Wildlife and Forest Conservation: Climate Change and its Effects on Health Triad

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Abstract

Conservation wildlife and forests is essential to preserve the planet's health. In addition to supporting a diverse range of plant and animal species, forests provide vital ecosystem services like clean air and water, soil protection, and temperature regulation. However, illegal hunting, habitat fragmentation, deforestation, and climate change pose serious risks to forests and wildlife. In a world where rising temperatures, erratic weather patterns, and environmental degradation all contribute to poor health outcomes globally, climate change is becoming more widely acknowledged as a serious public health concern. Weather patterns are altered by climate change, which has a profound impact on the environment, the economy, and society at large. It affects global livelihoods, wildlife, health, food, energy,security, and water supplies. With an emphasis on health issues like heat-related illness, respiratory and cardiovascular conditions, and the spread of vector-borne diseases, this study explores the complex interactions between climate change and human, animal, and environmental health. Malnutrition, food, water, and vector-borne illnesses, as well as elevated morbidity from the combined impacts of exposure to high temperatures and air pollution, are all consequences of climate change. Forests are the major hotspots for wildlife conservation. Deforestation is the primary cause of biodiversity loss and a key contributor to climate change. Stress is the phenomena in which animals react to any unexpected intensifying situation. Heat stress is typically categorized as no stress, mild stress, moderate level stress, and severe stress for animals, particularly livestock, such as horses, cattle, buffalo, sheep, and poultry. Ecosystems and biodiversity are negatively affected by changing precipitation patterns and rising global temperatures. To mitigate and adapt to climate change, it is mandatory that individuals, communities, governments, and industries work together to implement climate resilient infrastructure, promote climate smart agriculture, support climate change research and development, and transition to renewable energy sources, increase energy efficiency, and adopt sustainable land use practices.

Keywords: Climate change, Wildlife, Forest conservation, Human health, Environmental health, Animal health, Air pollution, Heat-related illness.

Cite this Article as: Mustfa W, Ijaz M, Ehsan N, Batool M, Tehreem S, Tahir M, Fatima R and Maalik S, 2025. Wildlife and forest conservation: climate change and its effects on health triad. In: Kausar R, Nisa ZU, Jamil M and Bashir I (eds), Integrated Health and Sustainability: Plants, Wildlife, and Genetic Resilience. Unique Scientific Publishers, Faisalabad, Pakistan, pp: 58-64. https://doi.org/10.47278/book.HH/2025.409

A Publication of Unique Scientific Publishers

Chapter No: 25-009

Received: 01-Feb-2025
Revised: 13-Apr-2025
Accepted: 18-May-2025

Introduction

Wildlife refers to all organisms that exist outside of direct human control, comprising both undomesticated animals and uncultivated plants (Yarrow, 2009). Scope of "wildlife" varies among scholars, with some defining it strictly as all non-human animals, while others include wild plants and habitats (Wyatt & Nurse, 2020). Certain definitions focus specifically on free-ranging vertebrates, excluding species like fish. Earth's intricate and diverse ecosystems are home to approximately 8.7 million unique species, each playing a vital role in maintaining ecological balance (Mora et al., 2011). Wildlife has played a major effect in human lives since the beginning of time.

The interdependence between species ensures that ecosystems function smoothly. Many animals, especially insects like bees, play a vital role in pollinating plants, including many of the crops we rely on for food. This makes wildlife essential for agriculture and food production. Animals such as earthworms and other soil organisms improve soil structure and fertility. Wildlife also plays a role in maintaining clean water by filtering and purifying water sources, which is vital for human and animal consumption. Wildlife contributes to climate regulation through processes like carbon sequestration. Forests, oceans, and wetlands, which support various species, act as carbon sinks, absorbing carbon dioxide from the atmosphere (Andermann et al., 2020).

