Buchanan A., et al. 2021).

According to recent research in the field of behavior science, it is the best time to shift societies towards sustainable lifestyle. That is because of the global pandemic of Covid-19 and its related challenges which forced people to re-evaluate and rethink about their habits, behaviors, and choices. The resulted interruption of usual routines should be employed to establish a more sustainable human behavior. As cultural and social perspectives influence humans' intellectual processes, emotions, and values, and accordingly the general behavior in society, the need is argent for interventions aiming at shifting the general attitudes towards sustainable environmental behavior (Gifford, R. & Nilsson, A., 2014). It was proved that most environmental problems due to unsustainable behaviors and practice and thin, changes in individual human behavior towards more pro-environmental actions are thus highly necessary which means that promoting environmentally responsible behavior is not a luxury, but it became a must for life sustainability. Behavioral approach concentrates mainly on exploring psychological and social factors affecting human choices and motivating behaviors. Regarding environmental domains, behavioral insights could be used to change behaviors toward sustainability through explaining the mechanisms of decision-making process developing research on pro-environmental behavior change and identifying the suitable informational and structural tools that facilitate behaviors movement toward environmental sustainability targets (McKenzie-Mohr and Schultz, 2014). Most current human activities are not sustainable, and the consequences of the daily and momentary unsustainable actions increase the limitations of resources and make it is impossible for future generations to meet their needs.

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Human activities, such as consumption, agriculture, forestry, transportations, and industrial production based on the burning of fossil fuels have affected the ecosystems in a partly negative way. Unsustainable behaviors result in challenging environmental problems such as climate change, global warming, air and water pollution, biodiversity limitation, and desertification, are the result of human behavior (Gardner & Stern, 2002; Winter & Koger, 2014; Vlek & Steg, 2007).
In that regard, many significant questions should be discussed:

- What are the main determinants of environmental sustainability?
- How human behavior derives the world toward the Anthropocene?
- Should behavioral insights be integrated into environmental policies' making process?
- How to change human behavior to be more compatible with environmental sustainability concerns?

The detailed answers to those questions will be explored throughout the next sections.

2. MATERIAL AND METHODS

The methodology used in this study is descriptive in nature as the empirical study involves a combination of inductive and deductive approach to explore and analyse the existing body of knowledge on the key variables of the study specifically, environmental sustainability, Anthropocene, and behavioral insights. An online survey was designed and prepared to explore the public awareness about environmental problems and the willingness of people to participate in solving these problems by changing their lifestyles toward more sustainable practices. The survey targeted 400 households' participants in Egypt during the last three months of 2021 to explore attitudes' determinants and behavior's motivations in relation to environmental concerns which can help in designing effective environmental policy interventions depending on the actual households' behavior.
Data collected from a cross-section of age groups, gender, and income classes reflected several values and practises towards the environmental domains. Participants were asked about their intentions and actions regarding the quality of environment and the conservation of resources, and the different responses were analysed. Considered practices were categorized related to environmental concerns as follow:

1. Sustainable use of resources (energy and water conservation), as participants were asked if they use water saving devices at their homes, avoid excessive consumption of water in their daily use, and have energy cost-effective appliances.
2. Protecting environmental quality (decreasing air and water pollution) as participants were asked if they are keen to reduce the daily usage of the main causes of population such as cars and plastics and decrease smoking and food waste, and if they have the willingness to change to green energy techniques.
3. Environmental awareness as they were asked about their knowledge related to the carbon emotions' impacts, if they think they need nudging tools to help them making the sustainable choice, if they believe environmental problems should be considered in their daily practices, and if they are interested in environmental issues.

The survey involved 400 participants were distributed according to gender, age, educational level, and income level as follow:

Table 1: Sample distribution according to gender, age, education, and income level

Criteria	Categories	Number	Percentage
Gender	Female	277	69.25%
	Male	123	30.75%
Age	Less than 30	88	22%
	30- 50	241	60.25%
	More than 50	71	17.75%
Education	Less than middle education	12	3%
	Middle education	158	39.5%
	Higher education	230	57.5%
Income (Yearly)	Less than 120.000 LE	62	15.5%
	120.000 – 240.000 LE	209	52.25%
	More than 240.000 LE	129	32.25%

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Participants' responds showed little variations due to the income level compared to the variations due to gender, age, and educational level but overall, educated youth females were the most group interested in environmental domains as they have more willingness to think in a sustainably manner and engage in green environmental practises. Responses were mainly affected by price factors and psychological factors. While 72.3% of the respondents have the willingness to modify their lifestyles toward sustainable environmental practices, only 16.7% of them use resources rationally and 54.6% of them may change their behavior toward green environment only if others did. That gap between the surveyed households' participants intentions and their real practices is called in behavioral science "Intention- Action gap) and the willingness to do identified action when others did is called "social norms impact". For environmental awareness, responds showed large disparities between participants with different education level. Prices and costs affected responses significantly as 78% of them strongly disagree to be charged any extra payments for replacing old devices by green ones to control their water and energy use.

