



Original Research Paper

Examining the Impact of Habitat Destruction on Animal Health and the Spread of Vector-Borne Diseases

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Key Words

Habitat destruction, Infectious diseases, Vector-borne diseases, Ecosystem restoration, Animal health, Disease transmission, Biodiversity, Climate change, Ecological disruption, Public health interventions.

Abstract

Habitat degradation from human activities, such as deforestation and urbanization, has a profound effect on ecosystems and promotes the spread of infectious diseases, especially invasive ones like Lyme disease, malaria, and dengue. In this paper, the connection between habitat destruction and the transmission of disease vectors is explored, focusing on the disruption of ecosystems, changes in disease transmission interactions, and their significance at the regional and global levels. The impact of habitat destruction on vectors and the disease prevalence has been established through a literature review, case study, and statistical research. The study involves comparisons of intact and degraded habitats, with climate change as another aggravating factor. Habitat destruction creates favorable environments for disease vectors by disrupting predator-prey relationships, increasing human contact with wildlife, and creating new breeding sites. The report indicates that diseases spread differently in different areas, with tropical and temperate areas being the most vulnerable. There are also discussions of the economic costs and interventions aimed at improving population health. The necessity of combined strategies is emphasized, too. Destruction of habitat is unpleasant, such as the spread of illnesses. Widespread destruction has very bad effects on health and the economy. The study further underscores how habitat degradation can undermine ecosystem stability, compromise animal health and increasing the risk of disease transmission. Ecosystem restoration efforts are essential to mitigate these effects and safeguard both biodiversity and public health. All the policies of the population health must involve the restoration of the ecosystem and a positive and cooperative sustainable land use because the long-term consequences of the ecosystem degradation and human health are too negative.

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Introduction

The destruction of the habitats involves urbanization, deforestation, as well as agricultural development, which involves entirely altering or clearing the natural habitat. Such an imbalance in the eco-system causes the loss of biodiversity as the species lack their habitat and other necessary resources, which causes a reduction in their number and eventual extinction. The destruction of habitats also interferes with the important ecological functions, including nutrient cycling and pollination, that the ecosystem balance and strength require.

Pathogens, such as bacteria, viruses, fungi, or parasites, can be spread within or between hosts, causing infectious diseases. Of particular concern are vector-borne diseases (VEC), which are transmitted by vectors such as mosquitoes, ticks, and fleas (Diuk-Wasser et al., 2021). Such vectors are simply the intermediaries between two hosts, with a pathogen being transmitted between animals and humans. Environmental conditions, including vector populations (e.g., Lyme disease, malaria, and dengue) and their densities, are among the most critical factors determining VEC prevalence, and these factors are often affected by habitat alterations (Treash, 2022).

Destruction of habitats is also essential to the dissemination of communicable diseases, particularly those transmitted by vectors such as Lyme disease, as the balance between vectors, their hosts, and pathogens shifts (Ostfeld et al., 2002). The environment in which disease vectors

reproduce is negatively being impacted as a result of the destruction of the natural habitats, the disturbance of the ecological processes, and the increased contact between humans and the wildlife (LaDeau et al., 2015). As habitat destruction continues to escalate, the interdependence between animals, their environments, and the spread of infectious diseases becomes more evident (Lwankomezi & Kaganga, 2024; Kideghesho et al., 2006). Altered ecosystems facilitate the spread of vector-borne diseases by creating new breeding grounds for vectors and increasing human-wildlife interactions. This paper highlights how habitat degradation directly contributes to the spread of diseases like Lyme disease, emphasizing the critical need for ecosystem restoration to mitigate these risks.

Key Contributions

- This paper highlights the direct and indirect links between habitat destruction and the spread of infectious diseases, particularly vector-borne diseases like Lyme disease.
- This paper will explore the role of habitat destruction in increasing and spreading such diseases, and specifically Lyme disease, and the wider implications of the same on the health and conservation of the people.
- The research provides policy and conservation proposals to reduce the impacts of habitat destruction on the health and biodiversity of communities.

