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Global Health, Climate Change, and Migration: Ethical Issues

SUMMARY

This article examines the relationship between global health, climate change, and migration. It explores migration of both humans and animals, and its inverse. Many researchers directly link seasonal droughts, heatwaves, heavy rainfall, and floods to human health, observing, among other things, that these conditions increase contact with wildlife. As a result, there are serious concerns about the risk of future pandemics and epidemics. These issues primarily have a moral dimension because they relate to human well-being and test the fair distribution of healthcare resources. In this context, the development of a new ethic for a truly sustainable environment is deemed necessary, as the protection of the environment and global public health is a global moral responsibility and obligation. Moreover, there is a duty to protect all those displaced by a health crisis due to climate change, and the concept of a type of health asylum could be proposed, as we might soon talk about health refugees and migrants in combination with environmental ones.

Keywords: Global health, environmental ethics, migration, climate change.

INTRODUCTION

Climate change significantly impacts global health, among other effects. Its impacts can be divided into two broad categories: 1. direct and 2. indirect. The former includes extreme weather events (heatwaves, storms, floods, hurricanes, droughts) and the consequent disasters (injuries, loss of human lives). At the same time, the latter encompasses poverty, malnutrition, lack of drinking water, displacement of people and communities, cardiovascular and respiratory diseases, and mental health issues (Intergovernmental Panel on Climate Change, 2023; Robine et al., 2008; UNICEF, 2023).

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The World Meteorological Organization and the United Nations Environment Programme, as early as 1988, about 35 years ago, established the Intergovernmental Panel on Climate Change (IPCC) to assess the scientific knowledge base and research conducted on climate change (Githeko & Woodward, 2023). This committee presented three reports (in 1990, 1995, 2001), discussing the potential health impacts of human intervention in the environment. Additionally, the undertaking of new scientific studies was encouraged for a deeper understanding of the climate-health relationships (Githeko & Woodward, 2023).

The realization that the environment influences human health can already be found in 460 BC in the work of the father of modern medical science, "On Airs, Waters, and Places" by Hippocrates, who encourages physicians to consider how factors such as drinking water can affect the health of their patients (Hippocrates, 1993). The influence of climate on human health was also well understood, with heat causing fever, cold leading to hypothermia, and drought resulting in famine (Frumkin et al., 2008). The environmental epidemiology, the branch that deals with identifying how environmental exposures affect human health, thoroughly examines these consequences. This field seeks to understand how various external risk factors may predispose or protect against disease (Merrill, 2008). However, there are still considerable limitations in the available information, as most studies on climate and health and most national assessments of health risks from climate change have been conducted in developed countries, and the assessment of future impacts depends on various uncertainties. Therefore, the climate-health relationships that are easier to study and assess are those related to heatwaves, and natural hazards from floods, storms, fires, and various infectious diseases (Karagiannopoulou, 2021).

The European Centre for Environment and Health of the World Health Organization (WHO-ECEH) estimates that 1.4 million deaths annually in Europe alone are due to environmental exposures that could have been avoided (World Health Organization, 2017). For this reason, the impacts of climate change on health are increasingly causing concern within the international community. As early as 2009, a publication in the medical journal The Lancet stated that "Climate change is the biggest global health threat of the 21st century." This was reiterated in 2015 by the World Health Organization and in 2019 by the Australian Medical Association, which officially declared climate change as a health emergency (Costello et al., 2009; World Health Organization, 2015; The Guardian, 2019).

CLIMATE CHANGE, MIGRATION, AND GLOBAL HEALTH

A critical issue that has not been adequately assessed is the relationship between climate change, migration, and health, involving both human and animal migration and its reversal. For instance, the Republic of Kiribati is facing challenges due to rising sea levels, which are predicted to make it uninhabitable in a few years. Therefore, for a clearer approach to the issue, there is a need to distinguish between 1. national and international environmental migration, 2. temporary and permanent environmental migration, 3. environmental migration triggered suddenly by extreme weather events and environmental migration with gradual deterioration, such as sea level rise and desertification (Brown & McLeman, 2013; Rosenow-Williams & Gemenne, 2018). Additionally, problems arise from the migration of wildlife from areas affected by drought in search of food. This is compounded by the food crisis that leads people to consume wild animals for sustenance, the trade in exotic species, and the inadequate conditions of animal husbandry needed to meet global food requirements.

In 2022, a study dedicated to the relationship between climate change and zoonoses, i.e., viruses that jump from animals to humans, was published. The study identified strong links between zoonotic diseases, climate change, and the emergence of epidemics over the last 15 years, due to the massive migration of species to new areas, leading to encounters between species that had not previously met (Carlson et al., 2022; Yong, 2022). Indeed, the United Nations Environment Programme classifies COVID-19 as a zoonosis and states that the most fundamental way to protect ourselves from zoonotic diseases is to prevent the destruction of nature (United Nations Environment Programme, 2023a, 2023b, 2023c).

In this context, many researchers directly link seasonal droughts, heatwaves, intense rainfall, and floods to human health, noting an increase in contact with wildlife. As a result, they express serious concerns about the risk of future pandemics and epidemics. Among the concerns expressed is the melting of glaciers (e.g., in the Arctic), where, according to some scientists, microbes that have been "locked" for millions of years could be found, and their release might potentially lead to new pandemics threatening humanity (Liu et al., 2022). The risk is unknown and, therefore, speculative. For this reason, the development of thorough studies to identify and understand potential threats in advance is advocated (Liu et al., 2022; New Scientist, 2023a, 2023b; Yirka, 2022,).

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The impacts of climate change are evident in the spread of both existing and new infectious diseases and the situation becomes more complex when combined with

migration. Indicatively, among the infectious diseases whose transmission is affected by climate change are malaria, dengue fever, Ebola, and West Nile virus:

1. Malaria, which results in the death of about 300,000 children (under the age of 5) annually, poses a direct threat due to rising temperatures (Patz & Olson, 2006), as it is transmitted through mosquito bites (Buck & Finnigan, 2023). Today, it continues to be endemic in regions of Sub-Saharan Africa, Asia, the Amazon, and other tropical areas, affecting 40% of the global population living in areas where the disease is endemic, with local climatic conditions allowing its transmission throughout the year. There is observed a rapid genetic adaptation of the parasite, enables it to quickly adjust to environmental changes and develop resistance to medicines (Sato, 2021). It is noted that the risk of the disease is expected to increase by 5-15% by 2100 due to climate change. In Africa alone, according to the MARA project (Mapping Malaria Risk in Africa), a projected increase of 16-28% is expected by 2100 (Patz et al., 2005).