Using a structure equation model, the relations between values, attitudes, and practices related to environmental sustainability were explored as it was stated that attitudes are significant determinants of households' behavior toward the environment. Data analyses for the causal relationships between environmental sustainability and behavioral factors supported the conclusion that gender has a significant direct impact on attitudes towards sustainability's which- in turn- have a positive direct impact on the environmental behavior. The indicated results have key implications for the success of environmental policy interventions. For example, policy makers must pursue at managing the intention- action gap and social norms impacts to help people behave according to their good intentions and create an appropriate social environment concerning the desirable targets of sustainability. Behavioral insights would have an urgent role in doing so as will be proven later in this study.

3. RESULTS

3.1 Determinants of and challenges to environmental sustainability

The core question at the heart of sustainability domain is how to allocate the finite resources of the planet to meet the needs of the present generation without compromising the ability of future generations to meet their own needs (UNDP, 2020).

Achieving environmental sustainability is a must to meet economic and social needs for future generations. To ensure that sustainability, all community partners (government, firms, citizens, and civil society organizations) should cooperate to protect ecosystems, decrease environmental pollution, fight climate change, and conservation of renewable and non-renewable resources as necessary actions to improve the main indicators of environmental sustainability such as air quality, biodiversity, transport and energy efficiency, water conservation, waste management, and environmental quality criteria.

The main indicators of environmental sustainability are the use of fossil fuel energy, carbon dioxide emissions, forest space, depletion of clean water, and conservation of natural resources. The environmental threats are measured by mortality rates attributed to household and ambient air pollution and to unclean water, sanitation services, and land degradation's rate due to human activities (UNDP, 2020).

As a global objective, achieving environmental sustainability faces many challenging barriers and constrains such as the lack of financial resources, the shortage of skills related to environmental management, the absence of interinstitutional co-ordination, the limited environmental awareness, poor access to and management of information, and structural and political constraints. But human behavior related to resources conservation and environment protection still a key factor and plays the most important role in moving the world toward sustainability. So, if people are the main cause of unsustainability problem, they must be an urgent part the solution. The confusing dilemma here that although about 80 percent of people all over the world believe in the urgent necessity of saving the planet through conserving resources and protecting environmental balances, few of them are willing to take real actions to do so, and fewer actually do. To bridge this gap between values and practices, behavior- based interventions are required.

3.2 Human behavior and the Anthropocene

According to recent geological research, the damaging influences of humans on the global environment force the planet toward the "Anthropocene", a new geological period where humans represent the central driver of earth system processes on a globally scale (Steffen et al. 2011). The unsustainable behaviors of humans cause risky environmental imbalances such as climate change, biodiversity damage, and ecological deprivation. Also, fast changing in lifestyles -caused by rapid globalization and increasing economic growth- accelerated environmental problems and strengthened the challenges of achieving sustainability (IPCC, 2014).

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The age of "Anthropocene" is divided in recent literatures into three interrelated stages: from the Industrial Revolution until 1945, from 1945 to 1960, and from 1960 until the present. The challenging impacts of human practices on nature and environment during the current stage of the Anthropocene threaten the survival of Humankind and overall Earth planet. Harmful daily human activities such as fossil fuels burning, the overuse of fertilizers and pesticides in agriculture, and unsustainable patterns of consumption and production increase greenhouse gases more than the capability of the plant atmosphere to absorb which-in turn- results in uncontrollable rises in the global temperature and sea levels (Freire de Mello et al., 2019).

Considering the "Anthropocene", many suggestions were provided to reflect concerns with environmental degradation and sustainability human development's indicators such as footprints indices as measurements of the pressure of human activities on the environment as the ecological footprint measures the global demand for biocapacity related to its availability and assess the biosphere's supply of ecosystem products and services. Also, carbon footprint is and indicator of greenhouse gas emissions which reflect issues like environmental pollution and climate change. In the same context, recent research suggests adding carbon dioxide emissions per capita to human development index to reflect environmental degradation involving both of loss of biodiversity, and pollution. So, United Nations Developmental Programme (UNDP) had already adjusted the Human Development Index (HDI) by adding environmental dimensions considering key indicators covering environmental sustainability and environmental risks (UNDP, 2020).

