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CLIMATE CHANGE AND ENVIRONMENTAL DEGRADATION: A SERIOUS THREAT TO GLOBAL SECURITY

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Abstract:
Climate change and environmental degradation are significant threats to the survival of humanity. However, existing research focuses on the nexus between climate change and environmental degradation, highlighting the causes that strengthen the relationship. Despite experts expressing strong sentiments about the two phenomena being risks to global security, the assertions have drawn inadequate attention from scholars and practitioners, who prioritize illustrating the causes and impacts of climate change and environmental degradation instead. This narrative review aims to fill the gap by presenting evidence that affirms the theory about climate change and environmental degradation being primary security concerns for contemporary society. Climate change and environmental degradation cause security concerns through threats to military infrastructure and installations, depletion of resources leading to conflicts over disputed claims, and displacement of people, causing migration and refugees. Therefore, mitigating the causes of climate change is the most plausible strategy for reducing the threat to national and global security.

Keywords: climate change, environmental degradation, threats, security, destruction

1. Introduction

Comprehensive reports by government and non-government players on the effects of climate change on the environment exist, including supporting research, but the accounts fail to integrate the important aspects of national and global security. There are growing

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concerns among global security experts that the effects of climate extend beyond the much focused on global warming. The persistent climate change and environmental degradation is a humanitarian crisis time bond whose outcomes can destabilize national governments and world peace. As early as 2007, experts were drawing insights into the relationship between climate change and security. Among those who expressed strong sentiments about the relationship was Emyr Jones Parry, who served as the United Kingdom's permanent representative to the United Nations since 2003. Parry (2007) insinuated that climate change would lead to people fighting over land, water, and resources, but this time, the fights would be at unprecedented levels compared to past conflicts. Consequently, many experts and observers recognized climate change as the leading threat to humanity's survival, likening the seriousness of its problems to those caused by guns and bombs. The United Nations Environmental Program (UNEP) corroborated the assertions in its report linking climate change to exacerbated inherent social, economic, and environmental problems. Many climate change and environmental degradation security concerns are associated with its impacts on food, water and energy supplies, loss of livelihoods from famine, disasters, and diseases, increased competition and conflict over natural resources, and forced migration and displacement. Drawing on the observations above, it is imperative to acknowledge and understand climate change and environmental degradation as critical developments to fast-track ameliorative measures and diminish the likelihood of conflicts, a national and global security concern that threatens human well-being and existence.

2. The Association between Climate Change and Environmental Degradation

2.1 Defining the Connection between Climate Change and Environmental Degradation

The consensus among observers of the ecological trends and developments is that contemporary human societies would be responsible for the demise of humanity. The United Nations' definition of climate change affirms this assertion. While natural events previously contributed to the long-term change in temperatures and weather patterns, shifts since the 1800s depict the driving role of human activities, primarily related to the combustion of carbon-based fuels. To keep the earth 60°F warmer, ensuring it is ideal for sustaining human life, some greenhouse gases, including atmospheric water, methane, and carbon dioxide (CO_2), act as a partial blanket, letting some of the sun's rays and heat escape and retaining some (Romm 2). However, the levels of greenhouse gases, particularly CO_2, increased substantially since the Industrial Revolution 250 years ago. The result has been the continuous release of billions of tons of greenhouse gases into the atmosphere, causing the earth to warm by 2F (1.1C) in the last two centuries, with the worst increases in temperature occurring from 1970 (see Figure 1 below) (Romm 2; US EPA). The resulting thermal expansion is the major cause of weather and environmental changes whose multiple effects degenerate into security risks at different levels.