This paper is divided into the following sections: Section II describes the correlation between habitat destruction and the amount of

case studies, and will be statistically analyzed. Section III entails the alteration in habitat and its implication on the behavior of vectors and the spread of diseases involving human activities and the comparison between healthy and degraded habitats. IV takes into account the effect of the disease transmission on population and environment health and offers the recommendations on the habitat restoration and policy changes. In section V, the conclusion will include the summary of the most critical findings and a call to action for further research and ecosystem protection to avoid outbreaks of infectious diseases.

The Link between Habitat Destruction and Vector-Borne Diseases

Disruption of Ecosystems and Facilitation of Vector Spread

Human activities that destroy habitat, as well as cause drastic alteration of natural ecosystems, include deforestation, urban sprawl, and agricultural expansion (Geetha, 2024). Deforestation, wetland or grasslands normally cause a reduction in both biodiversity and ecosystem services like pest control, pollination, and water purification. This provides the best place of breeding of disease vectors like mosquitoes, ticks, and fleas (Wood & Lafferty, 2013). As an illustration, the destruction of natural predators that control the populations of vectors or modifications of landscape that leads to the advantage of the vector larvae are direct causes of growth in the population of vectors.

Moreover, disrupted habitats increase contact among wildlife, vectors, and humans, thereby providing more opportunities for zoonotic diseases to be transmitted to the human population (Ma et al., 2022). Environmental changes, including rising temperatures or standing water, are other consequences of habitat destruction and can thus promote the reproduction and survival of vectors.

Correlation Between Habitat Destruction and Increased Disease Incidence

Several case studies have shown a clear correlation between habitat destruction and increased cases of vector-borne diseases (de Souza & Weaver, 2024). Indicatively, deforestation in some regions of North America has been traced to the spread of Lyme disease (Brown et al., 2014). Deforestation creates additional edge habitats, which are ideal for supporting the survival of a tick population that spreads Lyme disease (Mertens, 2025). Likewise, in tropical areas, agricultural land expansion and urbanization have enabled the spread of malaria and dengue fever by altering mosquito habitats. Habitat destruction in these regions is also common, resulting in wildlife displacement and the introduction of invasive species that could become new vector hosts. There have been case studies in Southeast Asia on how rapid urbanization and deforestation contribute to the spread of diseases such as Zika, dengue, and malaria, due to the rise in mosquito habitats (Ostfeld & Keesing, 2000).