In the age of "Anthropocene", personal and collective decision-making process are worsening environmental problems and challenging sustainability which emphases the importance of behavioral based interventions aiming at providing individuals, households, business organizations and firms efficient incentives to make more environmentally sustainable decisions. Behavioral insights can be employed to improve the effectiveness of existing policy tools and to develop new instruments targeting more environmentally sustainable behaviors as complementary tools to traditional environmental policies such as pricing and regulation. It is about deeper understanding of the main cognitive mechanisms of human choices to obtain more effective design, implementation, and evaluation of environmental policies. Eliminating the damaging impacts of humans on the different dimensions of environment during the Anthropocene imposed policy makers to develop and apply new regulations, technical solutions, international agreements, economic tools, and informational instruments to facilitate movements towards sustainability (Steg and Vlek, 2009).

Anthropocene and Covid-19 Pandemic:

Scientists argue that the viruses rise and widely spread as a result of unbalanced interactions between humans and the planet. So, Covid-19 pandemic is the latest harrowing consequence of natural and environmental imbalances, and unless humans relax their grip on nature and environment, it will not be the last (UNDP, 2020). Empirical research explored a two directions dynamic relationship between the damaging impacts of human activities on the global environment and the wide spreading of Corona Virus in the beginning of 2020 till now (Human Development Report, 2020). The uncontrollable imbalances in environmental components caused the virus to be a widespread pandemic and then, lockdown and shelter in place related to Covid-19 pandemic have forced a high percentage of people to work from home and forced organizations, educational institutions, and firms around the world to close their physical locations and shift to online and virtual work which-in turn- caused fast and unexpected changing in habits, behavior and approximately, the whole human lifestyles in a way may be a great opportunity to shift behaviors toward more sustainable patterns of consumption, production, resources' conservation, and other environmental concerns.

4. DISCUSSION

4.1 Behavioral interventions for environmental sustainability; policy implications and implementations

Globally, households account for 29% of energy consumption and contribute to 21% of carbon emissions. Researchers estimate that adopting interventions based on behavioral strategies could reduce individual energy consumption by 5-20%. Adopting such measures presents a significant opportunity for policymakers to affect energy consumption (M. G. McEachern et al. 2020). For Egypt as a developing country with relatively hight human development index (0.707 in 2019), the averages of environmental indictors for the last 10 years show unneglectable negative impacts of human activities on the natural resources and environmental quality. For example, fossil fuel energy consumption accounts for 97.9% of total energy consumption, carbon dioxide emissions per capita (per unit of GDP) exceeded 0.2 kg per 2010 US$ of GDP, forest area is about only 1% of total land area, and freshwater withdrawals reached 112 % of total renewable water resources (UNDP, 2020).

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According to behavioral science approach, if environmental crisis is caused by humans, then people are the solution. It puts people at the heart of any policy aiming at environmental sustainability. So, understanding what motivates people and what drives their behavior is the key variable in the sustainability equation. Regarding that, behavioral insights have a vital role to play in the context of designing, implementing, and evaluating environmental policies. Environmental sustainability requires a general behavior change to shift the whole individual, organizational, and institutional behavior in the society toward more sustainable practices relating to environmental considerations. Insights from behavioral science can help in creating suitable social and cultural environment for making sustainable choices and moving toward sustainable lifestyle (McKenzie-Mohr, 2011; Steg and Vlek, 2009).

Related research approved three methods of integrating behavioral tools into environmental policies aiming at achieving environmental sustainability: motivating the change, socializing the change, and easing the change (Williamson et al., 2003).

Kollmuss and Agyeman (2002), analysed the internal and external factors that determine and explain pro-environmental behavior and concluded that programs aiming at adopting human behavior should select targeted behavior for change, then identify the appropriate intervention tools, and evaluate the program effectiveness.

Mont, Lehner and Heiskanen (2014), concluded seven tactics help policy makers in deriving behaviors toward desired directions:

1. Simplification and framing of the available information when presented.
2. Modifying the physical environment to fit the targeted choices.
3. Making the desired policy as a default option.
4. Considering social norms and providing comparisons.
5. Applying feedback instruments.
6. Using incentives and penalty tools.
7. Setting targets and commitment schemes.

