

Impact of Environmental Variables on Zoonoses and Arboviruses in Brazil from a One Health Perspective: Integrative Review

Impacto das Variáveis Ambientais Sobre Zoonoses e Arbovirose no Brasil na Perspectiva da Saúde Única: Revisão Integrativa

Impacto de las Variables Ambientales en las Zoonosis y Arbovirosis en Brasil Desde la Perspectiva de una Salud: Revisión Integradora

RESUMO

Objetivo: analisar e sintetizar as evidências disponíveis na literatura científica acerca da relação entre as alterações no uso da terra e na cobertura vegetal e a ocorrência de zoonoses e arbovirose. **Método:** Trata-se de uma revisão integrativa da literatura nas bases de dados PubMed, BVS e SciELO. Foram incluídos 22 estudos nos idiomas inglês e português. **Resultados:** A maioria dos estudos foram realizados na Amazônia brasileira, as principais doenças foram leishmanioses, malária e arbovirose, associadas a fatores como desmatamento, perda de cobertura vegetal, mudanças no uso da terra, urbanização, expansão agropecuária e mudanças climáticas. As alterações ambientais favorecem a proliferação de vetores, intensificam o contato entre humanos e animais e aumentam o risco de transmissão de zoonoses. **Conclusão:** todas as alterações ambientais associadas ao aumento da temperatura e da densidade populacional ampliam os riscos epidemiológicos, reforçando a importância de políticas de conservação ambiental, planejamento urbano e manejo sustentável dos recursos naturais para a promoção da Saúde Única.

DESCRIPTORES: Arbovirose; Conservação dos Recursos Naturais; Mudanças climáticas; Saúde única; Zoonoses.

ABSTRACT

Objective: To analyze and synthesize evidence from the scientific literature regarding the relationship between changes in land use and vegetation cover and the occurrence of zoonoses and arboviral diseases. **Method:** This is an integrative literature review using the PubMed, BVS, and SciELO databases. Twenty-two studies in English and Portuguese were included. **Results:** Most studies were conducted in the Brazilian Amazon; the primary diseases identified were leishmaniasis, malaria, and arboviral diseases, associated with factors such as deforestation, loss of vegetation cover, land-use changes, urbanization, agricultural expansion, and climate change. Environmental changes foster vector proliferation, intensify human-animal contact, and increase the risk of zoonosis transmission. **Conclusion:** Environmental changes associated with rising temperatures and population density heighten epidemiological risks, underscoring the importance of policies for environmental conservation, urban planning, and sustainable natural resource management in promoting One Health.

DESCRIPTORS: Arboviral infections; Conservation of natural resources; Climate change; One Health; Zoonoses.

RESUMEN

Objetivo: analizar y sintetizar la evidencia disponible en la literatura científica sobre la relación entre las alteraciones en el uso del suelo y la cobertura vegetal y la aparición de zoonosis y arbovirose. **Método:** se trata de una revisión integradora de la literatura en las bases de datos PubMed, BVS y SciELO. Se incluyeron 22 estudios en inglés y portugués. **Resultados:** la mayoría de los estudios se realizaron en la Amazonia brasileña; las principales enfermedades fueron leishmaniasis, malaria y arbovirose, asociadas a factores como la deforestación, la pérdida de cobertura vegetal, los cambios en el uso del suelo, la urbanización, la expansión agropecuaria y el cambio climático. Las alteraciones ambientales favorecen la proliferación de vectores, intensifican el contacto entre humanos y animales y aumentan el riesgo de transmisión de zoonosis. **Conclusión:** todas las alteraciones ambientales asociadas al aumento de la temperatura y de la densidad poblacional incrementan los riesgos epidemiológicos, lo que refuerza la importancia de las políticas de conservación ambiental, la planificación urbana y la gestión sostenible de los recursos naturales para promover el enfoque de "Una Sola Salud" (One Health).

DESCRIPTORES: Arbovirose; Conservación de los recursos naturales; Cambio climático; Una Salud; Zoonosis.

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INTRODUCTION

The concept of “One Medicine” was formulated in the 20th century by epidemiologist Calvin Schwabe, who proposed the integration of human and animal health¹⁻². As global discussions progressed, this approach evolved into the concept of One Health (), which has been strengthened internationally by the OHH-LEP panel and supported by the World Health Organization³⁻⁴, which helps us understand how ecosystem dynamics directly impact public health.