Many medications have been derived from plants, animals, and microorganisms found in the wild. The preservation of wildlife is essential for future medical discoveries. Wildlife is integral to cultural heritage and spiritual practices across many societies. Moreover, wildlife provides aesthetic value its beauty and diversity inspire art, photography, and tourism, fostering appreciation and connection to nature. Wildlife supports industries like agriculture, tourism, and fishing. Ecotourism, in particular, generates significant economic benefits, creating jobs and fostering sustainable development. We have an ethical duty to protect and preserve wildlife. Many species are at risk due

to habitat destruction, poaching, and climate change. Protecting wildlife ensures that future generations can enjoy and benefit from the natural world (Mora et al., 2011).

Wildlife plays an important role in maintaining the health and balance of ecosystems. It contributes to the variety of life on Earth. The diversity of species ensures that ecosystems remain resilient, adapt to changes, and function properly. Every species has a role in its environment, whether it's pollinating plants, decomposing organic matter, or controlling pest populations. Wildlife helps maintain ecological balance. Predators control the population of prey species, herbivores shape plant communities, and plants provide food and shelter for animals (Andermann et al., 2020). Various factors that help in wildlife conservation are described in Figure 1.

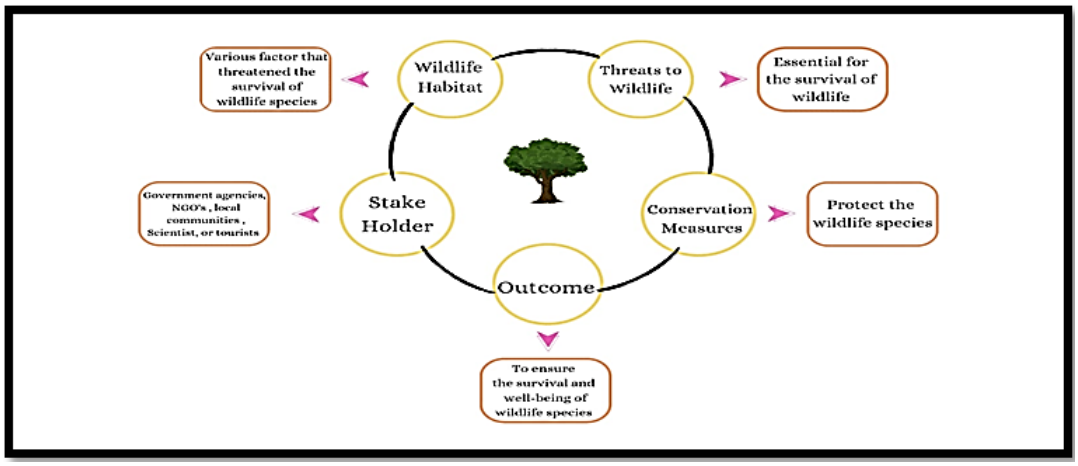

Fig. 1: Factors that help in Wildlife protection conservation

Wildlife exerts a profound and multifaceted influence on the environment. Through their interactions, animals maintain important ecological processes, including nutrient cycling and population regulation. However, human activities have significantly disrupted these natural dynamics by altering ecosystems and breaking vital ecological links. Food chains, which connect animals to plants (as seen in herbivores and seed-eaters) and to other animals (as seen in predators), play a pivotal role in stabilizing population balances within habitats. These intricate interactions highlight the importance of species diversity in maintaining ecological equilibrium (Chardonnet et al., 2002).

Birds, for example, are essential for pollination and seed dispersal, promoting plant reproduction and ecosystem health. Human activities, such as introducing non-native species, have further destabilized ecosystems, causing significant environmental disturbances. According to the United Nations Sustainable Development Goals report, nearly one million species face extinction within the coming decades. Over the past 126,000 years, humans have played a major role in mammal extinctions through practices such as hunting, overharvesting, introducing invasive species, polluting habitats, and converting natural landscapes for agriculture and urbanization (Pereira et al., 2012).