It was stated that integrating the above-mentioned strategies into environmentally relevant policy making process increase the environmental policies' outcomes which will be designed relying on more realistic analysis about human thinking types and the mechanisms of decision-making process and then, policy interventions will be more effective in driving individual and collective decisions toward more sustainable choices. By obtaining a deeper understanding of the human behavior's determinants and derivers, behavioral insights should be e a complementary tool to traditional policy instruments, such as pricing, taxes, subsides, and legal regulations.

Empirical evidence and countries' experiences:

Many developed and developing countries had integrated behavioral insights in environmental policies to enhance sustainable use of resources and eliminate environmental threats:

USA: "Opower report" was applied and sent to more than 6.2 million households. This report depends on information about personalized feedback, social comparisons, and energy conservation to diminish the use of renewable energy. Also, recycling commitment and feedback increased paper recycling by 25.4 – 40% (Allcott and Rogers, 2012). Moreover, firms and organizations employed behavioral targeting mechanisms to control the material they use in the production process and manage issues like disposal, commuting to work, and water and energy use. Additionally, the US Environmental Protection Agency applied many behavioral tools such as modifying social norms and addressing barriers to reduce bad impacts of consuming contaminated fish in California (McKenzie-Mohr and Schultz 2014).

Canada: To reduce emissions associated with vehicle engine idling, anti-idling programs were stablished in Toronto related to employed personal contact, prompts, and commitments and they succeeded in reducing idling by 32% and the length of idling by 73% (McKenzie-Mohr et al. 2012).

Costa Rica: Using goal setting, prompts, and social norms, monthly households' water consumption was reduced by 3.7–5.6%.

Japan: Feedback and goal setting were used to enhance sustainable and green transportation. As a result, car use was reduced by 7.5% with 68.6% increase in public transportation use.

South Africa: Goal setting and social competition decreased energy use by about 13.5%. Insights from behavioral science have been integrated into and applied to a large scale of environmental policy areas, specifically areas of energy use, water conservation, food consumption, transportation choices, waste management and resource effectiveness.

Now, let's apply on the household's energy use where behavior is obviously not economically rational as people could save money if they saved energy, but they do not. Behavioral- based policy interventions can help in maintaining a rational use of energy through

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efficiency labels which could be framed to provide a relative ranking of an electrical device with respect to the best-in-class one, and the savings that one could enjoy when switching to the latter, Also, the installation of sensor-based energy devices makes it is easy to control energy consumption. Additionally, a change to the default setting of thermostats and the comparison of a household's energy consumption to the consumption of a same-sized household in the same neighborhood may help in energy saving while real-time in-home displays connected to smart energy meters can provide real time feedback on energy consumption and costs. In addition, rewarding households who have been particularly savvy with energy consumption encourage positive norms for energy conservation.

The behavioral tools should be employed as compliance tools with environmental regulation and traditional pricing tools. The individually, and consequently the collective decision-making concerning the use of resources either in consumption or production disciplines have an urgent role in recover or worsen environmental problems as individual decision-making is forced by imperfect cognitive resources and restricted willpower, and it is affected by thoughts and consideration of others' attitudes which affect their consumption, production, and investment decisions, which are reflected in good sustainable or unsustainable environmental choices. The outcome of applied policies depends on the capability of those policies to encourage and support both of individuals, households, firms, and organizations to make more environmentally sustainable choices and decisions. So, policies are required to be designed based on realistic representations of the incentives guiding and driving individual and collective decision-making process. Finally, it should be stressed that behavioral intervention policies are not substitutions of the traditional policies which have a great supportive role to play starting from providing suitable institutional framework to environmental programs' financing and management. Along with the clear vision and identified targets, policies are needed to inter-sectoral coordinated and real incentives should be provided to encourage households and firms to improve their environmental performance using public expenditures, incentives for private investments in pollution reduction, user charges for environmental services, and subsidies for private investments in infrastructure, adoption of greener technologies and clean development mechanism. Additionally, the whole awareness of people and organizations needs to be risen about the possible opportunities and gains from environmental compliance compared to the losses related to major environmental impacts, particularly in terms of biodiversity conservation, water pollution or climate change which would be translated into important economic losses for them and for the whole society.