2. Dengue fever is primarily found in tropical areas and transmitted through mosquitoes, whose numbers could be affected by increasing rainfall (World Health Organization, 2023d). It is estimated that there are 50-100 million infections annually, and its transmission has dramatically increased in the last 50 years. Dengue is endemic and primarily located in Southeast Asia, the Americas, Africa, the Eastern Mediterranean, and the Western Pacific. Additionally, in Europe, there is a potential threat, as cases were reported for the first time in France and Croatia in 2010 (Ebi & Nealon, 2016; World Health Organization, 2023a).

3. Ebola Virus Disease (EVD) or Ebola Hemorrhagic Fever (EHF) is caused by the Ebola virus, one of the deadliest viruses, which started with a small outbreak and eventually became a significant global issue. It was first observed in 1976 near the Ebola River in the Democratic Republic of Congo. The virus has infected people in several African countries over time. The disease is fatal, with death rates ranging from 50% to 90%, as more than 28,600 cases and 11,310 deaths have been recorded (Centers for Disease Control and Prevention, 2023). An epidemic was observed during the drought in Central Africa, which exacerbated food insecurity and led communities in West Africa to consume animals, such as bats, that had been infected with the virus (Christensen, 2019).

4. West Nile virus typically appears as a seasonal epidemic, with most cases occurring in late summer or early autumn in temperate countries, while in southern climates, transmission of the virus is possible throughout the year (Petersen, Brault & Nasci, 2013). The virus has a transmission cycle between birds and mosquitoes. In humans, it is primarily transmitted through mosquito bites and

cannot be transmitted from person to person. It can spread rapidly and adapt to various environments. The prevalence of the disease increases due to rising temperatures and intense, irregular rainfall (Klingelhöfer et al., 2023; Petersen, Brault, & Nasci, 2013).

The spread of the aforementioned diseases is expected to increase in the coming years and these diseases are anticipated to appear in previously unaffected areas of Northern Europe, the Americas, Asia, and Australia. This is due to changes in climatic patterns affecting the behavior of vectors, such as mosquitoes, which transmit infectious diseases. The shifting patterns of temperature and rainfall will extend their geographic range into regions where populations may be immunologically vulnerable and public health systems unprepared (Schwab & Malleret, 2020).

The increasing frequency and intensity of heat waves, a consequence of climate change, contribute to heat-related illnesses and deaths and prompt considerations for the relocation of populations from particularly affected areas. Vulnerable populations, such as the elderly and those with pre-existing health conditions, face significant risks if they do not migrate. Thermal stress, dehydration, and cardiovascular complications are common health concerns during extreme temperature events (Watts et al., 2015). Additionally, water shortages due to drought can lead to widespread diseases, malnutrition, and migration. Extreme weather events, including storms, typhoons, floods, and wildfires, can cause injuries, property and healthcare facility destruction, and large migratory flows, exacerbating health risks. Furthermore, floods can contaminate water sources, increasing the risk of waterborne diseases such as cholera and subsequently contaminating entire regions (Haines et al., 2006). These events also affect agricultural productivity, which can lead to food shortages, malnutrition, diseases, and migration (United Nations, 2019).

Infectious diseases represent another significant issue, with their increasing frequency linked to climate change in two ways. Firstly, extreme weather events disrupt water supply and sewage structures in affected areas and force people who lose their homes into crowded shelters, creating conditions conducive to epidemic outbreaks. Secondly, rising temperatures lead to the migration of disease vectors, previously considered tropical, to other regions of the planet. For example, ticks carrying Lyme disease are now found in parts of Canada previously deemed too cold for their survival. Moreover, in Bolivia, where the changing climate has led to increased rainfall, the population of mosquitoes carrying dengue fever has grown (UCAR Center For Science Education, 2023), while in Asia, 96% of dengue fever deaths, are transmitted by the Aedes aegypti mosquito, occur. Both diseases are expected to affect a much larger portion of the global population as the habitats of these mosquitoes expand (UCAR Center For Science Education, 2023). In a related study, researchers

examined over 70,000 scientific papers analyzing the relationships between various climate risks and infectious diseases. Some of these studies reviewed data spanning 700 years, before the onset of the human-induced climate crisis. They found that 218 of the 375 different infectious diseases reported, more than half (58%), have been exacerbated by climate impacts that are becoming more frequent due to global temperature rise (Mora et al., 2022).

Air pollution poses a problem for global health, primarily affecting populations living close to pollution sources, often leading to their relocation. The degradation of air quality is also a reality due to the increased frequency of wildfires and higher ground-level ozone levels. Smoke from wildfires contains particles and pollutants that can exacerbate respiratory conditions such as asthma and increase the risk of respiratory infections (United States Environmental Protection Agency, 2021).

The mental health impacts of climate change should not be underestimated either, as events triggered by climate change, such as natural disasters, loss of livelihoods, and the necessity for relocation, can negatively affect mental health (McAdam, 2012). Anxiety disorders, depression, and post-traumatic stress disorder (PTSD) can develop as individuals and communities face the consequences of extreme weather events and environmental changes (Berry, Bowen, & Kjellstrom, 2010). These conditions may also lead to increased incidents of violence. Young people and adolescents are particularly vulnerable to these risks, as they face intense stress due to climate change and the uncertain future it creates (Meier, Bustreo & Gostin, 2022).

Additionally, the risk of new armed conflicts, including potential global or nuclear wars, must be considered, as these could lead to the emergence of new epidemics and the displacement of populations. The recent developments in the war in Ukraine and the possibility of a global conflict are particularly alarming. Equally concerning are the developments in the Middle East, where the likelihood of old tensions flaring up with the involvement of multiple states is significantly increased (Khorram-Manesh, Goniewicz & Burkle, 2023).