2. Importance of Forest

An area with a high tree density is called a forest and cover much more (about 50% of the total land area), tree forests now make up only 9.4% of the earth's surface, or 30% of the total land area. Establishing and conserving forests for the benefit and sustainability of future generations is known as forest conservation. Deforestation is the primary cause of biodiversity loss and a key contributor to climate change. Decrease in temperature, wildlife attraction, food production, shelter, oxygen production during the day, carbon dioxide storage, light reflection reduction, wind direction and speed guidance, sound barrier, higher-quality water supply, flood control, and wood for manufacturing (paper, furniture, pencils, etc.) are just a few of the many advantages that forests offer. It helps maintain a healthy ecosystem, lowers noise pollution, stores carbon, helps control global warming, purifies water, and lessens the effects of natural disasters like landslides and floods. Additionally, it is home to almost 90% of the terrestrial biodiversity on Earth (Pawar et al., 2015).

3. Benefits of Forests

Forest ecosystems are becoming more widely recognized as multipurpose production systems that offer a wide range of goods and services, including timber, habitats, recreational opportunities, water resource protection, flood prevention, wildfire prevention, sustainable harvesting, tourism, water filtration, hydrological balance, oxygen production, pollution absorption, recreational purpose, erosion control, carbon storing, and other non-wood items (Lindenmayer, 2009).

Forests have long been utilized for hunting, relaxation, berry and mushroom picking, and the gathering of fuelwood and lumber. More modern management goals include storing carbon and maintaining ecological variety. Ecological balance, biodiversity, human well-being, and the provision of financial resources are all dependent on forests. Addressing global issues including habitat loss, resource depletion, and climate change requires their conservation and sustainable (McAlpine et al., 2006)

3.1. Steps for Conservation of Forest

Since forest conservation is a national issue, forest departments must work together perfectly to address it. They must be included in the national task. At all costs, the cutting down of forest trees must end. The Chipko campaign, which aimed to preserve the Tehri Garhwal Forest, gained international recognition as a symbol of people's efforts to stop environmental degradation. Chipko means "to hug tight" or "to cling to." the image of axe men daring cutting trees while women embrace them. This campaign to protect trees is still

one of the most well-known environmental initiatives in the world. The local divinity protects forests that are conserved through fear of God. It might have sacred grooves or a temple. Here, no plant or tree is chopped down, no animal or bird is killed, and no living thing is harmed (Butler & Laurance, 2008).

India's sacred grooves are a special kind of traditional institution that works to preserve forests and biodiversity. Numerous grooves support local populations by providing water sources and native plants in its natural or nearly-natural state. There are well over 13,000 known sacred grooves in India. Often joined by birds that disperse seeds, like great pied and malabar pied hornbills, these channels formed a network of patches throughout the land. Acts for forest conservation: To aid in the preservation of the nation's woods, the Forest Conservation Act of 1980 was passed. Without the prior approval of the central government, it severely limits and controls the de-reservation of forests or the use of forest land for purposes other than forestry (Pawar et al., 2015).

One of the most significant challenges of the twenty-first century is climate change which threatens ecosystems, wildlife, and people alike. Long-term deviations in the abiotic factors such as precipitation, rainfall, snow, rising sea levels, ocean acidification, temperature variations melting mountain glaciers, accelerating ice melt in the Arctic, Antarctica, Greenland, and shifting flower, plant bloom times and wind pattern are referred to as climatic changes (Jay et al., 2018). According to the 2018 US National Climate Assessment, human activity is the main cause of the Earth's climate changing (Koch *et al.*, 2019). Cloudbursts, dry spells, rising sea levels, melting permafrost, salt accumulation, increased wildfires, decreased agricultural yields, diminished water supplies, health issues brought on by high temperatures in urban areas, and ablation are some of the additional concerns that climate change presents to both people and species (WWF). Individual species and their habitat are effected by climate change (Sattar et al., 2021).