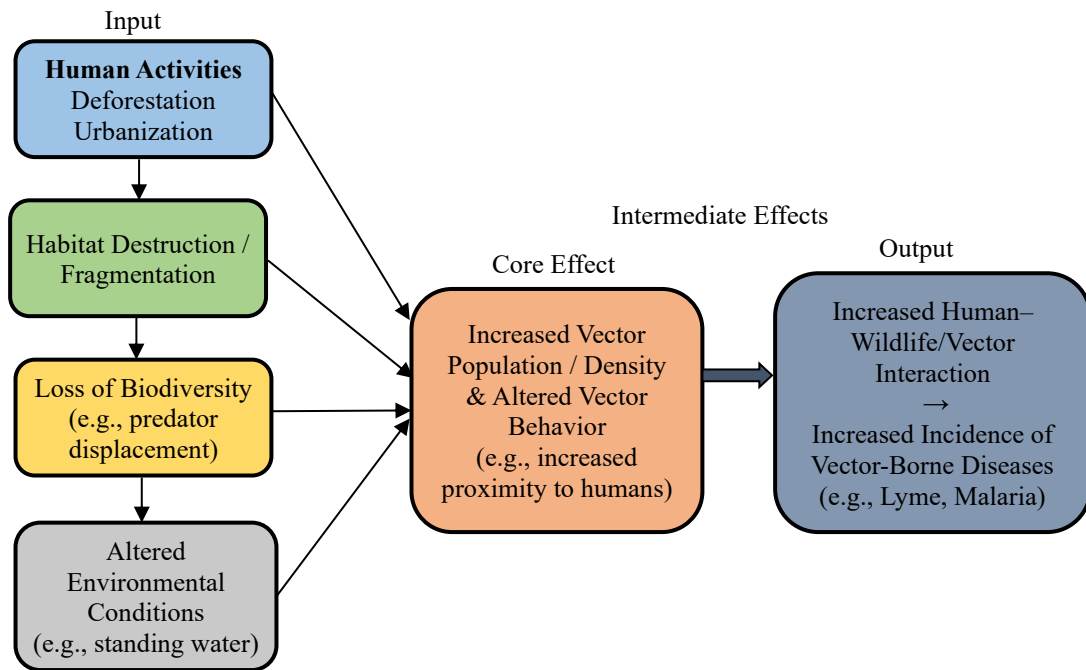


Figure 1: Mechanism of Disease Spread in Degraded Habitats

As shown in Figure 1, urbanization and deforestation, which are the result of human activities, are processes that cause the proliferation of diseases transmitted by vectors. The flowchart uses human activities as input, leading to habitat destruction and fragmentation, which in turn results in biodiversity loss and changes in the environment, specifically the standing water. These intermediary effects result in increase in population of vectors and behavioral change especially in relation to closeness to human beings. The primary result of such changes is the spread of contact between humans and wildlife/vectors, thus heightening the predisposition to such diseases like Lyme disease and malaria (Tohit et al., 2024). This example demonstrates that the changes of the environment and disease spreading are closely interrelated with each other, this is why the erosion of habitats can be a significant factor

contributing to the general issues of the population.

Statistical Analysis of Disease Prevalence in Habitat-Degraded Areas

In this subsection, statistical analyses will be done to give the quantitative relationship between the prevalence of vector-borne diseases and the extent of habitat degradation (Ostfeld & Keesing, 2000). Information will be sourced from diverse research comparing areas where habitats have been destroyed at different levels and examining the prevalence of diseases such as Lyme disease, malaria, and dengue (Onalaja, 2025). The trends in disease prevalence with respect to the magnitude of habitat loss will be determined using statistical methods such as regression analysis (Martina & Osterhaus, 2007). For example, it has been determined that in areas with high deforestation or urbanization, Lyme disease transmission is more likely, due to increased tick populations (Reisen, 2010).

Equally, in regions with fewer wetlands, the population of disease-carrying mosquitoes, such as *Anopheles* (malaria) and *Aedes* (dengue and Zika), is likely to increase, with the burden of disease (Manguin & Boëte, 2011). The connection between habitat destruction and other interactions, including climate change and

human behavior, that lead to the increase in disease risks will also be discussed (Geetha, 2024).

Regional Variations in Habitat Destruction and Disease Transmission

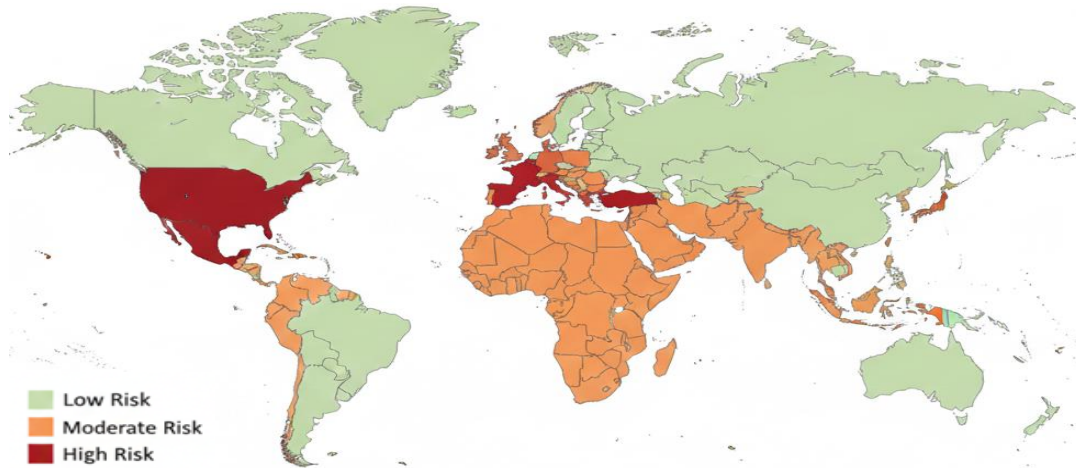


Figure 2: Regional Vulnerability to Vector-Borne Disease Spread Due to Habitat Destruction