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Climate change can indirectly affect disease response, as it undermines the environmental determinants of health. Rapid urbanization, driven by forced population relocation, often leads to increased population density, creating environments conducive to the rapid transmission of infectious agents (World Health Organization, 2018). Densely populated urban areas provide optimal conditions for the spread of diseases, particularly respiratory infections. Furthermore, increased global mobility, international travel—whether for leisure or business—and trade facilitate the rapid movement of people, animals, and goods across borders.

This interconnectivity enhances the potential for the introduction and spread of infectious agents worldwide, given that a disease can be transmitted during travel and upon reaching the final destination. Antimicrobial resistance represents another significant global health issue related to climate change and is expected to become an even more pressing concern in the coming years. According to the World Health Organization, it is estimated that in 2019, antimicrobial resistance directly caused 1.27 million deaths and indirectly contributed to an additional 4.95 million deaths globally (World Health Organization, 2023c). The problem of antimicrobial resistance predated the discovery and widespread use of antibiotics, which create resistant microorganisms not only through the human microbiome but also through microbial communities in water and soil. These communities are particularly diverse and capable of extensively spreading the resistance they develop. Increased transfer of resistant microbes from animals to humans has been observed since the 1970s, with the case of resistant Salmonella being well-documented (Brinkac et al., 2017). The dispersion in the environment through waste, water from agriculture or healthcare facilities, and their transport through air, dust, food, and travel plays a significant role. Therefore, to limit the transmission of resistant microorganisms, measures are needed not only to prevent their transfer among humans but also to reduce their spread into the environment (Bengtsson-Palme, Kristiansson & Larsson, 2018). The COVID-19 pandemic led to extensive use of antibiotics, a fact that may further exacerbate the problem of antimicrobial resistance in the future (Razzaque, 2021).

The aforementioned factors place additional pressure on healthcare systems. Strengthening health systems, vigilant monitoring of infectious diseases, and greater protection of biodiversity and the natural environment could contribute positively and preventatively (World Health Organization, 2023b). Moreover, maintaining high immunization rates, the process through which an individual is protected against a disease through vaccination and becomes resistant to an infectious disease is imperative. Currently, vaccines are available for preventing more than 20 life-threatening diseases, which help people of all ages live longer and healthier lives. Vaccination currently prevents 3.5-5 million deaths each year from diseases such as diphtheria, tetanus, pertussis, influenza, and measles (Linou, 2017).

The robust immunization systems built in the last decade offer hope for the future. However, the outlook is not as optimistic in developing countries, which will suffer the most severe impacts of climate change and whose residents may be forced to migrate. For example, tetanus is an extremely rare disease in the developed world. Yet, in developing countries, its spread is challenging to quantify, as many cases go unrecorded. In the decade from 2001 to 2010, there were about 180,000 deaths annually from tetanus alone (Longo et al., 2012).

Professor Camilo Mora from the University of Hawaii recently stated that «we are opening Pandora's box of disease». Moreover, he likened the situation to provoking a lion with a stick, which is expected to eventually attack (Mora et al., 2022).

CHALLENGES AND POLICY STRATEGIES FOR CLIMATE CHANGE AND MIGRATION

The precautionary principle is a concept in environmental sciences, which posits that if there is a suspicion that an activity is causing harm, action should not be delayed until sufficient evidence is gathered to confirm it. It originated in German environmental policy and emerged in the early 1970s. It was later highlighted during the Second North Sea Conference and has since been argued to be a general principle of international law (Churchill & Freestone, 1991). In 2000, the European Union began to formally adopt it into its legislation as announced by the European Commission (Kriebel et al., 2001). This development is particularly encouraging for the issue under examination, as actions to safeguard global public health and the environment are deemed necessary. The existing evidence is considered sufficient for the adoption of immediate and substantial measures, especially as migrant flows to Europe increase and raise new concerns regarding management and the potential risk associated with the native population.

In the same decade, the concept of One Health emerged, representing a collaborative and interdisciplinary approach that recognizes the interconnection between human health, animal health, and the environment. One Health emphasizes the need for coordinated efforts across various sectors, including medicine, veterinary science, environmental science, and other related fields, to address complex health issues (Evans & Leighton, 2014). A key principle of this approach is interdisciplinary collaboration, as this collaborative approach aims to break down the traditional barriers between individual sciences and promote a holistic understanding of health (Chakraborty, Andrade & Smith, 2022). It supports a preventative approach to disease prevention and control, rather than reacting to outbreaks after they occur, which requires effective surveillance, early detection, and integrated strategies to address health threats before they escalate (Ryu et al., 2017). Beyond immediate health concerns, One Health emphasizes social and environmental management and calls for responsible practices to ensure the health of the planet. In an era where global challenges demand interconnected solutions, One Health offers a visionary framework guiding us toward a healthier, more sustainable coexistence of human, animal, and environmental well-being (Zinsstag et al., 2011). Indeed, as many infectious diseases have a zoonotic nature, the One Health strategy aids in identifying and controlling these diseases at the animal-human-environment interface, reducing

the risk of such a disease spreading to humans (Karesh & Vora, 2010). Although discussions about the need for coordinated actions within the framework of One Health began in 2003, it was not until 2021 that a committee was established by global organizations aimed at enhancing and promoting the initiation of actions within this plan (One Health High-Level Expert Panel et al., 2022).

It is encouraging that two years earlier, in December 2018, the United Nations General Assembly adopted the Global Compact for Safe, Orderly, and Regular Migration (GCM), which is the first intergovernmental agreement that comprehensively and cohesively covers all dimensions of international migration. The linkage of climate change, health, and migration within the Global Compact on Migration is significant for the topic at hand as it lays the groundwork for the legal relocation of those forced to move because their health is endangered by climate change. Initially, the Global Compact on Migration commits to creating favorable political, economic, social, and environmental conditions that allow people to live peaceful, productive, and sustainable lives in their own countries and to fulfill their aspirations, while ensuring that neither desperation nor a deteriorating environment compels them to seek a livelihood elsewhere through irregular migration (GCM, 2018). To fulfill this commitment, the implementation of the 2030 Agenda for Sustainable Development is being promoted, including the Sustainable Development Goals and the Paris Agreement, as well as the Sendai Framework for Disaster Risk Reduction 2015–2030. Additionally, there is an emphasis on the need to invest in programs that accelerate the achievement of states' Sustainable Development Goals to eliminate the negative drivers and structural factors that force people to leave their countries of origin. These include food security, health and sanitation, urban and rural development, decent work, resilience and disaster risk reduction, climate change mitigation and adaptation, and addressing the socioeconomic impacts of all forms of violence (GCM, 2018).