Highlighting this environmental relationship, a study conducted in Nigeria⁵—in line with discussions on urban microclimates⁶—demonstrated how vegetation cover influences the climate of cities, emphasizing that unplanned urbanization and the replacement of vegetation with anthropogenic surfaces cause an increase in local temperature

and the loss of green spaces.

The removal of vegetation—resulting from deforestation and other human activities—creates favorable conditions for the proliferation of vectors and the emergence of zoonoses, such as visceral leishmaniasis⁷. This disease affects both humans and animals—such as dogs, which can contract canine visceral leishmaniasis (CVL)—illustrating how the improper management of solid waste and the environment compromises the integrated well-being of humans and animals⁸⁻⁹. These and other environmental issues, such as pollution and climate change, highlight the need for environmental monitoring and stewardship to prevent the spread of zoonoses and the contamination of food with pathogens, reinforcing that the concept of health is closely intertwined with human, animal, and environmental health².

According to the Ministry of Health

¹⁰, arboviruses—viral diseases transmitted by arthropods—arise from the interaction between vectors and human populations. This process is accentuated in densely populated urban areas, where the *Aedes aegypti* mosquito encounters high population density and elevated temperatures that favor the maintenance of its reproductive cycle and the spread of zoonoses and arboviruses¹⁰⁻¹¹.

At the same time, drastic changes in land use and land cover—characterized by the replacement of forested areas with pastures and the degradation of riparian vegetation—compromise environmental quality and human and animal well-being. These anthropogenic changes trigger erosion processes and nutrient leaching into water resources, in addition to disrupting the ecological dynamics of reservoirs and vectors¹²⁻¹³.

Given this socio-environmental and epidemiological landscape, this study

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is warranted, as it seeks to gather and synthesize scientific evidence relevant to public health. Accordingly, the objective of this study was to analyze and synthesize the evidence available in the scientific literature regarding the relationship between changes in land use and vegetation cover and the occurrence of zoonoses and arboviruses.

METHOD

This is an integrative literature review. This approach allows for the combination of qualitative and quantitative studies, enabling a critical synthesis of knowledge and a deeper understanding of the subject of study¹⁴⁻¹⁵.

The research was conducted rigor-

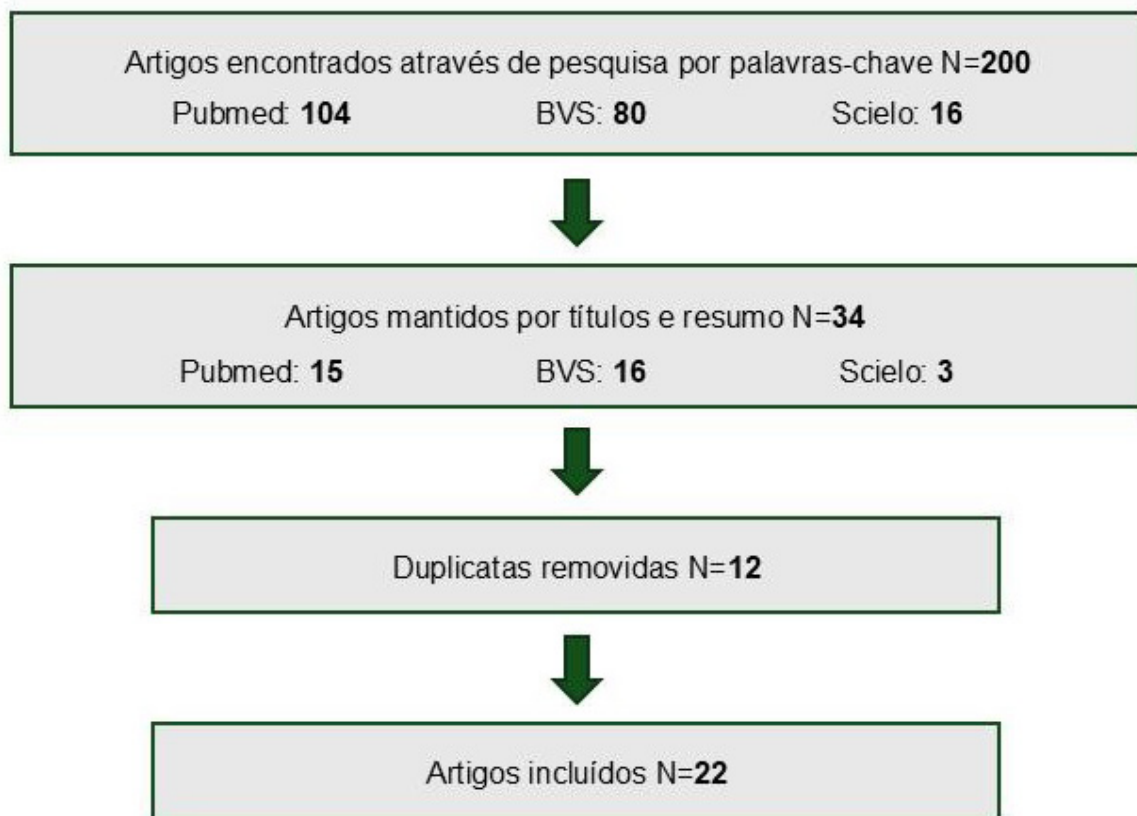
ously in six phases: 1) identification of the topic and definition of the guiding research question; 2) sampling and systematic literature search; 3) categorization and extraction of information; 4) critical analysis of the included studies; 5) interpretation of the results obtained; and 6) synthesis of the knowledge produced¹⁴.