Changes in greenhouse gas (GHG) concentrations in the atmosphere had the potential to alter global climates. Since the industrial revolution, and especially began in the mid-1900s, human activities have increased the concentration of greenhouse gases (GHGs) such as CO_2, methane, nitrous oxides, and chlorofluorocarbons in the atmosphere. Global warming is caused by the greenhouse effect, which becomes worse by a number of human activities that increase greenhouse gas emissions. Temperatures have risen eight times during the past 20 years compared to the previous 100, and most species are finding it difficult to adapt to the rapid rate of climate change. The rate of change has a significant impact on wildlife's capacity to adapt to climate change (Zheng et al., 2019).

Malnutrition, food, water, and vector-borne illnesses, as well as elevated morbidity from the combined impacts of exposure to high temperatures and air pollution, are all consequences of climate change. Three percent of cardiovascular diseases and two percent of ischemic heart diseases were caused by lead exposure. Around 2% of cardiopulmonary illnesses worldwide were caused by exposure to outdoor air pollution. The insecure food chain, public health problems, and livestock's adaptive behavior against expectations are all caused by a number of factors, including floods, droughts, earthquakes, deforestation, heavy or no rains, an elevated global temperature curve, an increase in the greenhouse effect, relative risky values of the air quality index and temperature humidity index, the emergence of the global warming issue, abrupt and quick changes in weather patterns, and many more. Climate change throughout time may be the cause of the increased occurrence of infectious diseases in animals, such as helminthic infection, mycosis, salmonellosis, campylobacteriosis, and mange, in various geographical areas. Malaria is distinctive among these diseases because, like most infectious and parasitic diseases, its transmission is closely linked to and primarily regulated by rainfall, temperature, and air humidity (Raimi et al., 2020).

4. Climate Change and its Impacts on Environmental Health: Temperature and Precipitation Changes: Ecosystems, Biodiversity, and Natural Resources

Indeed, the climate change that is presently affecting ecosystems is altering their habitats and influencing the distribution and movement of species. Aquatic organisms and warm-blooded species, along with their cold-blooded terrestrial counterparts, are migrating poleward along warmer and less predictable paths. Ecosystem disruption and imbalance have endangered biodiversity and stability in the ecosystems such as those mentioned above. Moreover, such changes create uneven ecological balance (Pecl et al., 2017).

Such changes pose threats to endemic species that cannot adapt or cannot find habitats to migrate. Changes in precipitation patterns also affect plant growth and phenology, which influences the timing of natural events related to the availability of food and the cycles of nutrients. Increased length and severity of droughts, coupled with irregular rainfall, lead to reduced plant growth and subsequent availability to herbivores that eventually disrupt the entire food chain. As an instance, a decline in herbivore population due to the reduction in plant productivity affects even those predator species, which depend on herbivores for food, such predators are put under risk, resulting in a food chain disruption. Thus it cascades biodiversity to a level closer to collapse (Duffy et al., 2017).

Natural resources are now grossly affected by these adverse challenges. Forests carbon sink and vast biodiversity reservoir is under an increasingly destructive assault from wildfires, pest invasion, and drought exacerbated by climate change (Silman, 2017). Biodiversity plays a vital role in maintaining ecosystem balance and stability, ensuring resilience and ability to adapt to environmental changes. A diverse array of species within an ecosystem enhances resistance to diseases and pests and provides various resources for human use, such as food, medicine, and raw materials (Qureshi et al., 2023).

5. Water Quality and Scarcity Issues

Environmental changes affect the quality and availability of water, which in reality will have significant environmental changes and adverse public health consequences. Global warming has also brought adverse effects on the quality of water. Increased evaporation of water due to rising global temperatures lowers surface and groundwater levels in several regions. More uneven rainfall patterns lead some areas into more droughts and famines and others into floods out of season. From these alterations in the availability and quality of freshwater resources, it follows that there will be direct impacts on human and ecological health. Owing to these various forms, the competition for available resources is aggravated by the growing water scarcity. According to a report by the United Nations published in 2020, it has predicted that, by the year 2050, about one-half of the entire population of the world could live in water-stressed areas as population growth increases the demand, together with climate change (Schewe et al., 2014).