Figure 2 depicts the geographical differences in the risk of transmission of disease vectors, which is intensified by the destruction of habitats. The map has been color-coded to differentiate between high, moderate and low-vulnerability areas as a result of local geography, climate, land use and socio-economic factors. The tropical areas, the Amazon and the Southeast Asia are classified as High Risk because of deforestation and agricultural development, which provide new mosquito habitats that transmit diseases like malaria, dengue, and Zika. By contrast, the coded Moderate-High Risk in North America and Europe are regions of temperate climate, and habitat fragmentation and suburban sprawl are conducive to the tick's population, which leads to Lyme disease transmission. Lastly, Overgrazing and desertification in dry environments like the

Middle East is also dangerous and brings about diseases such as leishmaniasis. It is true the map graphically depicts the idea that habitat loss and the spread of diseases have a complex relationship needing multi-layered responses to this problem, all of which depend on the particular localized conditions.

Various areas experience the effects of habitat loss differently, and how diseases disseminate is influenced by local geography and climate as well as land cover and socioeconomic factors. In the tropics, such as in the Amazon, Southeast Asia, and elsewhere, the clearing of forests and the expansion of agricultural land provide mosquitoes and other disease vectors with a habitat, enabling the spread of diseases such as dengue, Zika, and malaria (Mills et al., 2010). Especially with accelerated climate change,

fragmentation of habitats and suburban sprawl are factors in the spread of Lyme disease in tropical developing countries, while in Europe and North America, countries where adapted populations of ticks thrive. Arid zones, like the Middle East and North Africa, undergo habitat loss due to desertification and overgrazing, which promotes the disease that is transmitted by sandflies, leishmaniasis. Habitat destruction has also been felt more in the third world, where deforestation and insufficient infrastructure contribute further to the transmission of the disease by vectors, whereas in the developed countries, more developed health care systems and less rapid habitat destruction alleviate the effects. Nevertheless, suburban sprawl in even the developed regions continues to pose risks of diseases such as Lyme disease and the West Nile virus (Buchwald et al., 2021). Finally, the area disparities demonstrate a complicated nature of the interaction between the destruction of habitats and disease dissemination, which contributes to the necessity of specific interventions that can consider the area conditions (both environmental and socio-economic ones).

Mechanisms of Transmission in Habitat-Destroyed Environments

Impact of Habitat Loss on Vector Behavior and Disease Transmission

Destruction of habitats causes considerable changes in the surroundings, and these changes directly affect the behavior of a given vector and the spread of a disease. Disturbances of the natural habitat, including forests and wetlands, tend to provide breeding facilities to vectors, like mosquitoes and ticks, which breed in stagnant water or in microhabitats. Extinction of biodiversity and the disturbance of predator-prey interactions also promote the increase of disease vectors, as natural predators of mosquitoes or ticks (birds or amphibians) will be forced out. Moreover, the disappearance of habitat causes wildlife to relocate nearer to human settlements, which exposes them to increased human-wildlife interactions, which influence the transmission of zoonotic diseases. More activities at all times of the year can also be the result of other environmental changes, such as warmer weather caused by deforestation, which creates more opportunities for transmitting diseases. In such a way, the alterations in the habitat structure make the living conditions of vectors better and more prone to the further spread of diseases.

Table 1: Impact of Habitat Destruction on the Spread of Vector-Borne Diseases

Disease Example	Primary Vector(s)	Associated Habitat Destruction Type	Key Mechanism of Spread
Lyme Disease	Ticks	Forest Fragmentation, Suburban Sprawl	Creates ideal "edge habitats" for ticks; loss of predators
Malaria	<i>Anopheles</i> Mosquitoes	Deforestation, Agricultural Expansion	Creates new breeding sites, such as standing water and altered environments
Dengue/Zika	<i>Aedes</i> Mosquitoes	Rapid Urbanization, Poor Water Management	Artificial habitats like standing water in containers/sites

Table 1 provides a summary of how particular forms of habitat destruction relate to the primary disease vectors and how these changes in the environment contribute to the dissemination of the disease vectors. It provides examples of Lyme disease, malaria, and dengue/Zika, and how varying forms of habitat destruction, including forest fragmentation, deforestation, agricultural expansion, and urbanization, cause optimal locations of disease vectors, including ticks and mosquitoes. The fundamental processes of disease dissemination, including the creation of edge habitats of ticks, the emergence of new breeding areas of mosquitoes, and the creation of artificial habitats of cities, also stand out in the table and increase the speed of disease spread.