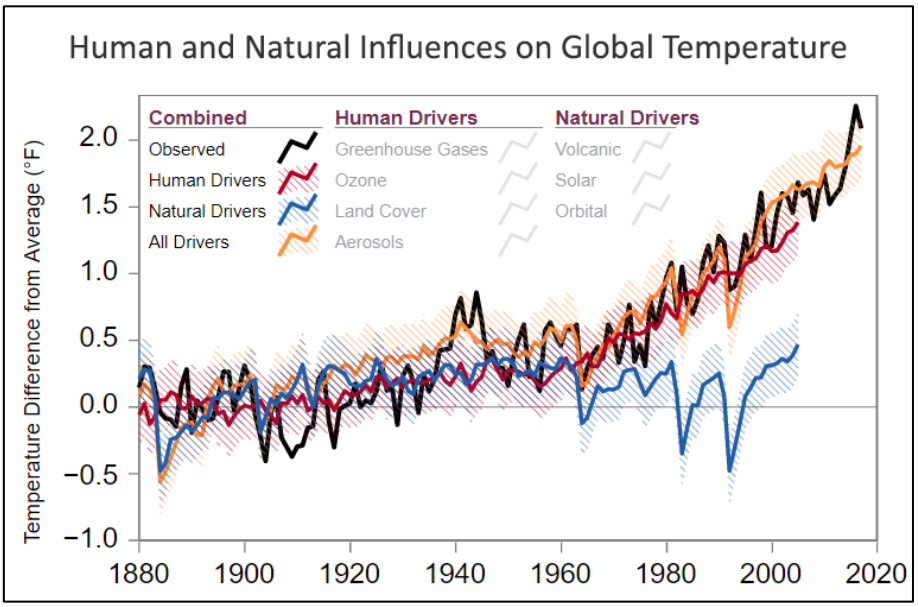

Figure 1: Average increases in global temperature over the past century due to different causes (**Source:** US EPA https://www.epa.gov/sites/default/files/2021-05/graph2_0.png)

In the same breath, environmental degradation is a consequence of natural causes, like climate change and human activities. The phenomenon refers to the deterioration of the environment through events that destroy or deplete natural resources, damage ecosystems, and cause the extinction of species. Environmental degradation results from the complex interplay of socioeconomic, institutional, and technological factors. In most settings, population growth, urbanization, economic growth, increase in agricultural practices, and heightened demand for transportation are factors responsible for changes in the environment. The impacts manifest exponentially in Sub-Saharan Africa, which, despite contributing little to environmental pollution, faces unprecedented levels of environmental degradation. The growth and development trends contribute to increases in resource utilization, particularly energy and natural resources. However, despite the abundance of renewable energy in the region, the preference for non-renewable energy increased by 69% between 2010 and 2017 (Wang and Kangyin 2019). The increase corresponds with high levels of greenhouse gases released into the atmosphere, compounding the impacts of climate change.

2.2 Framing Climate Change and Land Degradation Nexus as Security Challenges

Climate change and environmental degradation interact in a manner that causes deleterious effects on humanity and its habitats. Understanding the relationship between the two phenomena calls for an intricate examination of the nexus they have with adverse effects like migration and displacement, resource depletion, and habitat destruction (International Organization for Migration 2). Historically, human migration has been an indicator of interdependence with the environment, a relationship that experiences a new and urgent dynamic courtesy of the contemporary reality of climate change. The analysis of the nexus should draw on the knowledge that climate change parse does not cause migration. However, its role in exacerbating the gradual process of environmental

degradation and elevating the intensity and frequency of natural disasters is well documented. Climate change is also a driver of the onset of desertification, coastal region erosion, drought, and the rapid onset of flash floods and tropical storms (International Organization for Migration 2). The migratory outcome is the predictor of the prospected conflicts as communities and individuals compete and fight for diminishing limited resources, resulting in major security concerns.

Climate change attracts substantial attention because evidence shows the negative effects it has on human societies. In the event that climate change occurs without degrading the environment, few stakeholders would be at the forefront of fighting it, implying the concerns expressed should attract equal attention. However, such is not the case. Despite limited literature on the nexus between environmental hazards and climate change, it is important to consider the perceptions people attach to their environment and how they experience it, including the influence on the intention to migrate (Piguet 9). People are unlikely to migrate if the conditions where they reside favor the production of resources that provide sustainable livelihoods. However, contemporary reality is farther from such an ideal state. Hermans and Robert (237) noted that systematic reviews of the historical trends have consistently demonstrated the role of drought, heat waves, and changes in precipitation patterns as drivers of environmental change and land degradation. Experts warn that the developments are likely to worsen due to unmitigated climate change, a phenomenon responsible for some of the already observed worrisome trends. To contextualize the situation, it is important to draw on recent data estimates on the degradation of at least a quarter of the earth's ice-free land, particularly in the global south, where more than 1.3 billion people have been affected (Hermans and Robert 238). The effects are more profound in developing economies where land degradation is synonymous with competition for limited natural resources, land abandonment, displacement, and migration. The pressure inflicted on communities by climate change-related factors predicts security concerns at different levels.