4.2 Enhancing compatibility between human behavior and environmental sustainability

As was indicated, environmental sustainability is about general attitude towards the environment, reflecting a personal evaluation of environmental concerns, specifically climate change, overfishing, freshwater exhaustion, deforestation, and loss of biodiversity (Franson & Gärling, 1999). Environmental sustainability requires a balanced relationship between the use of natural resources and its availability as the depletion rate of natural resources shouldn't exceed its regeneration rate. On the other hand, the waste generation's rates should be less than the ability of the environment to adapt (Schill, C., et al. 2019). Behaviorally informed policy tools must have an important role in helping people to better evaluate environmental costs and benefits and act on their preferences. According to recent research in behavioral science, most of human choices are taken automatically which makes behavior changing more than challenging. As was stated by the research survey, while most people tend to be concerned about the environment, they do not always translate their intentions to behaviors. This gap between intentions and actual practices makes behavioral-related interventions an urgent requirement for deriving behaviors toward sustainability using psychological motivations and sociological incentives, specifically in the context of conserving resources and fighting climate change. Policy interventions aiming at enhancing the compatibility of human behavior with environmental concerns would be more efficient using well framed information, feedback tools, making the default option more sustainably and many behavioral factors which involved in what called "choice architecture" (Klaniecki et. al, 2018).

Cultural and socio–economic perspectives have vital impacts on human behavior (Henrich, J. et al, 2005). They draw mental models concerning attituded and behavior (Lamont, M. er al., 2017). On the other hand, accumulated knowledge concerning the conditions of social and physical environment, along with nature practices have an important role to play in reshaping environmental attitudes and behavior (Soga, M. & Gaston, K. J., 2016).

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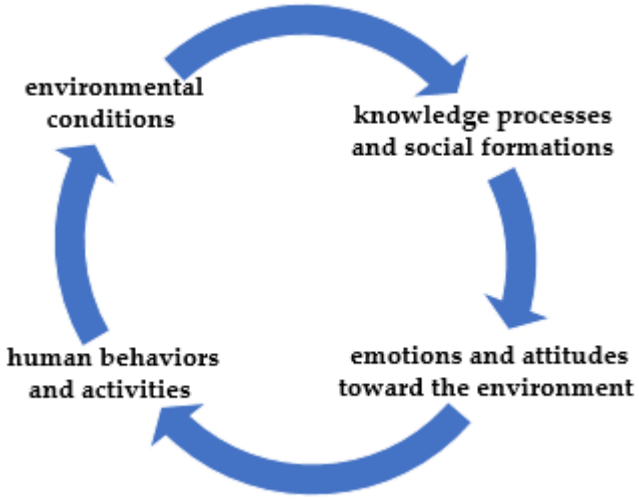

Figure 1. The dynamic relation between knowledge and human behavior

To shift individuals toward sustainable thinking and lifestyle which are more compatible with environmental sustainability, many facts should be considered:

1. Changing daily habits to be more sustainable requires getting rid of the old unsustainable habits. To succeed, sustainable practices should be the default option and easy to do. Moreover, providing incentives is a must to help in getting the new behavior started.
2. Social influence is a key factor as most individuals imitate the general practices of others and follow them which increase the importance of showing and appreciating the sustainable behaviors in the society.
3. Sustainability patterns of behavior can be more attractive when they are related to tangible personal benefits which means that underlining self-efficiency like health and product quality help individuals to gain targeted habits and sustainable behaviors.
4. Psychological factors like feelings and impressions have great impacts on deriving human behavior. So, making the sustainable habit funny and happily can encourage people to do it.
5. According to the psychological view of "bounded rationality" as a constraint of human behavior, people get different conclusions from the same information when changing the way of information framing or presenting and they usually tend to compare the cost associated with giving up definite alternative with the benefit of gaining it. Considering this psychological determinant of human behavior, environmental information should be framed in the way that encourage people to choose the environmentally desired choice through persuading them about the opportunities that could be lost or given up when taking another choice.
6. Considering the principle of the "bounded willpower" in the psychological area, there are notable inconsistencies between human beliefs and human behaviors. That's why awareness campaigns are insufficient to move behaviors toward environmental sustainability as policy interventions should manage that cognitive conflict and eliminate the gap between attitudes and behaviors, or the mismatch between beliefs and real practices.
7. Regarding the sociological attitude of the "bounded self-interest", social norms have great impacts on human behavior, interventions aiming at more sustainable environmental practices must include quantitative and qualitative methods to help people in comparing their own behaviors to social ideal benchmarks.