Searches were conducted in the PubMed (National Library of Medicine), BVS, and Scielo databases using combinations of English keywords, with the aim of identifying studies related to the incidence of zoonoses and arboviruses and environmental variables in Brazil. The searches included the following terms: ("leishmaniasis" OR "malaria" OR "hantavirus" OR

"zoonotic diseases" OR "arboviruses") AND ("deforestation" OR "land use change" OR "climate change") AND Brazil.

Following the search phase, the studies were screened based on their titles and abstracts to identify the most relevant articles that addressed the question: "What is the correlation between land use and vegetation cover and the incidence of zoonoses and arboviruses in Brazil?" Studies published between 2024 and 2026 in English or Portuguese, with the full text available, were included. Based on these criteria, 22 articles were selected for an integrative review (Table 1).

Figure 1. Flowchart of the article selection process.



Source: Authors, 2026.

Data analysis was performed through a descriptive synthesis of the selected studies, which allowed us to organize, categorize, and critically examine the evidence found. This approach aims to integrate and consolidate the knowledge produced regard-

ing the subject of study, providing a comprehensive and structured overview of the topic¹⁴.

Regarding ethical considerations and limitations, since this is a review study using secondary data in the public domain, the risk of undue

disclosure of personal information is minimal. However, the study is subject to limitations inherent to the method, such as selection bias, the inclusion of potentially outdated data, and subjectivity in the interpretation of findings¹⁶.

Table 1. Selected articles and topics addressed

Number	Article Title	Level of Evidence	Biome/Region	Studied Disease/Health Issue	Analyzed Environmental Variable	Main Finding
1	Risk factors for emerging, re-emerging, and newly recognized arboviruses and zoonotic viruses in Brazilian amazon	Level V	Amazon	Emerging, re-emerging, and newly recognized arboviruses and zoonotic viruses	Natural ecosystem changes	Disturbances in Amazonian ecosystems result in the emergence of new enzootic viruses and the re-emergence of known viral agents causing epidemic diseases in humans
2	Intermediate forest cover and malaria risk in an Amazon deforestation frontier	Level IV	Amazon	Malaria	Percentage of forest cover	Intermediate forest cover in Amazonian landscapes increases anopheline biting rates, human malaria cases, and Nyssorhynchus vector abundance
3	Responses of vector and non-vector mosquito communities to a gradient of native forest cover loss in the Cerrado hotspot, Brazil	Level IV	Cerrado	Mosquitoes (Vectors)	Loss of native vegetation	Vector species were associated with landscapes presenting a loss of forest cover
4	The importance of Indigenous Lands and landscape structure in shaping the zoonotic disease risk-Insights from the Brazilian Atlantic Forest	Level IV	Atlantic Forest	Zoonoses	Landscape structure and Indigenous Lands	The results showed a protective effect of forest cover on disease risk, which was exacerbated as indigenous land coverage increased within the municipality
5	Deforestation and visceral leishmaniasis: linking landscape change and health in the Amazon	Level IV	Amazon	Visceral Leishmaniasis	Deforestation rates	Findings indicate that the incidence of visceral leishmaniasis increased over time in the Amazon region, with patterns in some areas coinciding with deforestation, particularly in zones of intense land-use change
6	The impact of weather and extreme events on malaria transmission in the Brazilian Amazon: a case-crossover and population-based study	Level IV	Amazon	Malaria	Climate + Extreme weather events	Results suggest that climate change could have a significant impact on the risk of malaria transmission in the Brazilian Amazon
7	(Re)Emerging Arboviruses of Public Health Significance in the Brazilian Amazon	Level V	Amazon	Arboviruses	Landscape changes	Continuous human-maintained landscape changes across Brazil will result in the emergence and resurgence of additional vector-borne arboviruses and disease cases
8	Spatiotemporal relationship between agriculture, livestock, deforestation, and visceral leishmaniasis in Brazilian legal Amazon	Level IV	Amazon	Visceral Leishmaniasis	Agriculture, livestock, and deforestation	Areas with high incidence of VL and deforestation were identified in the states of Roraima, Pará, and Maranhão