2.3 Factors Behind Climate Change and Environmental Degradation

2.3.1 Causes of Climate Change

To date, mitigating climate continues to present challenges because the world has yet to agree on a unified approach forward, a situation caused by the lack of consensus on whether climate change is real or a magnification of its impacts beyond proportion. Skeptics of climate change vehemently reject scientific data because it counters their beliefs (Druckman and Mary 111). On the contrary, scholars and practitioners prioritize identifying factors and conditions that counter or reject the directed motivated reasoning of skeptics (Druckman and Mary 111). For instance, scientific evidence in support of climate change denounces the role of the sun in climate change, terming it inconsequential (see Figure 2 below). Consequently, attention has now shifted to human activities. Trenberth (463) observed that a growing body of evidence shows the central role of humans as agents of climate change, a trend that is likely to persist for the next few centuries. According to Trenberth (463), climate change may have modest effects of about 5-15% on rainfall patterns, drought, storms, and the environment, but the crossing

of the threshold due to the proliferation of human activities causes a nonlinear increase in damages. The observations have been affirmed by data from various climate agencies, including the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, which emphasizes the role of human-induced influences as responsible for most of the warming that increased exponentially in the last four decades (Malla *et al.* 2). Therein, lies the challenge because human activities are vital to the survival of the human race. The dilemma is about the level to which human activities should be reduced to ensure no exponential damage, a source of debate on whether mitigating climate change is a logical idea or not.

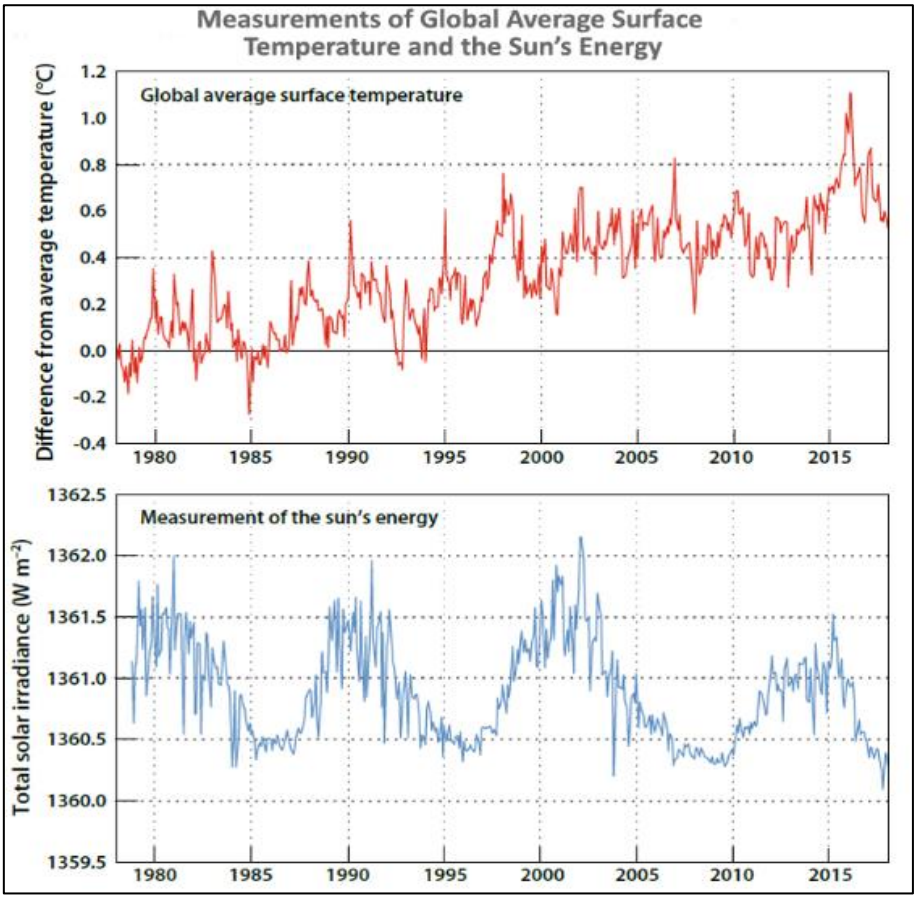

Figure 2: Comparing the rise in global temperature and the sun's energy over time (**Source:** EPA).