Human Activities as Drivers of Vector Spread in Degraded Environments

In degraded environments, human activities are essential in promoting the proliferation of disease vectors. The development of urbanization, agricultural activities, and infrastructures provides artificial environments that favor the population of vectors. To illustrate, the urban water systems are poorly managed, the construction sites that have been abandoned, and irrigation canals form standing water, which form the best breeding grounds of such mosquitoes as *Aedes aegypti*, the key agent in transmitting diseases such as dengue and Zika. Deforestation to make farmlands also changes the ecosystem in the area, creating new and usually artificial homes for vectors and hosts. Moreover, the destruction of the habitat by humans puts the wildlife and the vectors in closer contact with human populations, thereby exposing them to the

risk of disease spillover. Moreover, other human activities like trade, travelling, and transportation of agricultural products may bring about some invasive species, such as mosquitoes and ticks, to new locations, which worsens the transmission of infectious diseases.

Comparison of Vector Populations in Intact Habitats versus Degraded Habitats

It was observed that there are distinct differences in the abundance and behavior of disease vectors in the comparison of the populations of vectors in the intact and degraded habitats. Natural predators and the ecological balance in the intact ecosystems are effective in controlling the population of vectors to ensure that they are kept at a reasonable level. Indicatively, the overpopulation of ticks and mosquitoes is avoided in healthy forests by predators like birds and amphibians that feed on the ticks and mosquitoes in large numbers. Conversely, in poor environments, predators are removed, coupled with changes in environmental conditions, and thus, the population of vectors grows very high. Divided habitats and cities are rich in breeding places of mosquitoes (standing water in gutters or containers), and ticks are able to develop in the disrupted landscape with reduced natural pressures. Also, the vectors in the degraded environments tend to have different behaviors, like having more contact with people due to the loss of natural habitats, thus enhancing the chances of transmission of diseases even more. Consequently, the destruction of habitats causes an increase in the population of vectors and an increase in the chances of a disease spreading.

Table 2: Relationship Between Habitat Destruction and Vector Populations

Habitat Destruction Level	Region	Vector Type	Disease Type	Vector Population Density (per unit area)
Low	North America	Ticks	Lyme Disease	10 individuals per 100 m ²
Moderate	Southeast Asia	Mosquitoes	Malaria	50 individuals per 100 m ²
High	Sub-Saharan Africa	Mosquitoes	Malaria	150 individuals per 100 m ²
High	South America	Mosquitoes	Dengue	120 individuals per 100 m ²
Moderate	Europe	Ticks	Lyme Disease	30 individuals per 100 m ²
High	Southeast Asia	Mosquitoes	Zika	90 individuals per 100 m ²

Table 2 shows a summary of the relationship between the level of habitat destruction and the population of the vectors of different diseases transmitted in the human body. It contains information on various areas, the major species of vectors, and the related diseases, including Lyme disease, malaria, dengue, and Zika. The table indicates the rise in the density of the disease vectors (e.g., ticks and mosquitoes) with the increase in the amount of habitat destruction, and areas such as Sub-Saharan Africa and South America are the most densely populated with vectors. The figures indicate the role played by the degradation of habitats in the growth of vectors, which play a role in the spread of infectious diseases.

Climate Change as a Contributing Factor

The impact of habitat destruction on the transmission of infectious diseases is worsened by climate change, which alters environmental conditions that promote the proliferation of vectors of disease. Increasing temperatures, changing rainfall patterns, and resulting seasonal cycles have the potential to increase the geographic capabilities of vectors such as mosquitoes and ticks and bring diseases to new regions. As an example, warmer temperatures allow *Aedes aegypti* (carrier of dengue, Zika, and

chikungunya) to survive in areas that are otherwise inappropriate, which is a threat to outbreaks. Likewise, warmer winters and changed rainfall patterns allow ticks to survive in previously too-cold areas, resulting in more tick-borne diseases such as Lyme disease and Rocky Mountain spotted fever. Extreme weather conditions such as floods and drought are also caused by climate change, providing new breeding areas to the mosquitoes, and disrupting the ecosystem, further enhancing the spread of the diseases in vectors. The interplay between climate change and habitat destruction forms a feedback process of the former, where altered climates render habitats susceptible to destruction, and vice versa of the latter, as habitat destruction causes climate change and increases the risk to human health.