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9	Factors Associated With the Emergence and Spread of Visceral Leishmaniasis in the State of São Paulo, Brazil	Level IV	São Paulo	Visceral Leishmaniasis	Environmental, climatic, socioeconomic, and structural factors	The presence of railways, highways, and sugarcane cultivation areas, as well as high annual temperatures and evapotranspiration rates, were associated with the occurrence of VL. Conversely, lower rates of VL were associated with higher precipitation, higher altitude, and more rainy days
10	Canine leishmaniasis in the Atlantic Rainforest Biome region of Bahia, Brazil, affected by deforestation: a one health perspective	Level IV	Bahia Atlantic Rainforest	Canine Leishmaniasis	Deforestation	Although prevalence is low, social and environmental conditions favor the maintenance and expansion of transmission
11	A Contribution towards Sustainable Development in the Amazon Based on a Socioeconomic and Environmental Analysis of Visceral Leishmaniasis in the State of Pará, Brazil	Level IV	Pará	Visceral Leishmaniasis	Socioeconomic and environmental analysis	The disease showed a heterogeneous pattern of case distribution, with a direct relationship between areas with cases and deforestation associated with different anthropogenic activities. There is a socio-environmental production of the disease that goes beyond mesoregional limits, and its establishment is related to the unsustainable development model implemented in the region
12	Climate change, urbanisation and transmission potential: Aedes aegypti mosquito projections forecast future arboviral disease hotspots in Brazil	Level IV	Brazil	Aedes aegypti	Climate change, urbanization, and transmission potential	This study illustrates the dual threat posed by climate change: worsening existing public health challenges and creating new vulnerabilities in the landscape of mosquito-borne diseases in Brazil
13	Climatic, environmental, and social factors in Visceral Leishmaniasis: A spatio-temporal perspective in Brazilian biomes.	Level IV	Brazilian Biomes	Visceral Leishmaniasis	Climatic, environmental, and social factors	In conclusion, the study demonstrated that climatic, environmental, and social factors influence the occurrence of visceral leishmaniasis differently across Brazilian biomes and over time
14	Ecological change increases malaria risk in the Brazilian Amazon	Level IV	Amazon	Malaria	Ecological changes	In this study, we demonstrate a clear positive association between deforestation and short-term malaria transmission
15	Spatial analysis of American cutaneous leishmaniasis in the state of Amazonas.	Level IV	Amazonas	American Cutaneous Leishmaniasis	Municipal Human Development Index (MHDI) and deforestation	High incidence and persistence of this disease in this state were associated with deforestation