6. Air and Soil Pollution Exacerbation

By changing climates, air and soil quality deteriorate drastically, leading to heavy impacts on the ecosystem and human health. Weather conditions are drastically changed, making droughts and wildfires more frequent and severe. Hazards from these events include particulate matter and toxic chemicals, notably carbon monoxide and nitrogen oxides, mainly responsible for much air pollution). Leftovers from these types of events include particulate matter and toxic chemicals like carbon monoxide and nitrogen oxides, leading to significant air pollution (Barjeste et al., 2024). Moreover, elevated temperatures further aggravate the conditions for the release of volatile organic compounds (VOCs) from both vegetation and soils, making up another cause of deteriorated air quality (Fu & Tian, 2019). The WHO estimates that almost 7 million people die every year due to high exposure to air pollution, a number that is expected to rise as climate change continues to worsen air quality (Fu & Tian, 2019).

Soil deterioration has been another major aspect of climate change as soil erosion and desertification become rampant due to the loss of nutrients. Changes in precipitation patterns and their extremes have caused soil loss, which has reduced agricultural productivity further resulting in adverse effects on food security (Hughes et al., 2017).

Warmer temperatures contribute to the formation of ground-level ozone, a pollutant harmful to both human and environmental health. Warmer wavelengths are very important in the formation of the ground ozone, a pollutant that adversely affects both human and environmental health. Ground-level ozone stresses plants and crops, and their production is compromised; it also stresses forests, causing loss of biodiversity and diminished carbon sequestration capacity in ecosystems affected. Besides which, it puts several health conditions at risk; inhalation of high levels of ozone worsens conditions like asthma, and lung efficiency declines especially for populations like children and the elderly.

Pale-green soil makes up a significant fraction of ecosystems on this planet; it initiates plant biomass production, holds water, and daintily sequesters carbon. But extreme weather events, including intense showers and extended drought, tend to damage the quality of the soil material. Soil erosion adds to sedimentation in rivers and lakes, which impairs water quality and aquatic biodiversity. Higher temperatures, in conjunction with changing rainfall patterns, will increase the chances of soils being contaminated with pesticides, heavy metals, and other pollutants. Degradation and desertification occur in soils over prolonged periods of severe drought in arid areas, and make the land quite unfit for agricultural purposes (Mishra et al., 2016).

6.1. Climate Change and Human Health

Climate change is a huge and continuously effecting and growing menace to human health, exhibiting many direct and indirect perils on human that influence populations globally to a great extent. These impacts include many problems like instant physical harms, such as elevated heat stress and deteriorating air pollution, to long-term obstacles such as food insecurity, the propagation of water-borne diseases, and a soar in mental health ailments. This sequence of health impact is main feature how climate change is an intricate public health catastrophe that not only intensifies present health difficulties but also unequally affects vulnerable communities, deepening existing inequalities (Watts et al., 2018).

6.2. Direct Impacts of Climate Change on Human Health: Heat Stress

It is one of the fastest and immediate impact on human health among climate change adverse effects. Excessive exposure to high temperatures can cause heat-related illnesses like heat exhaustion and heat stroke. The World Health Organization (WHO) reports that extreme heat can make chronic heart, lung, and kidney diseases worse. This put people at risk in areas with limited access to air conditioning and healthcare (WHO, 2018).

The WHO estimates that almost 7 million people die every year due to high exposure to air pollution, a number that is expected to rise as climate change continues to worsen air quality. Extreme weather events that are occurring more often now like hurricanes, wildfire and floods, associated directly with climate change, show harmful effects on human health. The frequency and intensity of these events have increased, resulting in directly harming physical health of human, displacement, irritation and loss of life. These disasters not only cause immediate trauma and mortalities but also destruct the infrastructure of healthcare system for immediate help and future needs (WHO, 2021).