Nevertheless, both critics and supporters of climate change recognize the importance of treating associated evidence with the seriousness it deserves. The effects may be exaggerated, but there is no doubt that manufacturing (24%), power generation (25%), deforestation and food production (11%), increased transportation (27%), and powering commercial and residential buildings (13%) are the major culprits are per 2020 data (Turrentine par. 12). According to the National Academy of Sciences (9), these human activities contribute substantial amounts of greenhouse gases to the atmosphere. The commonest greenhouse gases are CO_2, methane, nitrous oxide, chlorofluorocarbons, and water vapor. Parse, the greenhouse effect makes life possible on Earth. Without it, too much heat will escape the earth, making it too cold and unlivable. However, with an

increase in greenhouses in the atmosphere, they absorb and re-radiate approximately 90% of the heat escaping from the earth's surface, raising the atmospheric temperature.

Experts agree that burning fossil fuels is the leading cause of greenhouse emissions in human activities. The abundance of greenhouse gases in the atmosphere today dwarfs any levels ever measured in the last 800,000 years. Through the burning of fossil fuels and other activities, humans contribute over 30 billion tons of CO2 to the atmosphere yearly. The trend has seen CO_2 concentration rise beyond the preindustrial levels to about 280 parts per million (ppm) in the 18th century and 414 ppm in 2020 (National Oceanic & Atmospheric Administration). Similar trends have been observed with other greenhouse gases over the year, as illustrated in Figure 3 below.

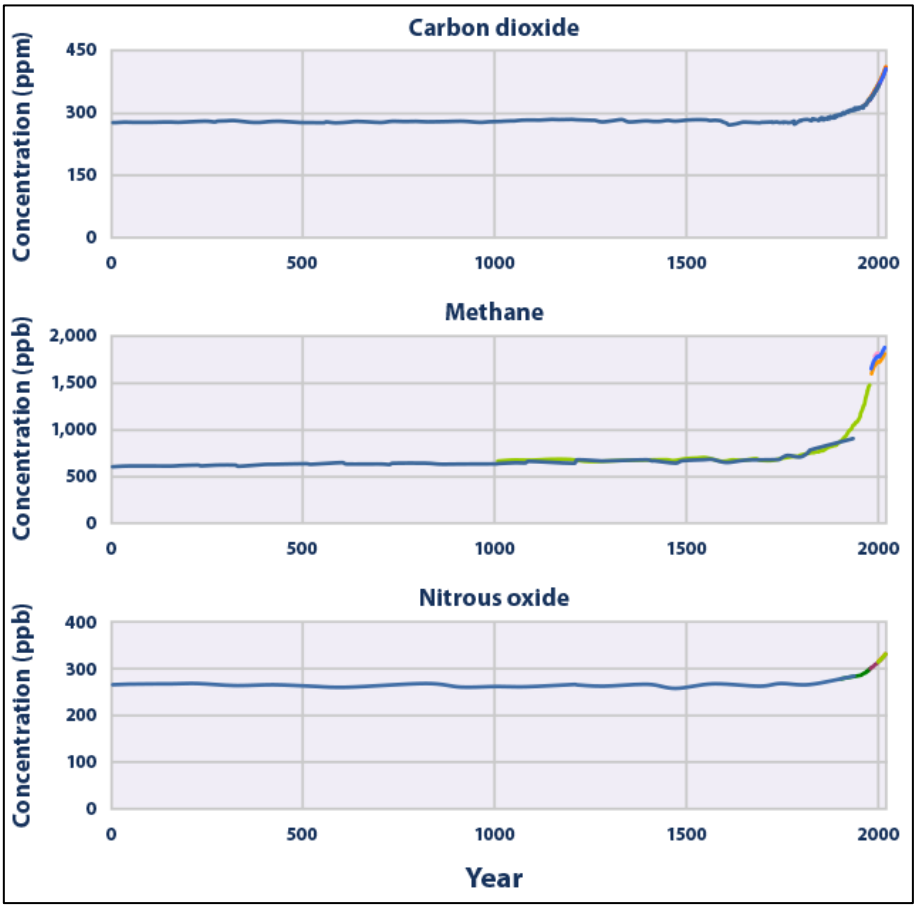

Figure 3: Trends in greenhouse gases' atmospheric concentrations over time (**Source:** EPA, https://www.epa.gov/climatechange-science/causes-climate-change).

Other causes of climate change that contribute to changes in greenhouse gas atmospheric concentration and temperature variations include natural processes such as changes in the earth's orbit and rotation, variations in solar activity, changes in the earth's reflectivity, volcanic activity, and alterations in naturally occurring CO_2. Collectively, the greenhouse gases from human activities and natural processes cause global warming, a phenomenon responsible for climate change (Trenberth 463). The effects mostly observed and felt are consequences of global warming.