Figure 3 shows the correlation between the level of habitat destruction (Low, Moderate, High) and the related density of vectors (individuals per 100 m²) of different diseases, i.e., Lyme disease (Ticks), Malaria (Mosquitoes), Dengue (Mosquitoes), and Zika (Mosquitoes). The bar chart on the left represents the trend of the rise in the density of the vectors with the level of habitat destruction. The graph on the right is the line chart of how habitat destruction and climate change affected the incidence of the

disease (cases per 100,000), and the blue and purple dotted lines indicate the changes that happened to the habitat destruction and climate change, respectively. This compounding chart shows that further destruction of habitats and climate change are additive to the development

of increasing populations of vectors and the increased prevalence of diseases. It is also given in the chart that the dynamics between environmental factors and public health are revealed.

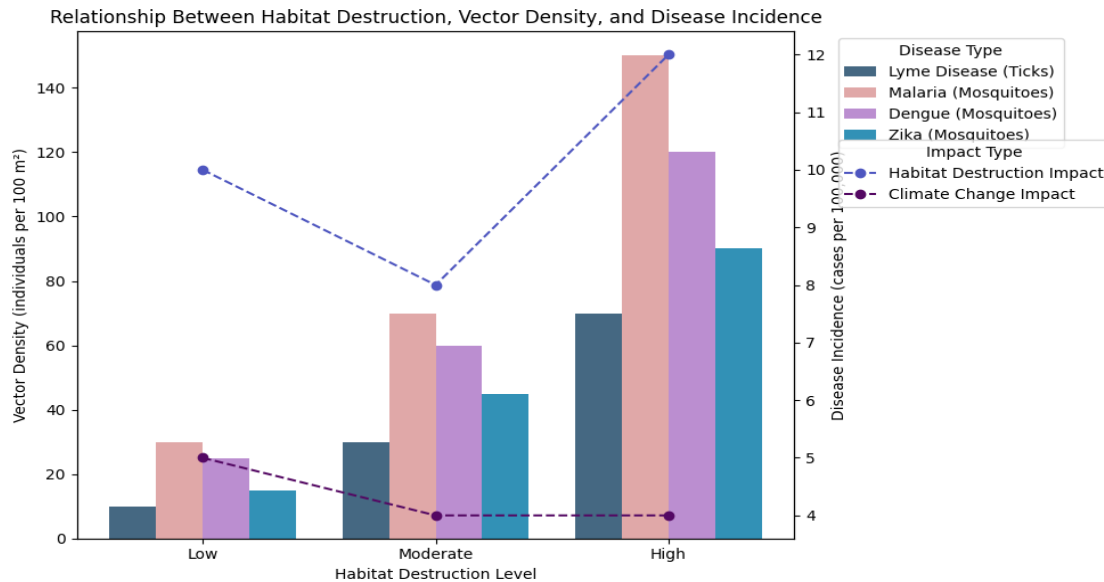


Figure 3: Relationship Between Habitat Destruction, Vector Density, and Disease Incidence

Implications for Public Health and Conservation

Impact of Habitat Destruction on Human Health and Well-Being

Habitat destruction has an extensive impact on human health which is largely reflected through the transmission of contagious illnesses. With the natural habitats being cleared to carry out farming, urbanization, and building of infrastructures, the subsequent fragmentation of the ecosystems leads to an increase in the spread of disease vectors such as mosquitoes and ticks, which are vectors of various pathogenic agents. The biodiversity loss is also contributing to the spread of such diseases by eliminating natural predators and natural ecosystem services. As an

illustration, habitat destruction has been chiefly attributed to the spread of diseases such as Lyme, malaria, and dengue since it exposes the vectors to increased contact with human beings. Additionally, when ecosystems are destroyed, resources that are essential in human well-being, including clean water, sources of food, and medicinal plants, will be depleted, and the threat to the health of the population will be increased.