Furthermore, the Global Compact on Migration addresses objectives and commitments, specifically naming 'Natural disasters, the adverse effects of climate change, and environmental degradation.' In this context, it outlines the following actions:

> "1. Strengthen joint analysis and sharing of information to better map, understand, predict, and address migration movements that may result from sudden-onset and slow-onset natural disasters, the adverse effects of climate change, environmental degradation, and other precarious situations, while ensuring the effective respect for and protection and fulfillment of the human rights of all migrants;
>
> 2. Develop adaptation and resilience strategies for sudden-onset and slow-onset natural disasters, the adverse effects of climate change, and environmental degradation such as desertification, land degradation, drought, and sea level rise, considering the

potential implications for migration, while recognizing that adaptation in the country of origin is a priority;

3. Integrate displacement considerations into disaster preparedness strategies and promote cooperation with neighboring and other relevant countries to prepare for early warning, contingency planning, stockpiling, coordination mechanisms, evacuation planning, reception and assistance arrangements, and public information;

4. Harmonize and develop approaches and mechanisms at the subregional and regional levels to address the vulnerabilities of persons affected by sudden-onset and slow-onset natural disasters, by ensuring that they have access to humanitarian assistance that meets their essential needs with full respect for their rights wherever they are, and by promoting sustainable outcomes that increase resilience and self-reliance, taking into account the capacities of all countries involved;

5. Develop coherent approaches to address the challenges of migration movements in the context of sudden-onset and slow-onset natural disasters, including by taking into consideration relevant recommendations from State-led consultative processes, such as the Agenda for the Protection of Cross-Border Displaced Persons in the Context of Disasters and Climate Change, and the Platform on Disaster Displacement" (GCM, 2018).

Additionally, the Global Compact refers to improving the availability and flexibility of pathways for regular migration. It highlights the need for collaboration to identify, develop, and enhance solutions for migrants forced to leave their countries of origin due to slow-onset natural disasters, the adverse effects of climate change, and environmental degradation, such as desertification, land degradation, drought, and sea level rise. This includes planning options for organized relocation and issuing visas in cases where adaptation in their country of origin or return is not possible (GCM, 2018). While the Global Compact provides a significant framework for environmental migration that places migrants and their human rights at the forefront, supporting the principles of non-regression and non-discrimination, it is only the beginning and not the end of a renewed effort by the international community to converge and address these significant and pressing issues (Solomon & Sheldon, 2018).

It is worth noting that in September 2020, the European Commission presented a new Pact on Migration and Asylum that outlines a fairer approach to managing migration and asylum. The health and healthcare of migrants are also included in the pact, which provides for health checks to timely identify the potential needs of migrants. The European Commission also announced new legislative proposals intended to be included in this pact for screening third-country nationals at the external borders. According to these proposals, individuals entering the EU without meeting the entry conditions will be subject to mandatory health checks as part of a

new pre-entry screening process, to determine whether additional support is required (European Commission, 2023).

The European Union, aiming to assist, provides funding for improving the healthcare of vulnerable migrants, integrating them into national health systems, and training healthcare professionals. Additionally, it supports EU countries receiving a particularly large number of migrants to address health sector challenges and promotes the exchange of best practices for healthcare models. Moreover, it coordinates the following activities through the Health Security Committee:

> "Gathers requests for medical supplies from EU countries that are most challenged, so other EU countries can respond with additional capacity,
>
> Monitors communicable diseases through the early warning and response system,
>
> Connects national contact points for health funds, civil protection, asylum, migration, and integration,
>
> Cooperates with the European Centre for Disease Prevention and Control, the Regional Office for Europe of the World Health Organization, and the International Organization for Migration to better identify and address the needs of EU countries and refugees,
>
> Develops training programs and educational material for healthcare personnel and other professionals working with migrants, to familiarize them with unfamiliar diseases and inform them about different cultural perceptions and the specific needs of newly arrived migrants and refugees" (European Commission, 2023).

The question arising from these measures is whether the protection of the health of all those displaced due to environmental conditions, whether related to the climate crisis or not, plays a primary or secondary role. Concerns have been raised that powerful states are not interested in further advancing the issue and only take action when their security is threatened, leaving open the question of whether they genuinely care about environmental refugees and migrants (Rosenow-Williams & Gemenne, 2018).

The impacts of climate change on health indeed exacerbate existing inequalities. Developed and developing countries are disproportionately affected, and vulnerable populations appear more susceptible to its consequences. Undoubtedly, the impacts of climate change are not the same for everyone, as certain groups of people are more exposed to environmental hazards, such as air, soil, and water pollution. This often occurs due to marginalization, economic and political processes, and racism. Environmental racism affects different groups worldwide, but the most marginalized groups in each region bear the brunt of its effects. These marginalized groups are often located near pollution sources, such as major roads, toxic waste sites, landfills, and factories (Kaufman & Hajat, 2021). There are documented instances of xenophobic reactions where racial and ethnic groups have been marginalized. These individuals

are perceived by societies as "undesirable elements" or as "threats", described as "public health time bombs", "criminals and dangerous", "invaders", people who "alter the homogeneity of the host country", described as "uneducated, uncultured, and unwilling to attend school", and who "take over jobs from native workers", posing a threat to democracy and draining public resources (Barreneche, 2020).

Climate change, often referred to as a «risk multiplier» is a public health issue, not a racial one. It is essential not only to strive to protect the planet but also to combat the racial hatred it incites. It is also crucial to learn from the racial fears stemming from historical events and apply this knowledge to the feelings of fear and anxiety during a global health threat. Unfortunately, the stigma associated with such an event can persist long after its conclusion. For example, the stigmatization of Asians following the recent pandemic appears to have been prolonged. This phenomenon was particularly intense in the Americas, where incidents of discrimination had to be confronted head-on: in schools, workplaces, businesses, and other public spaces (Gover, Harper & Langton, 2020).