2.3.2 Causes of Environmental Degradation

Most case studies of environmental degradation paint a picture of the alarming situations in developing regions, particularly Sub-Saharan Africa (SSA), which is a yardstick of poor environmental protection policies that contribute to improper resource utilization and management. One comprehensive study involving evidence from 14 SSA countries attributed environmental degradation to trends in economic growth and energy consumption, which in turn are driven by increases in population and urbanization (Wang and Kangyin 165). Although many studies used CO2 as the indicator due to the nexus between greenhouse gases, climate change, and environmental degradation, some scholars advocate for using a more comprehensive indicator, such as the ecological footprint. Wang and Kangyin (170) defined EF as an accounting model for estimating the quantity of land and water needed to produce all the goods consumed and assimilate the resulting waste from a given population or economic segment. In most cases, environmental degradation is characterized by the depletion of resources like air, water, and land, destruction of ecosystems, pollution, and wiping out wildlife, adversely altering natural balance and the environment.

Environmental degradation is a result of multiple factors, mostly human-induced. The common ones include social, economic, and environmental factors, but policy factors in politics and administration are also contributors. The numerous social factors that cause environmental degradation are increases in population and the associated consumption of resources and production of waste, poverty, and urbanization due to migration way from ecological settings that offer no productive opportunities. Notable economic contributors are a market failure due to a dysfunctional or absence of a market for environmental goods, pace of economic development, transportation, and effects of agricultural processes on natural resources (Bentley). Political, administrative, and environmental factors include poor leadership that lacks a vision, ineffective environmental policies and laws, air and water pollution, acid rain, and the destruction of the ozone layer. These environmental destruction causes establish a strong connection with climate change as both its contributors and outcomes.

2.3 Climate Change and Environmental Degradation as Threats to National and International Security

The relationship between climate change, environmental degradation, and national and global security is multifaceted. The association can be perceived from the resource-limitation angle or military preparedness. Many reports on the association between climate change and national or global security are by federal agencies, implying that scholars and practitioners are yet to recognize this perspective as integral to explaining the impacts on society. Climate change and environmental degradation are major causes of resource depletion today. Scarcity is a critical factor in the link between climate change, environmental degradation, and security, mediated by social tensions, political instability, and poverty that disrupt peaceful existence and co-existence (White House 3). The US military and intelligence officials are apprehensive of the role of climate change and environmental degradation as threat multiples with the potential to drive

individuals into different forms of crime and violence, including terrorism. For instance, poverty due to the depletion of resources causes the inability to access basic needs, exposing individuals to vulnerabilities, including radicalization and recruitment into terrorism to earn a living. In the same breath, analysis of all other impacts of climate change and environmental degradation

The US military and its global counterparts leverage the stability in social, economic, political, and environmental conditions to conduct effective military missions. When disruptions in these factors occur, the efficacy of military operations is ostensibly reduced, exposing the US and other nations to security risks. The understanding is behind the calls to recognize climate change and associated effects as core security issues (Parry par. 9). At the national level, climate change and environmental degradations progressively pose threats to critical infrastructure, major installations, and hurricane evacuation routes used by the military (White House 4). For example, coastal regions are increasingly vulnerable to rising sea levels, flooding, and storm surges, affecting the various modes of transportation (see Figure 4). The inaccessibility of the affected regions renders the military and homeland security missions ineffective. In times of disaster or emergency, such as hurricanes, whose frequency and severity are also associated with climate change, the inability to access those affected for evacuation presents a major security risk.