16	Between the unknown and the emerging: mapping Oropouche and Mayaro viruses in Brazil	Level V	Brazil	Oropouche and Mayaro	Demographic, temporal, and laboratory variables	Cases are concentrated in the North, where environmental and social factors favor transmission, especially in vulnerable populations. There are indications of a relationship between incidence and deforestation. Mayaro fever also shows an apparent association with environmental degradation
17	Epidemiological aspects of spotted fever in Rio de Janeiro: a One Health approach	Level IV	Rio de Janeiro	Spotted Fever Vectors	Presence of vectors, clinical evolution, and environmental characteristics of occurrence areas	Spotted fever in Rio de Janeiro presents a complex epidemiological pattern influenced by Atlantic Forest fragmentation, urbanization, and climate change
18	Land use and cover changes and sand fly (Diptera: Psychodidae) assemblages in an emerging focus of leishmaniasis.	Level IV	Codó, Maranhão	Sandflies	Land use and cover changes	Land use changes caused by human activities create new habitats for sandflies, altering the leishmaniasis transmission chain
19	Epidemiological aspects of leptospirosis in Rio Grande do Sul during the 2024 Flood	Level IV	Rio Grande do Sul	Leptospirosis	2024 Floods	The 2024 floods caused a significant increase in leptospirosis cases
20	Biodiversity assessment of Phlebotomine (Diptera: Psychodidae) in an environmental impacted area in Rio de Janeiro State, Brazil	Level IV	Rio de Janeiro	Sandflies	Environmental impacts	Despite almost 20 years separating the two studies in the municipality of Mangaratiba, there was no change in the overall sandfly fauna profile; however, a higher density of medically important species was observed in areas that suffered environmental impacts
21	Impact of climate change on leishmaniasis in Brazil	Level V	Brazil	Leishmaniasis	Climate change	Overall, it is found that leishmaniasis will increase its incidence in the country with climate change
22	Ecoepidemiological aspects of american cutaneous leishmaniasis in the state of São Paulo, Brazil	Level IV	São Paulo	American Cutaneous Leishmaniasis	Human activity and forest destruction	Human activities also favored <i>Lutzomyia intermedia</i> , a sandfly species that clearly manages to thrive in altered environments. <i>L. (V.) braziliensis</i> continues to be transmitted even after decades of forest destruction in São Paulo

Source: Authors, 2026.

RESULTS

A search of the PubMed, BVS, and SciELO databases identified 22 articles that met the eligibility criteria. Among these 22 selected studies, a predomi-

nance of studies conducted in the Brazilian Amazon (1, 2, 5, 6, 7, 8, 14) was observed, reflecting the epidemiological and environmental relevance of this region to the occurrence of zoonoses and arboviruses. Meanwhile, among

the diseases studied, research involving different types of leishmaniasis stood out (5, 8, 9, 10, 11, 13, 15, 21, 22),

followed by malaria and other arboviral diseases (1, 2, 6, 7, 14, 17). In addition, the main environmental vari-

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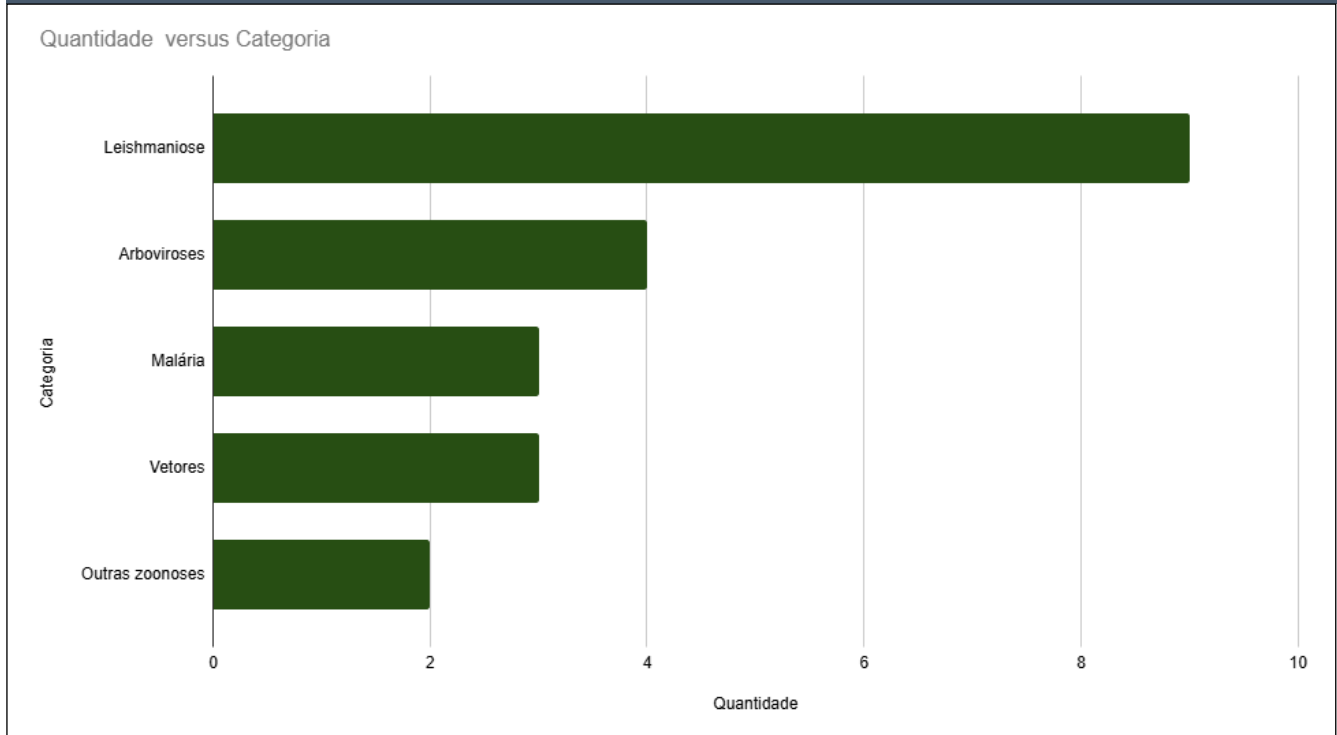
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ables addressed by the studies included vegetation loss and deforestation, climate change and associated events,