Figure 4 demonstrates how the disease occurrence has changed in advance of the drastic destruction of habitats in some regions. The x-axis is the number of years preceding the habitat destruction, and the y-axis is the number of cases of a disease per 100,000 people. The lines indicate the various geographical areas and types of diseases: Amazon Rainforest (Malaria), Sub-

Saharan Africa (Malaria), Southeast Asia (Dengue), North America (Lyme Disease), and Southeast Asia (Zika). The graph clearly shows that the disease incidence in all the regions has increased after the destruction of the habitat, and

the most significant increase has been in areas such as Sub-Saharan Africa and the Amazon Rainforest. This points to the direct relationship between habitat degradation and prevalence of the vector-borne diseases.

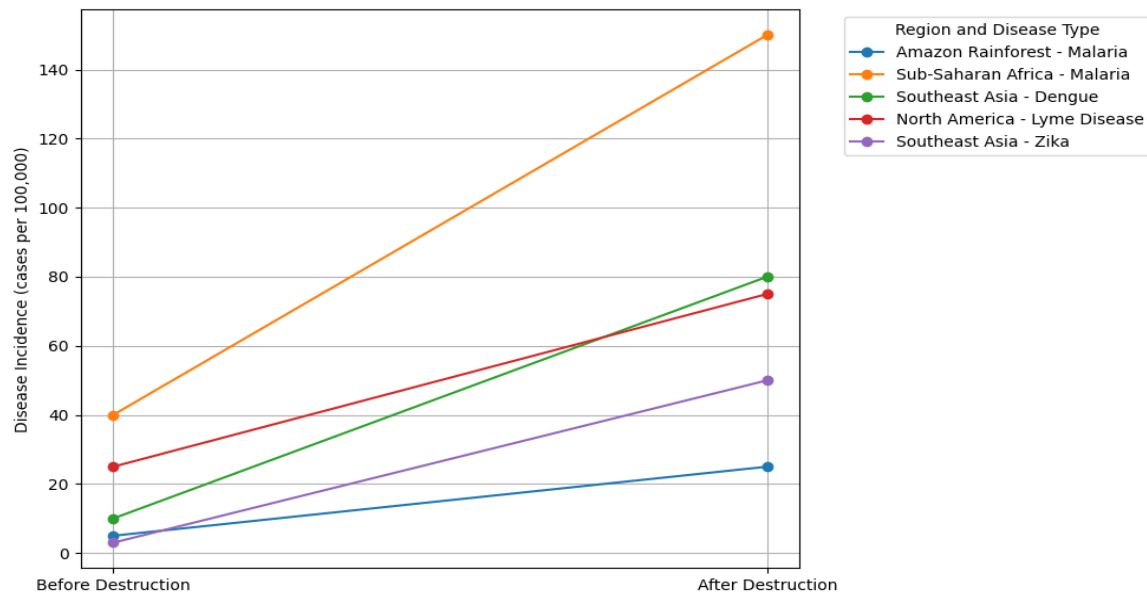


Figure 4: Disease Incidence Before and After Habitat Destruction

Mitigating the Spread of Vector-Borne Diseases Through Habitat Restoration and Conservation

Habitat restoration and conservation are among the best measures of curbing the spread of the disease that is transmitted by vectors. Reduce the number of disease vectors by repairing ecosystems that have been damaged and saving the natural habitats, avoiding the transmission of disease to human beings. As an illustration, planting the previously cleared lands for agricultural activities would be helpful in restoring the predator and vector balance, thereby lowering the number of ticks and mosquitoes. Measures that are taken to conserve the wetlands and forests can also reduce the development of artificial breeding places by mosquitoes and

other vectors of diseases. Moreover, a combination of ecological restoration and a set of approaches to the area that are based on public health, i.e., sustainable land management and adaptation to the climate, can enhance the health of the ecosystem and the health of people by limiting the environmental factors that facilitate the spread of the disease.