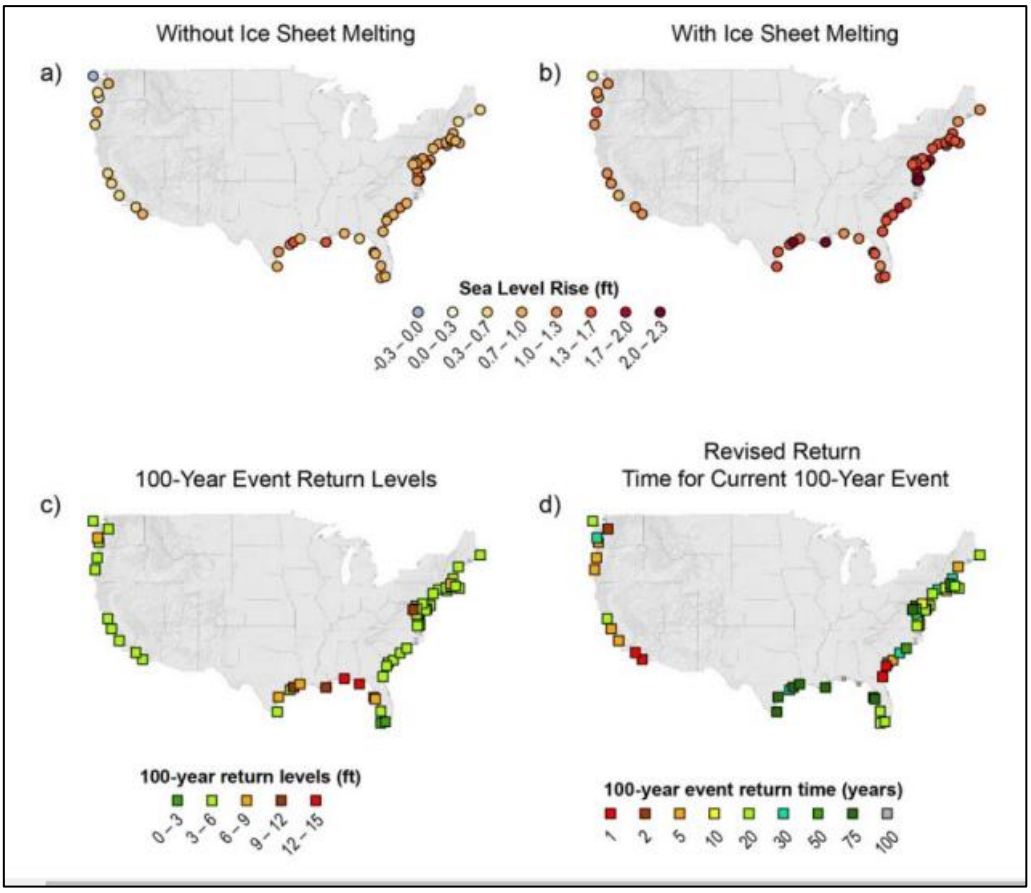

Figure 4: Projected sea level rise and flooding in the US coastal regions by 2050 (**Source:** U.S. Global Change Research Program, 2014 as cited in White House 4)

Military experts also agree that climate change as a driver of unpredictable instability is a cause for concern. The impacts of climate change and environmental degradation, specifically the depletion of natural resources like water and productive land, create potential conflict among individuals, communities, and countries. The current example is the Nile River in SSA, which has a drainage basin that covers almost a dozen countries. Efforts by any country to build a dam on the Nile must receive approval from other states, as was the case between Egypt and Ethiopia over the latter's Grand Ethiopian Renaissance Dam (GERD), highlighting the complexity of the impact of climate change driving nations to compete for water, food, and energy security (Ayferam par. 1). Some of these conflicts occur in areas where the US military operates, exposing its personnel to extenuating circumstances beyond the scope of the mission.

The threats to the ability of the US to provide security and protection to vulnerable nations and communities in the world have also diminished in regions experiencing substantial effects of climate change and environmental degradation. Flooding and storms threaten to submerge naval and other military bases, and the increased burden of disease is a risk to military personnel, while conflicts over resources add to the burden of issues the military must contend with during missions. In addition, the massive displacement of populations from climate-related impacts is a security threat as the US has to deal with refugees and internally displaced people (Natural Resource Council of Maine). Overall, the outcomes of climate change and environmental degradation increase the scope of military engagements due to the sheer number of people affected who need assistance.

3. Conclusion and Recommendations

Drawing on the nexus of climate change, environmental degradation, and security, it is evident that combating the latter without mitigating the first would be hypothetical. Evidence shows that climate change and its impacts will persist into the unforeseeable future unless drastic and collective measures are implemented to arrest global warming. The interrelationship between the concepts discussed implies solving the problem should begin by targeting the driver or the reason why it exists. Given the link between climate change and human activities, mitigation efforts are likely to be challenging. Nevertheless, the target should be reducing greenhouse emissions by cutting down the use of fossil fuels. Restoring normalcy in weather and climate patterns will reverse and stop many of the impacts responsible for trends and events known to be security risks in the national and global realms.

Conflict of Interest Statement
Authors declare no conflict of interest.

About the Author(s)
Both authors work in the Center for Climate Change and Environmental Research (c3er), BRAC University, and have experience and a keen interest in working in the environment and climate change sector. Several research works were done by the correspondent authors in the environment and climate change sector and have links with academic networks such as ORCID, ResearchGate, etc.

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