REDEFINING ETHICS FOR ENVIRONMENTAL PROTECTION

The issues mentioned above primarily have a moral dimension because they concern human well-being and test the fair distribution of healthcare resources. In this context, the development of a new ethic for a truly sustainable environment is deemed necessary. Tassios (2012) notes that the "development" promised by the "modern" lifestyle is illusory and to become reality, environmental, economic, social, and cultural sustainability must be pursued equivalently within a four-dimensional space.

The last decades of the 20th century indeed saw a pronounced interest in environmental issues due to unbridled human intervention in nature. The proposed solutions advocate for a new orientation or a new "ethic" that recognizes "inherent value" in the natural world. For example, Aldo Leopold's "Land Ethic" (1887-1948) views humans as members of the biotic community ("the land"), not its owners; deep ecology, a stance formulated by Norwegian philosopher Arne Naess (1912-2009), advocates for forms of identification with the non-human world; and ecofeminism, which rejects the dominant attitude towards the natural world perceived as patriarchal. Naturally, these theories have received their fair share of criticism. Therefore, it's imperative to examine if and to what extent they constitute coherent and valid ethical theories, i.e., if they can provide effective solutions to the now acute environmental problem or, at the very least, serve as fertile ground for the evolution of environmental ethics (Protopapadakis, 2012).

Professor Protopapadakis, for example, argues that Aldo Leopold's Land Ethic does not constitute a coherent and comprehensive system, but it also fosters a unique form of moral totalitarianism. In this context, he notes that the central concepts of this theory lack clear definition, the reasoning it follows does not have demonstrative power, and Leopold's positions entail a high potential danger. However, regarding the fertility of Leopold's theory, he seems convinced that, beyond the momentum it has so far provided to environmental ethics, it can in the future serve as a springboard for evolution and progress, precisely because, as a point of intense contradiction, it offers itself for creative philosophical dialogue (Ladas, 2020; Protopapadakis, 2012).

Because the ecological problem is primarily a moral issue, the relevant teachings of various religions become extremely interesting. All religions, particularly Christianity, Islam, and Judaism, incorporate fundamental "ecological" principles at their core regarding the creation of the world, the origin of humankind, the relationship between humans and nature, and the eschatological end of all things at the Day of Judgment (Mariora, 2008). Therefore, the faithful have at their disposal an already formulated "ecological" framework that largely determines, or ought to determine, their attitudes and behaviors towards nature, animals, natural resources, and the planet at large. The estrangement of believers from this environmental frame of reference constitutes the deepest cause of the ecological problem, while its rapprochement could provide a solution to the issue (Mariora, 2008).

In this context, it is important to note that Christianity emphasizes that the world is not a creation of man but of God, and therefore, humans must protect the natural environment. According to Christian teaching, the ecological crisis is due to human sin, and responsibility lies with each individual, not humanity as a whole. The ecological crisis has its roots in humanity's estrangement from God and neighbor, in arrogant and Luciferian behavior, and in failing to heed God's command to the first humans to guard the natural environment. The Church addresses the ecological crisis not only on a moral or social level but primarily on an ontological one, advocating a new religious and cultural approach (Ladas, 2015). In this context, Ecumenical Patriarch Bartholomew has undertaken significant initiatives for environmental protection, which is why he is called the "Green Patriarch" (Ladas, 2018).

Islam also has a clear ecological dimension and is positioned to reshape the worldview of Muslims towards such a direction, offering significant assistance in addressing today's ecological problems. Islam possesses a clear and comprehensive ecological framework that includes almost all modern parameters for prudent management and for solving or addressing the ecological problem as it tragically unfolds today (Mariora, 2008). The Islamic approach to nature is distinctly holistic and ontologically based on the belief that God is the Creator, the absolute sovereign, and the sole owner of

everything in the universe. God's love and care created the world and He equally cares for all creations. Given his rational capacity, man is charged by God with the great responsibility to protect all of Creation and to ensure its proper functioning (Mariora, 2008). Therefore, arbitrary and destructive behavior towards nature is in no way justified. On the contrary, such actions will be severely judged and punished by God on the Day of Final Judgment (Mariora, 2008).

Judaism also promotes the idea of caring for and properly managing the environment, as well as the human responsibility to care for and protect God's creation. Within Jewish tradition, specific approaches are identified that guide the faithful and provide significant resources that contribute to the development of Jewish environmentalism, activism, and advocacy for climate change (Krone, 2024).

Therefore, the religious perspective leads to an environmental ethic that is much more intense than what our society currently applies, and it suggests a more urgent response to the threat of climate change (Mariora, 2008). A necessary precondition is the development of this fundamental yet profoundly substantive "ecological" teaching, which religions inherently possess through their representatives, and its practical implementation by the faithful (Dobb, 2012).

CONCLUSION

Until recently, it was believed that climate change and migration primarily impacted economic sectors, tourism, and lifestyle. However, the perspective has shifted, and today climate change and migration are recognized as serious threats to Global Health, affecting the natural and anthropogenic ecosystems and their balance (Karagiannopoulou, 2021). This shift indicates the need for supporting national funding to address infrastructure and health system deficiencies, as well as providing assistance to countries that most require it (Ghebreyesus, 2020). Additionally, enhancing research on the health impacts of climate change and migration and promoting international cooperation on health issues related to climate and migration are also critical steps (McMichael & Lindgren, 2011).

It is widely accepted that the progress of Public Health has occurred as a function of the evolution of social systems. Societies that transitioned more rapidly from agricultural to industrial status also experienced swifter advancements in Public Health, with more effective and quicker control of infectious diseases compared to others. For instance, in developed countries of Northern and Western Europe, such as Great Britain, organized public health efforts were already underway by the 18th century, even leading to the development of the field of epidemiology (Aschengrau

& Seage, 2012). Today, the challenge lies in maintaining and enhancing this level of public health.

Regardless of the ultimate goal of environmental protection, whether it be humans or nature as a whole, at the heart of environmental ethics lies the effort to articulate the basis of interest in the natural world (Audi, 2015). Environmental ethics explores the perspective of a sustainable relationship between economic and ecological systems and seeks the implications of this relationship concerning social justice and political institutions (Audi, 2015). The environmental problems of today have accumulated mainly in the last few decades and are, among other things, the result of a lack of both environmental ethics and environmental education (Zerefos, 2018).