The important impacts of those social and psychological factors don't eliminate the role of the traditional tools in deriving human practices toward desired practices such as governmental regulations aiming at preventing the consequences of irrational human behaviors on environment in the way affecting present and future generations negatively, financial instruments like carbon tax placed on production and consumption of carbon to limit harmful emissions and subsides to encourage more sustainable environ-

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mental practices, and technical instruments relying on supporting environmental scientific research and green technological innovations to help in shifting individual, organizational, and institutional behavior toward sustainability. Benefiting from behavioral science in designing environmental policies and deciding the effective policy interventions.

5. CONCLUSION

Using qualitative and quantitative data analyses, this study concluded that enhancing environmental sustainability in the age of Anthropocene requires an accurate solution for the complicated equation concerns the dilemma of human behavior and its dynamics determinant of it. In that context, employing insights from behavioral science to develop environmental policies became a must. To help people in making environmentally sustainable choices on their daily activities, many fundamental principles of behavioral insights should be considered as guidance lines for policy makers as follow:

First, as behavioral research concluded, human choices are influenced by seven strategies: simplifying complex information and framing it, changing the physical environment, modifying the default option, the use of social norms and individuals/ groups comparisons, employing feedback instruments, using reward and punishment tools, and setting specific targets along with commitment devices. Applying those tools in energy-related issues could be helpful in enhancing energy efficiency and sustainability through using consumption labels, changing the location and appearance of recycling bins, modifying the default setting of thermostats to foster energy savings, providing a comparison between households' energy consumption in the same neighborhood, providing timely feedback on energy consumption and costs, rewarding households who succeeded in energy conservation, pinning down an objective of energy savings and following up on the objective with regular feedback and tips.

Second, environmental challenges could be tackled more easily using behavioral interventions tools to encourage conservation of resources (energy, water and materials), promoting private investment in more efficient technologies, encouraging environmentally sustainable patterns of consumption, and increasing compliance with environmental regulation. There are various behavioral tools are used to change environmental practices such as informational intervention tools aiming at changing perceptions, attitudes, motivations, and norms by providing knowledge and information and structural intervention tools targeting a change in the circumstances under which behavioral choices are made by changing the costs, benefits, and availability of different behavior by modifying physical, technical, and organizational systems, and price mechanisms. Additionally, nudge represents a combination of both informational and structural tools simultaneously as it aims at modifying the choice architecture by guiding human behavior in desirable directions and arranging the choice situation in a way that makes the desirable behavior the easiest or most attractive option (Thaler and Sunstein, 2008). An example of nudging tools is default option's setting which is based on a phycological conclusion states that individuals choose not to act unless they must do. To succeed in deriving the whole behavior towards more sustainable environmental programs, the right interventions tools for the targeted behavior should be indicated consistently with the main group of people are chosen to be a pilot group for specified desirable behaviors such as water conservation, energy use, sustainable consumption and production patterns, and green transportation and green waste generation.

Third: Human practices and choices are often affected by many of the behavioral biases, especially when individuals overestimate present costs and benefits against underestimating them for the future. In that context, efficient behavioral interventions can address such biases either using social comparisons and/or by providing clear and appropriate framed information to help people in making more rational and sustainable choices and then behavior. The main idea behind the negative impacts of human activities on environmental domains such as increasing carbon emotions is that when making decisions, households and business organizations rarely consider the resulting carbon emissions and its damaging impacts on global environment. Decisions are taking regardless neither its futural costs nor its harmful effects on the planet and on the upcoming generations' life. To activate behavioral interventions aiming at reducing harmful emissions, policy makers can integrate a traditional policy tool, such as imposing obligatory extra payments on carbon emissions due to unsustainable activities of individuals and firms to force them to consider social costs in their decisions. It is about an efficient combination between traditional policy tools and behavioral insights' interventions to maximize the outcome of environmental policies in achieving sustainability targets.

FUTURE RESEARCH

The current study is limited to Egypt as a middle eastern developing country but further empirical and experimental research is required to assess the effectiveness of behavioral-based interventions and evaluate cost-effectiveness of those interventions, and

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explore the mechanisms of transferring efficient behavioral interventions between different geographical and cultural areas all over the world focusing on the evaluation of definite behavioral interventions impacts and exploring the appropriate way of interaction between behavioral interventions and traditional instruments in different policy contexts, specifically in the domains of encouraging sustainable consumption and production patterns, waste management, resource conservation, green transport, energy use efficiency and environmental compliance.

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