6.3. Indirect Impacts of Climate Change on Human Health

Beyond the immediate physical disadvantages inflicted by climate change, it has numerous indirect health impacts such as this: the spread of water borne diseases. One of the most important contributory factors to such conditions is an increase in world or global temperature and change occurring in precipitation patterns. Healthy humidity and those elements that modify the environment give ideal conditions to pathogens, inviting them to thrive and multiply in water sources. For instance, warmer temperatures can give a suitable environment to bacteria like Vibrio cholera to proliferate at higher level, which causes cholera, and increase the production of harmful algal blooms that toxicate the water resources. These algal bloom toxify the water and drinking it can be injurious to health. Moreover, extreme weather incidents like flooding, can cause leeching or overflow of sewage water which further pollute the freshwater sources and rising the hazard and danger of water-borne diseases like hepatitis A, typhoid, and gastrointestinal infections (Ebi & Hess, 2020).

6.4. Food Insecurity

Climate change Indirectly Affects Food security and serious threat to Global Health. Increasing temperature and erratic behavior of rainfall have significant impacts on agricultural production, leading to reduced yields of harvested crops and disrupted distribution channels from harvesting markets to the consumer. Droughts, floods, and heat waves damage crops and reduce livestock productivity meaning many people around the world can no longer grow or afford nutritious foods or even go hungry. This will be particularly threatening in parts of the world where farming is a large part of the local economy. The Food and Agriculture Organization (FAO) predicts that malnutrition will increase worldwide by about 30% because of climate change by 2050. Part of this is actually due to the deterioration of freshwater quality related to all salinization from rising sea levels, and from monsoon interruption, increased degradation and pollution of soil-all of which usually impact

agricultural yield negatively. These are aggravated by extended droughts that, in turn, also deplete freshwater aquifers. As an example, Julian Cribb, in his book surviving the 21st Century (2020), foresees calamitously depleted underground water reserves for India during the period 2020 to 2030. While CO2 in higher concentrations in the atmosphere reduces the nutritional value of crops, it also aggravates the problem of feeding a growing global population. Malnutrition diminishes the immunity of the body and makes people vulnerable to innumerable other diseases, which complicate the extra burden on top of epidemic-genocide-like conditions within a specific area (Wheeler & Braun, 2013).

6.5. Vulnerable Populations and Inequality

The impacts of climate change on health are universal, but they don't harm people equally across populations. All vulnerable groups usually include low-income communities, indigenous populations, children, and older persons, as they are more likely to not have resources, access healthcare, and adapt. As added by the Intergovernmental Panel on Climate Change (IPCC), the presence of already social and economic inequalities intensifies the impact of climate change, further worsening health among marginalized communities (IPCC. Elders, children, indigenous people, and communities of low income are generally vulnerable because they tend to have less estates and face restricted healthcare access and adaptation, thus putting these groups at the greatest risk. People with low incomes live with many factors that increase their vulnerability to the health effects of climate. Low-income groups often face an added burden of air or water pollution that may be worsened by climate events like severe storms. They experience relatively more chronic medical conditions, such as diabetes and cardiovascular, respiratory, and kidney diseases, all of which may be amplified by climate change. Children and future generations experience a disproportionate burden of climate change compared to prior generations. Regional climates, local geography, and existing inequalities of colonialism are some of many factors that will compound vulnerability to climate change (Birkmann et al., 2022).

Indigenous Peoples Compared to the mainstream populations, the indigenous populations have a number of health risks such as poor mental health due to historical trauma or personal trauma, environmental exposures from pollutants or toxic substances, and diabetes. Such environmental impacts threaten indigenous people's homes, food sources, and cultural traditions: a diminishing sea-ice extent, rising flood and landslide incidence, damage to wildlife habitats, loss of medicinal plants, and effects on certain traditional foods with respect to abundance and nutrition (Ford et al., 2020).

6.6. Children and Pregnant Women

Many factors, such as economic status, nutrition and diet, living conditions, geographic location, and stage of development, will affect children's exposure to health threats due to climate change internationally (Centers for Disease Control and Prevention (CDC, 2021). Exposure to climate change can adversely affect pregnancy outcomes such as spontaneous abortion, low birth weight, preterm birth, and risks to the newborn and infant, such as increased neo-natal death, dehydration, malnutrition, diarrhea, and respiratory diseases (WHO, 2018).