Policy Implications for Addressing Habitat Destruction and Disease Transmission

To overcome the core issue of habitat destruction, it is essential to have strong policy interventions, which would involve conservation activities and community health. The governments and international organizations should focus on land-use policies that will see to

it that there can be no more destruction of the habitats, which will further enhance the spread of infectious diseases. To reduce the environmental footprint, policies that encourage sustainable agriculture, urban planning, and infrastructural development can be promoted to ensure that the biodiversity and ecosystem services are not compromised. Moreover, the incorporation of the prevention of disease and ecosystem management in the policies of public health is essential. This involves the integration of habitat protection in disease surveillance initiatives and the concept of One Health, which consists of the interrelationship between human health, animal health, and environmental health. There is an excellent opportunity to lower the risks of the emerging infectious diseases associated with environmental degradation by implementing policies that will help to mitigate the causes of habitat destruction, deforestation, land degradation, and unsustainable agriculture.

Economic Impact of Vector-Borne Diseases

The economic cost of diseases that are transmitted by vectors is enormous in terms of the cost of healthcare as well as the cost of lost productivity. Such diseases as malaria, dengue, and Lyme disease put pressure on the health care systems, particularly in low-resource areas. In addition to the cost of treatment, there is economic loss, especially in absenteeism in the workforce, especially in the agricultural sector, as well as reduced tourism during the outbreak. These are financial problems that hamper development and exacerbate poverty. To deal with the economic impact, it is not only

appropriate to provide better healthcare and prevent diseases, but also the ecosystem needs to be managed sustainably to minimize the spread of the disease.

Public Health Interventions and Prevention Strategies

Interventions to manage the complications of the diseases that are caused by vectors involve control of the vectors by using insecticide-treated bed nets, spraying, larviciding, and habitat control to remove breeding habitats. Awareness and personal protection campaigns, including repellents, protective clothing, etc., are also essential in terms of public health campaigns. These strategies are to be supplemented by preventative actions, including vaccination in some cases. Integrating environmental conservation with community health initiatives will develop a holistic method of handling diseases in areas that have been affected by the destruction of habitats and the impact of climate change. These individuals who are struggling or live in rural areas are more likely to be harmed by the destruction of ecosystems and the spread of disease because they don't have easy access to healthcare and prevention resources. These groups often have fewer resources to prevent or treat illnesses and are more likely to have health problems caused by the environment. There exist global inequalities as well, in that the rich nations also cause damage to the environment but do not experience as many health issues. To remedy these issues, it would be required to have health and conservation programs that encompass the entire community and pay attention to the needs of the most vulnerable groups.

Conclusion

The paper demonstrates the interconnection between habitat loss and the emergence of new infectious diseases, in particular, those caused by vectors such as mosquitoes. Deforestation, urbanization, and agricultural growth act as habitat degraders and provide good environments where disease vectors, including mosquitoes and ticks, thrive. The ecosystems become disrupted, and the biodiversity gets depleted, so the human-wildlife contact is enhanced, and the contact of the zoonotic diseases with the human population becomes more likely. Case studies and statistical analysis show that regions where habitats are destroyed have greater rates of the occurrence of vector-borne diseases, which highlights the importance of the problem of habitat loss in determining the dynamics of infectious disease transmission. The destruction of habitats significantly influences animal health and the transmission of diseases, as altered environments facilitate the spread of vectors like ticks and mosquitoes, which carry pathogens. These shifts in ecosystems result in a greater risk of diseases like Lyme disease, malaria, and dengue, further emphasizing the crucial role of ecosystem health in preventing infectious disease outbreaks.

To curb such risks, more studies are needed to understand more about the mechanisms underlying the linking of habitat destruction to disease transmission, particularly in poorly studied areas. Ecological factors should be incorporated in the public health policies through focusing on habitat conservation and restoration in the prevention of diseases. Conservation of ecosystems is not only essential in the

maintenance of biodiversity but also in controlling disease vectors. Saving the natural ecosystems, decrease the development of infectious diseases and contribute to the ecological and population health stability in the long term. The rise in the threat of vector-borne diseases due to the continuous degradation of the environment is one of the challenges that can be tackled through a collaborative strategy with integration of conservation, disease surveillance, and public health approaches.

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