changes in land use, human activities, and percentage of vegetation cover. These factors were analyzed for their

role as determinants in relation to the occurrence of zoonotic diseases.

Figure 2. Distribution of the main diseases addressed in the selected studies



Source: Authors, 2026

Major diseases identified

Among the main diseases identified in the selected studies, we can highlight leishmaniasis, malaria, and arboviral diseases. (1,2,5,6,7,8,9,10,11,13, 14,15,21,22) Leishmaniasis represents the group of diseases most frequently addressed in the articles studied (5, 8, 9, 10, 11, 13, 15, 21, 22), including different forms, such as visceral, cutaneous, and canine leishmaniasis. In the analyzed studies, a relationship was observed between the occurrence of leishmaniasis and climatic factors, social vulnerability, and vector adaptation in degraded areas (9, 13, 21, 22).

Malaria also stands out as one of the main diseases, particularly in Amazonian regions (2, 6, 14). The studies highlight the relationship between malaria transmission and environmen-

tal changes, climate change, extreme weather events, and intermediate forest cover. In this context, deforestation was considered the primary factor associated with an increase in the disease's transmission rate, favoring the presence of vectors and the occurrence of human cases (2, 6, 14).

Arboviral diseases have shown a higher incidence, particularly in conjunction with climate change and alterations to natural landscapes. The articles reinforce the idea that changes in ecosystems, urbanization, and climate change favor the emergence of vector-borne diseases, thereby increasing epidemiological risks (1, 7, 16).

Taken together, the studies analyzed demonstrated that the increase in these diseases is associated with environmental factors such as deforestation, land

use, the expansion of agribusiness, climate change, and uncontrolled urbanization. (5, 8, 9, 10,11, 13, 15, 21, 22).

Brazilian Amazon

The Brazilian Amazon has been the focus of a large number of studies (1, 2, 5, 6, 7, 8, 14). This biome is home to great biodiversity, and changes in its balance can lead to the emergence of new diseases with epidemic potential and the reemergence of already known zoonoses and arboviruses, such as malaria—a disease caused by protozoa of the genus *Plasmodium* through the bite of the female *Anopheles* mosquito (1, 6, 7).

In addition to malaria, other diseases are associated with changes in the landscape. The incidence of leishmaniasis in humans and dogs has been linked to

deforestation and socio-environmental conditions in different regions of Brazil, with the Amazon being the primary focus of most studies (5, 8, 10, 11, 15).

The concentration of studies in the Amazon, in addition to reflecting the epidemiological importance of this region, suggests the vulnerability of this biome to changes caused by human activity. Land-use change, urbanization, and agricultural expansion create environments conducive to human-animal contact, facilitating the transmission of zoonotic diseases.

Climate change

Analysis of the selected articles showed that climate change directly influences the increased transmission of zoonotic and vector-borne diseases (6, 12, 13, 17, 19, 21). Among the climate changes, the following stand out: rising temperatures, changes in precipitation, severe weather events such as floods, and environmental changes associated with human activities (6, 12, 17, 19).

Extreme events, such as floods, droughts, and changes in precipitation patterns, have also been identified as important factors contributing to increased environmental problems and public health vulnerability among populations (17, 19).

Taken together, the studies showed that the spread of vectors in environmentally degraded urban areas was directly associated with environmental and climate change, as these changes favor the adaptation and reproduction of disease-transmitting organisms. (6, 12, 13, 17, 19, 21).