6.7. Older Adults

Older adults may be further challenged by social factors such as isolation or living in older structures that make them vulnerable to heat and extreme events, such as hurricanes and foods; preexisting health conditions, such as respiratory conditions that may be worsened by extreme climate; and mental health challenges, such as depression, dementia, and other cognitive impairments. Older adults are also more likely to take medications to treat chronic medical conditions, including antidepressant and antipsychotic drugs and diuretics, which make them more vulnerable to complications from heat exposure. Outdoor workers are often among the first to be exposed to the effects of climate (Lester et al., 2020).

6.8. Climate Change Impact on Animal Health

Animals respond to changes in their environment through adaptation and climate through acclimation. Stress is the phenomena via which animals react to any unplanned, worsening situation. A lot of generations are concerned about adaptation. Heat stress is typically categorized as no stress, mild stress, moderate level stress, and severe stress for animals, particularly livestock, such as horses, cattle, buffalo, sheep, and poultry. Extended periods of extreme heat stress are considered animal violence and go against the goals of animal care. Frequent exposure to extreme stress typically results in relatively low body conditioning outcomes, weakened immunity, decreased capacity for production and reproduction, decreased feed intake, increased fluid loss (either sensibly or insensibly), and mental retardation. Because goats and sheep are comparatively more vulnerable to heat stress, caprine and ovine farming are declining in hotter places, such as Africa (Fatima et al., 2023). Increased perspiration, increased peripheral blood flow, elevated body temperature, decreased urine, polypnea, recumbency, tachycardia, decreased digestion, decreased rumen fermentation, decreased metabolism, and finally decreased animal performance are all caused by heat stress. In dairy animals under heat stress, mastitis is more common when there is a higher somatic cell count and a lower protein content in the milk. Heat stress has been linked to abortions in cattle and buffalo because it affects blastocyst formation and embryonic implantation (Rahimi et al., 2021). Climate change effects on animal health are described in Figure 2.

7. Food Security's Impact on Animal Health

According to the Intergovernmental Panel on Climate Change (IPCC) assessment, food insecurity and hunger as a result of extreme climate events like drought, floods, and storms. Furthermore, agricultural production is far below the necessary amount due to the destructive effects of these climate changes, which elevates prices and reduces availability. Heat stress causes the thigh meat's pH to drop and the breast meat's mitochondria to produce more superoxide.

7.1. Climate Change and the Latest Challenge of Animal Drug Resistance

The livestock industry has become heavily commercialized worldwide as a result of rising energy demand. When extensive systems shift

to semi-intensive and intensive systems, commercialization has been shown to increase the risk of infectious diseases and increase the prevalence of bacterial and viral diseases. Infectious diseases are the second leading cause of death in both humans and animals, after myocardial infarction. Worldwide, multidrug-resistant Haemonchus species in sheep and goats are causing challenges for animal health and the livestock industry financially. It is estimated that 14% of people have Extended Spectrum Beta Lactamase (ESBL) genes, which can forecast the occurrence of numerous enteric diseases in the future, such as salmonellosis and campylobacteriosis, which can also be harmful to animals (Hayek, 2022). Water bodies, high temperature humidity index, hot and cold shocks, open decay of carcasses, aquaculture, and anaerobic digestion all aid in the emergence of resistance genes. Temperature increases have been linked to increased medication resistance because of their impact on cell physiology. For veterinary and public health reasons, the FAO, OIE, and WHO have placed three bacteria under critical focus: *Klebsiella pneumoniae*, Escherichia coli, and Staphylococcus aureus. Resistance to these bacteria has been documented for every 10°C increase in ambient temperature (Macfadden et al., 2018).