The pace at which the environment is altered and human health is burdened necessitates citizen participation in environmental decision-making. Every citizen must acquire the ability to understand environmental issues, comprehend the causes of problems, evaluate potential solutions, and possess participatory skills (Skanavi, 2004; Ladas, 2020). Therefore, governmental services, organizations, university departments, political parties, ecological groups, or even individuals can engage in both environmental protection and the safeguarding of global public health.

The discussion about migration induced by environmental factors has been ongoing for more than a quarter of a century (El-Hinnawi, 1985). However, to this day, there is insufficient data regarding the number of individuals displaced due to environmental reasons, while the existing data are "highly contested" and "unsatisfactory" (Gemenne, 2011). In recent years, interest has shifted from migration generally caused by environmental factors to that specifically caused by climate change (Stoutenburg, 2011). Hugo cautions against adopting a direct cause-and-effect relationship between climate impacts and migration, arguing that people's resilience and their potential to adapt to new circumstances might eliminate the need for relocation (McAdam, 2012). Conversely, Kälin argues that there is no reason to differentiate between people displaced by non-climate-related environmental events and those affected by climate impacts (McAdam, 2012), a view that aligns completely with our understanding of issues related to global public health and migration.

From the above, it is clear that the protection of the environment and global public health is a global moral responsibility and obligation. The environment and human health are parts of an integrated whole, and we must protect them. We also must protect all those displaced due to a health crisis resulting from climate change, and there could be a case for some form of health asylum, as we could soon be talking about health refugees and migrants in conjunction with environmental ones.

REFERENCES

Aschengrau, A. & Seage, G. R. (2012). *Essentials of epidemiology in public health* (3rd ed.). Boston: Jones & Bartlett Learning.

Audi, R. (Ed.). (2015). *The Cambridge Dictionary of Philosophy*. Cambridge: Cambridge University Press.

Barreneche, S. M. (2020). Somebody to blame: On the construction of the other in the context of the COVID-19 outbreak. *Society Register*, *4*(2), 19-32. https://doi.org/10.14746/sr.2020.4.2.02

Bengtsson-Palme, J., Kristiansson, E. & Larsson, D. G. J. (2018). Environmental factors influencing the development and spread of antibiotic resistance. *FEMS Microbiology Reviews*, *42*(1), fux053. https://doi.org/10.1093/femsre/fux053

Berry, H. L., Bowen, K. & Kjellstrom, T. (2010). Climate change and mental health: A causal pathways framework. *International Journal of Public Health*, *55*(2), 123-132.

Brinkac, L., Voorhies, A., Gomez, A. & Nelson, K. E. (2017). The threat of antimicrobial resistance on the human microbiome. *Microbial Ecology*, *74*(4), 1001-1008. https://doi.org/10.1007/s00248-017-0985-z

Brown, O. & McLeman, R. (2013). Climate change and migration: An overview. In I. Ness (Ed.), *The encyclopedia of global human migration*. Oxford: Blackwell Publishers.

Carlson, C. J., Albery, G. F., Merow, C., Trisos, C. H., Zipfel, C. M., Eskew, E. A., Olival, K. J., Ross, N. & Bansal, S. (2022). Climate change increases cross-species viral transmission risk. *Nature*, *607*, 555-562.

Centers for Disease Control and Prevention. (2023). Ebola (Ebola Virus Disease), https://www.cdc.gov/vhf/ebola/index.html

Chakraborty, S., Andrade, F. C. & Smith, R. L. (2022). An interdisciplinary approach to One Health: Course design, development, and delivery. *Journal of Veterinary Medical Education*, *49*(5), 568-574.

Christensen, J. (2019). Climate crisis raises risk of more Ebola outbreaks, https://edition.cnn.com/2019/10/15/health/climate-crisis-ebola-risks/index.html

Churchill, R. & Freestone, D. (Eds.). (1991). *International law and global climate change*. UK: Graham & Trotman.

Costello, A., Abbas, M., Allen, A., Ball, S., Bellamy, R., Friel, S., Groce, N., Johnson, A., Kett, M., Lee, M., Levy, C., Maslin, M., McCoy, D., McGuire, B., Montgomery, H., Napier, D., Pagel, C., Patel, J., Puppim de Oliveira, J. A., Redclift, N., Rees, H., Rogger, D., Scott, J., Stephenson, J., Twigg, J., Wolff, J. & Patterson, C. (2009). Managing the health effects of climate change: Lancet and University College London Institute for Global Health Commission. *Lancet*, *373*(9676), 1693-1733.

Dobb, F. S. (2012). Jewish perspectives on climate change and environment. *Religions: A Scholarly Journal*, *2012*(1). https://doi.org/10.5339/rels.2012.environment.9

Ebi, K. L. & Nealon, J. (2016). Dengue in a changing climate. *Environmental Research*, *151*, 115-123.

El-Hinnawi, E. (1985). *Environmental refugees*. United Nations Environment Programme.

European Commission. (2023). Migrants' health. https://health.ec.europa.eu/social-determinants/migrants-health_en

Evans, B. R. & Leighton, F. A. (2014). A history of One Health. *Revue Scientifique et Technique (International Office of Epizootics)*, *33*(2), 413-420.

Frumkin, H., Hess, J., Luber, G., Malilay, J. & McGeehin, M. (2008). Climate Change: The Public Health Response. *American Journal of Public Health*, *98*, 435-445. https://doi.org/10.2105/AJPH.2007.119362

Gemenne, F. (2011). Why the numbers don't add up: A review of estimates and predictions of people displaced by environmental changes. *Global Environmental Change: Human and Policy Dimensions*, *21*(S1), S41-S49. https://doi.org/10.1016/j.gloenvcha.2011.09.005

Ghebreyesus, T. A. (2020). Urgent health challenges for the next decade. World Health Organization, https://www.who.int/news-room/photo-story/photo-story-detail/urgent-health-challenges-for-the-next-decade

Githeko, A. K. & Woodward, A. (2023). International consensus on the science of climate and health: the IPCC Third Assessment Report, https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=20e0a1b9fad2caeb947038e038ee618e74a472fa

Global Compact for Safe, Orderly and Regular Migration. (2018). Global Compact for Safe, Orderly and Regular Migration (GCM), https://www.ohchr.org/en/migration/global-compact-safe-orderly-and-regular-migration-gcm

Gover, A. R., Harper, S. B. & Langton, L. (2020). Anti-Asian hate crime during the COVID-19 pandemic: Exploring the reproduction of inequality. *American Journal of Criminal Justice*, *45*(4), 647-667. https://doi.org/10.1007/s12103-020-09545-1

Haines, A., Kovats, R. S., Campbell-Lendrum, D. & Corvalán, C. (2006). Climate change and human health: Impacts, vulnerability, and public health. *Public Health*, *120*(7), 585-596.