Vector-borne and non-vector-borne zoonoses

Most of the included studies addressed vector-borne zoonoses—that is, those whose transmission depends on the presence of a biological vector. Among the most studied vectors were sand flies, which are responsible for transmitting leishmaniasis. However, the results also showed that other mos-

quito species, as well as ticks and various blood-feeding insects, can play a role in the transmission chain, thereby increasing the epidemiological complexity of these diseases (3, 7, 18, 20, 22).

On the other hand, leptospirosis, another zoonosis analyzed, does not rely on vectors for transmission. It is caused by direct contact with the urine of infected animals, especially rodents. The study conducted in Rio Grande do Sul showed that the floods of 2024 resulted in a significant increase in cases of the disease, thereby demonstrating how extreme weather events can act as environmental determinants of the occurrence of zoonoses (19).

DISCUSSION

The data synthesized in this integrative review demonstrate a consistent and multifactorial relationship between vegetation cover, land use, and the incidence of zoonoses and arboviruses in Brazil, reaffirming the principles of the One Health approach¹⁻². Based on the analyzed studies (Table 1), it is observed that both the removal and alterations in vegetation cover directly influence the dynamics of pathogen transmission, especially in tropical ecosystems and in regions under intense anthropogenic pressure¹²⁻¹³.

Deforestation and changes in land use emerge as key factors driving increased morbidity from various diseases, with a particularly significant impact on the Amazon region. The studies included in this review demonstrate that the reduction in forested areas is strongly associated with an increase in cases of malaria, visceral leishmaniasis, and cutaneous leishmaniasis, as well as with the emergence of new viral zoonoses^{7,17-18}. This situation stems from the fragmentation of natural habitats and the edge effect, which facilitate contact between vectors, and human populations, creating conditions conducive to the circulation and

spillover of pathogens².

In the specific context of malaria, the evidence suggests that both deforestation and intermediate levels of forest cover and land fragmentation increase the risk of disease transmission^{12,19}. This pattern suggests that partially fragmented landscapes and forest edges provide favorable microclimates and ideal breeding grounds for the proliferation of vectors of the subgenus *Nyssorhynchus*—notably *Anopheles* (*Nyssorhynchus*) *darlingi*—demonstrating that the loss of continuity and the degradation of vegetation cover play a decisive role in sustaining the epidemiological cycle in endemic areas²⁰.

Thus, visceral leishmaniasis has been strongly associated with environmental changes, including deforestation, agricultural expansion, livestock farming, and the expansion of urban infrastructure⁷⁻⁸. The degradation and urbanization of these areas facilitate the adaptation of sandflies to new niches, increasing the risk of transmission in both rural and peri-urban environments⁸. Furthermore, climatic variables (such as temperature and precipitation) and socioeconomic factors exacerbate these dynamics, underscoring the complex and multifactorial nature of the disease⁷.

Another important aspect concerns the impact of biodiversity loss and ecosystem simplification. Studies conducted in the Atlantic Forest have shown that forest fragments with greater forest cover and the presence of Indigenous Lands exert a protective effect against zoonoses⁸. This finding supports the *dilution effect* hypothesis, according to which more biodiverse ecosystems tend to mitigate the circulation of pathogens by limiting the abundance and dominance of broadly competent hosts².

In the Cerrado and other affected regions, the removal of native vegetation has been linked to an increase in the abundance of insect vectors. This demonstrates that landscape change

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alters the structure of biological communities, favoring species of greater epidemiological relevance¹². This process drives the intensification of arboviral diseases such as dengue, chikungunya, and Zika, especially in contexts of unplanned urbanization²¹.

Arboviral diseases, in turn, are closely linked to urban and microclimatic factors. Rising temperatures, combined with population density and inadequate sanitation infrastructure, stimulate the proliferation of the *Aedes aegypti* mosquito.

Projections indicate that the interaction between climate change and urban expansion will tend to expand risk zones in Brazil, creating new transmission hotspots¹⁸. Extreme weather events also play a decisive role: flash floods and flooding result in a significant increase in cases of leptospirosis, illustrating how abrupt environmental changes affect public health¹² and highlighting the vulnerability of populations living in areas lacking adequate infrastructure².

Another recurring aspect concerns the role of human activities in the emergence of new ecological niches for vectors. Changes in land use, driven by the expansion of agriculture and livestock farming, are associated with the formation of habitats favorable to the development of sandflies and other epidemiologically relevant vectors⁷. This process not only alters local ecological dynamics but also reconfigures pathogen transmission chains, increasing the risk of endemic and epidemic out-

breaks¹².