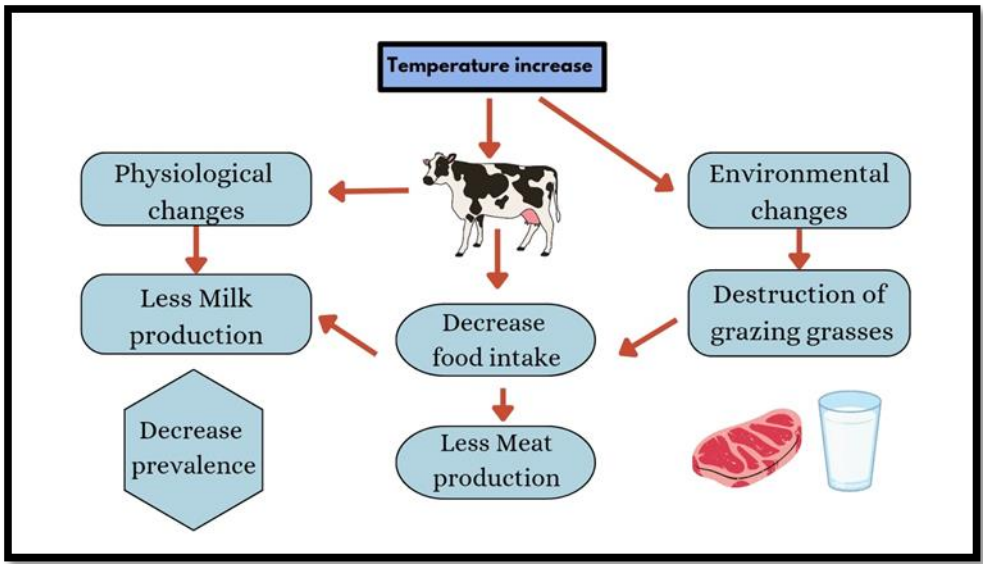

Fig. 2: Climate Change Effects on Animal Health

7.2. Animal Metabolic Alterations due to Heat Stress

Global warming is restricting oxygen use, resulting in hypoxic lifestyles and threatening animals' potential in general. Due to the high fat content in subcutaneous tissue, the thick layer of feathers that causes heat stress, the presence of pollutants, micro-plastics, and algal blooms, this poses a threat to swine, poultry, and marine life. The gut microbiome is changing everywhere due to global warming. Animals have shown a strong correlation between gut microorganisms and genetic alterations brought on by obesity and related health issues (Vallianou et al., 2019).

7.3. Animal Immunosuppression and Climate Change

Different animals react differently to heat stress, but immune system suppression is widespread, which increases the probability for infectious agents to infect an animal and harm it in a number of ways (Middleton, 2019). Cattle under heat stress may suffer from malnutrition, which can lead to abnormal lymphoid organ development and poor T and B cell differentiation. In poultry, heat stress can lead to a marked reduction in B cells in the bursa and splenic lymphocytes as well as compromised antigen-specific humoral responses. Heat stress can impair the cells that make up the fetus's immune system during development, resulting in an immunocompromised individual's. According to this leads to mineral deficiencies in zinc, copper, iron, and cobalt, which result in diseases including leukopenia and anemia. By modifying life cycles, the shifting water cycles have shifted the pattern of vector-borne diseases and made it more difficult for animals with weakened immune systems to survive (Shukla et al., 2018).

Conclusion

Wildlife and forest conservation are critical for maintaining the delicate balance of one health triad. Climate change is a global phenomenon that is increasingly affecting the interconnected health of humans, animals, and the environment, known as the one health triad. It has far-reaching effects that are detrimental to the wellbeing of one health triad of every civilization. Therefore, minimizing the catastrophic adverse effects of climate change is crucial for individuals, organizations, the government, and businesses. A collaborative one health approach is crucial to mitigate these impacts. Rising temperature, changing precipitation patterns, shifting ecosystems can lead to heat stress, vector borne diseases, habitat disruption, forest destruction, wildlife extinction, water scarcity, biodiversity loss air pollution poses significant risks to all three components of this triad. This can be accomplished by investing in carbon-emitting fossil fuel alternatives, reforestation, healthy lifestyle choices, and pollution-free environments through education.

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