Hippocrates. (1993). Άπαντα, Τόμος 3. Athens: Cactus.

Karagiannopoulou, M. (2021). *Κλιματική αλλαγή και οι επιπτώσεις της στη Δημόσια Υγεία* (*Climate change and its effects on Public Health*) [Doctoral dissertation, Harokopio University].

Karesh, W. B. & Vora, N. (2010). One world – one health. *Emerging Infections*, *9*, 327-335.

Kaufman, J. D. & Hajat, A. (2021). Confronting environmental racism. *Environmental Health Perspectives*, *129*(5).

Khorram-Manesh, A., Goniewicz, K. & Burkle, F. M. (2023). Social and healthcare impacts of the Russian-led hybrid war in Ukraine - A conflict with unique global consequences. *Disaster Medicine and Public Health Preparedness*, *17*, e432. https://doi.org/10.1017/dmp.2023.91

Klingelhöfer, D., Braun, M., Kramer, I. M., Reuss, F., Müller, R., Groneberg, D. A. & Brüggmann, D. (2023). A virus becomes a global concern: Research activities on West-Nile virus. *Emerging Microbes & Infections*, *12*(2). https://doi.org/10.1080/22221751.2023.2256424

Kriebel, D., Tickner, J., Epstein, P., Lemons, J., Levins, R., Loechler, E., Quinn, M., Rudel, R. & Schettler, T. (2001). The Precautionary Principle in Environmental Science. *Environmental Health Perspectives*, *109*(9), 871-876.

Krone, A. (2024). Judaism and climate change. *Religion Compass*. https://doi.org/10.1111/rec3.12491

Ladas, I. (2015). The relationship between God and world in the Orthodox Dogmatic Theology and the positions of Christian ethics to overcome the ecological crisis. In *New Trends in Ecological and Biological Research* (pp. 321-325). University Press of Prešov.

Ladas, I. (2018). Expanding Engelhardt's cogitation: Claim for Panorthodox bioethics. *Conatus Journal of Philosophy*, *3*(2), 9-15. https://doi.org/10.12681/conatus.19397

Ladas, I. (2020). Life after COVID-19: Understanding the environment for humanity's survival and sustenance. *Epistēmēs Metron Logos*, 4, 62-81. https://doi.org/10.12681/eml.23779

Linou, A. (Ed.). (2017). *Mayo Clinic Προληπτική Ιατρική και Δημόσια Υγεία*. Patras: Gotsis.

Liu, Y., Ji, M., Yu, T., Zaugg, J., Anesio, A., Zhang, Z., Hu, S., Hugenholtz, P., Liu, K., Liu, P., Chen, Y., Luo, Y. & Yao, T. (2022). A genome and gene catalog of glacier microbiomes. *Nature Biotechnology*, *40*(9), 1341-1348.

Longo, D., Fauci, A., Kasper, D., Hauser, S., Jameson, J. & Loscalzo, J. (2012). *Harrison's Principles of Internal Medicine*. USA: McGraw-Hill Education / Medical.

Mariora, M. (2008). Σχεδίασμα ἰσλαμικῆς οἰκολογίας (Design of Islamic ecology). *Theologia*, *79*(2), 119-146.

McAdam, J. (Ed.). (2012). *Climate change and displacement: Multidisciplinary perspectives*. Hart Publishing.

McMichael, A. J. & Lindgren, E. (2011). Climate change: Present and future risks to health, and necessary responses. *Journal of Internal Medicine*, *270*(5), 401-413.

Meier, B. M., Bustreo, F. & Gostin, L. O. (2022). Climate change, public health and human rights. *International Journal of Environmental Research and Public Health*, *19*(21), 13744. https://doi.org/10.3390/ijerph192113744

Merrill, R. (2008). *Environmental epidemiology: Principles and methods*. Jones and Bartlett Learning.

Mora, C., McKenzie, T., Gaw, I. M., Dean, J. M., von Hammerstein, H., Knudson, T. A., Setter, R. O., Smith, C. Z., Webster, K. M., Patz, J. A. & Franklin, E. C. (2022). Over half of known human pathogenic diseases can be aggravated by climate change. *Nature Climate Change*, *12*, 869-875.

New Scientist. (2023a). Could ancient viruses from melting permafrost cause the next pandemic?, https://www.newscientist.com/article/mg25333743-200-could-ancient-viruses-from-melting-permafrost-cause-the-next-pandemic/

New Scientist. (2023b). Biggest-ever virus revived from Stone Age permafrost, https://www.newscientist.com/article/dn25151-biggest-ever-virus-revived-from-stone-age-permafrost/

One Health High-Level Expert Panel (OHHLEP), Adisasmito, W. B., Almuhairi, S., Behravesh, C. B., Bilivogui, P., Bukachi, S. A. et al. (2022). One Health: A new definition for a sustainable and healthy future. *PLoS Pathogens*, *18*(6), Article e1010537. https://doi.org/10.1371/journal.ppat.1010537

Patz, J. A. & Olson, S. H. (2006). Malaria risk and temperature: Influences from global climate change and local land use practices. *Proceedings of the National Academy of Sciences of the United States of America*, *103*(15), 5635-5636.

Patz, J. A., Campbell-Lendrum, D., Holloway, T. & Foley, J. A. (2005). Impact of regional climate change on human health. *Nature*, *438*, 310-317.

Petersen, L. R., Brault, A. C. & Nasci, R. S. (2013). West Nile Virus: Review of the Literature. *JAMA*, *310*(3), 308-315. https://doi.org/10.1001/jama.2013.8042

Protopapadakis, E. (2012). Μια άγρια πράσινη φλόγα: Ο Aldo Leopold και η ηθική της γής (A Wild Green Flame: Aldo Leopold and the Land Ethic). In E. Protopapadakis & E. Manolas (Eds.), *Περιβαλλοντική Ηθική – Προκλήσεις και Προοπτικές για τον 21ο αιώνα (Environmental Ethics – Challenges and Perspectives for the 21st Century)*. Orestiada: Democritus University of Thrace Press.

Razzaque, M. S. (2021). Exacerbation of antimicrobial resistance: Another casualty of the COVID-19 pandemic. *Expert Review of Anti-Infective Therapy*, *19*(8), 967–971. https://doi.org/10.1080/14787210.2021.1865802

Rosenow-Williams, K. & Gemenne, F. (Eds.). (2018). *Organizational perspectives on environmental migration*. Routledge.

Ryu, S., Kim, B. I., Lim, J. S., Tan, C. S. & Chun, B. C. (2017). One health perspectives on emerging public health threats. *Journal of Preventive Medicine and Public Health*, *50*(6), 411-414.

Sato, S. (2021). Plasmodium—a brief introduction to the parasites causing human malaria and their basic biology. *Journal of Physiological Anthropology*, *40*(1), 1. https://doi.org/10.1186/s40101-020-00251-9

Schwab, K. & Malleret, T. (2020). *The Great Reset*. World Economic Forum.

Skanavi, K. (2004). *Περιβάλλον και Επικοινωνία – Δικαίωμα στην επιλογή (Communication – Right to Choose)*. Athens: Kaleidoscope.

Solomon, M. K. & Sheldon, S. (2018). The Global Compact for Migration: From the Sustainable Development Goals to a comprehensive agreement on safe, orderly and regular migration. *International Journal of Refugee Law*, *30*(4), 584-590. https://doi.org/10.1093/ijrl/eey065

Stoutenburg, J. G. (2011). Review of Climate Change and Displacement: Multidisciplinary Perspectives, edited by Jane McAdam. *European Journal of International Law*, *22*(4), 1196–1200. https://doi.org/10.1093/ejil/chr077

Tasios, T. (2012). Προίμιο για έναν διακλαδικότερο ηθικό προβληματισμό για το περιβάλλον. In E. Protopapadakis & E. Manolas (Eds.), *Περιβαλλοντική Ηθική – Προκλήσεις και Προοπτικές για τον 21ο αιώνα*. Orestiada, Greece: Democritus University of Thrace Press.

The Guardian. (2019). Australian Medical Association declares climate change a health emergency, https://www.theguardian.com/australia-news/2019/sep/03/australian-medical-association-declares-climate-change-a-health-emergency

UCAR Center For Science Education. (2023). Impacts of climate change on human health, https://scied.ucar.edu/learning-zone/climate-change-impacts/human-health

United Nations Environment Programme. (2023a). Preventing the next pandemic – Zoonotic diseases and how to break the chain of transmission, https://www.unep.org/resources/report/preventing-future-zoonotic-disease-outbreaks-protecting-environment-animals-and

United Nations Environment Programme. (2023b). Making Peace with Nature: A scientific blueprint to tackle the climate, biodiversity and pollution emergencies, https://seea.un.org/content/making-peace-nature-scientific-blueprint-tackle-climate-biodiversity-and-pollution

United Nations Environment Programme. (2023c). Science points to causes of COVID-19, https://www.unep.org/news-and-stories/story/science-points-causes-covid-19

Watts, N., Adger, W. N., Agnolucci, P. et al. (2015). Health and climate change: Policy responses to protect public health. *The Lancet*, *386*(10006), 1861-1914.

World Health Organization. (2015). WHO calls for urgent action to protect health from climate change – Sign the call, https://www.who.int/news/item/06-10-2015-who-calls-for-urgent-action-to-protect-health-from-climate-change-sign-the-call

World Health Organization. (2017). Ostrava Declaration on Environment and Health, https://www.euro.who.int/__data/assets/pdf_file/0007/341944/OstravaDeclaration_SIGNED.pdf

World Health Organization. (2018). *Addressing the social determinants of health: The urban dimension and infectious diseases*.

World Health Organization. (2023a). Neglected tropical diseases: Dengue, https://www.who.int/news-room/questions-and-answers/item/neglected-tropical-diseases

World Health Organization. (2023b). Coronavirus disease (COVID-19): Climate change, https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-covid-19-climate-change

World Health Organization. (2023c). Antimicrobial resistance, https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance

World Health Organization. (2023d). Dengue and severe dengue, https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue

Zerefos, C. S. (2018). Περιβάλλον και Βιοηθική (Environment and Bioethics). In *Proceedings of the 2nd Panhellenic Scientific Conference with International Participation "Greece-Europe 2020: Education, Lifelong Learning, Research*, New Technologies, Innovation, and Economy" (pp. 16-19). Lamia. https://doi.org/10.12681/elrie.2441

Zinsstag, J., Schelling, E., Waltner-Toews, D. & Tanner, M. (2011). From "one medicine" to "one health" and systemic approaches to health and well-being. *Preventive Veterinary Medicine*, *101*(3-4), 148-156.

Globalno zdravlje, klimatske promjene i migracije: etička pitanja

SAŽETAK

Članak ispituje odnos između globalnog zdravlja, klimatskih promjena i migracija. Istražuje migracije ljudi i životinja, kao i njihove suprotnosti. Mnogi istraživači izravno povezuju sezonske suše, toplinske valove, obilne kiše i poplave s ljudskim zdravljem, primjećujući, između ostalog, da ovi uvjeti povećavaju kontakt s divljim životinjama. Kao rezultat toga, postoji ozbiljna zabrinutost o riziku od budućih pandemija i epidemija. Ova pitanja imaju prvenstveno moralnu dimenziju, jer se odnose na dobrobit ljudi i testiraju pravednu raspodjelu zdravstvenih resursa. U tom se kontekstu smatra potrebnim razviti novu etiku za istinski održiv okoliš, jer je zaštita okoliša i globalnog javnog zdravlja globalna moralna odgovornost i obveza. Štoviše, postoji dužnost zaštite svih onih koji su raseljeni zbog zdravstvene krize uzrokovane klimatskim promjenama te se može predložiti koncept zdravstvenog azila, jer bismo uskoro mogli govoriti o zdravstvenim izbjeglicama i migrantima u kombinaciji s onima iz okolišnih razloga.

Ključne riječi: globalno zdravlje, etika okoliša, migracije, klimatske promjene.