Furthermore, it is worth noting that the spatial distribution of these diseases is heterogeneous, strongly influenced by regional, socioeconomic, and environmental determinants. The Amazon accounts for a significant proportion of studies and cases, reflecting its high vulnerability to intense anthropogenic pressure⁷. On the other hand, regions such as the Southeast and Northeast also exhibit concerning epidemiological patterns, associated primarily with unplanned urbanization and habitat fragmentation^{12,22}.

Thus, the findings demonstrate that the relationship between vegetation cover and public health is not linear, but rather complex and dependent on multiple interrelated factors^{2,23}. Consequently, the conservation of intact ecosystems, land-use planning, and the integration of public policies are essential for mitigating the risk of transmission of zoonoses and arboviruses²¹.

In summary, this review reinforces the imperative need for interdisciplinary approaches grounded in the concept of One Health, which simultaneously address human, animal, and environmental health¹⁻². The adoption of sustainable landscape management strategies, combined with the strengthening of epidemiological surveillance and socio-environmental policies, is essential to prevent and mitigate the impacts of environmental changes on public health in Brazil^{7,13}.

CONCLUSION

The results of this study demonstrate how changes in vegetation—such as deforestation and land-use changes—negatively influence the quality of life for humans and animals, affecting habitats through degradation and leading to a higher incidence of diseases such as leishmaniasis, malaria, and arboviral diseases.

Anthropogenic changes in the Amazon render the biome vulnerable through increasing and unchecked urbanization, illegal practices, and the replacement and conversion of green areas into agricultural land, which narrows the space between humans and various animal species, leading to an increase in zoonotic diseases.

These effects, combined with rising population density and temperature, amplify epidemiological risks and the emergence of new disease outbreaks, demonstrating that the relationship between public, animal, and environmental well-being requires multifaceted actions and the strengthening of socio-environmental policies.

Thus, the study clarifies the mechanisms that directly influence and impact public health and how the responsible management of natural resources and proper urban planning affect the quality of life of living beings. The results obtained pave the way for future research addressing how environmental changes influence health and the incidence of zoonoses.

REFERENCES

1. Schwabe CW. Veterinary medicine and human health. 3rd ed. Baltimore: Williams & Wilkins; 1984.
2. Pitt SJ, Gunn A. The One Health concept. *Br J Biomed Sci.* 2024;81:12366.
3. World Health Organization. Tripartite and UNEP support OHHLEP's definition of "One Health" [Internet]. Geneva: WHO; 2021.
4. Adisasmito W, Almuhairei S, Behravesh CB, Bilivogui P, Bukachi SA, Casas N, et al. One Health High-Level Expert Panel (OHHLEP). One Health: A definition for the global context. *PLOS Pathog.* 2022;18(3):e1010372.

5. Ayanlade A, Aigbiremolen MO, Oladosu A. Urban microclimate and vegetation dynamics in Nigerian cities. *Environ Dev.* 2021;38:100612.
6. Alves M, Santos R, Oliveira T. Microclimates and urban heat islands: environmental impacts on public health. *J Urban Health Sust.* 2023;12(2):45-58.
7. Filho J, Silva A, Lima R. Epidemiological patterns of visceral leishmaniasis under environmental changes. *Rev Bras Parasitol Vet.* 2025;34(1):e001225.
8. Nascimento L, Costa M, Souza R. Environmental management, solid waste and visceral leishmaniasis: a One Health approach. *Cad Saude Publica.* 2026;42(2):e0004526.
9. Paula EMN, Bartoli G, Vilela GB, Paludo RLR, Martini AC, Dall'Acqua PC. Estudo epidemiológico dos casos notificados de leishmaniose visceral em humanos no Estado de Mato Grosso do Sul. *Braz J Implantol Health Sci.* 2026;8(5):2019-32.
10. Brasil. Ministério da Saúde. *Aedes aegypti*: arboviroses e estratégias de controle vetorial [Internet]. Brasília: Ministério da Saúde; 2024 [citado 2026 jul. 30]. Disponível em: <https://www.gov.br/saude>
11. Soares PAS, Jesus GGS, Pereira JA. Mudanças climáticas, uso do solo e arboviroses: ações multissetoriais para mitigação na saúde pública. *Rev Tópicos.* 2026;4(33):1-37.
12. Do Nascimento RS, Silva AR, Oliveira MT. Impactos das alterações no uso do solo na qualidade dos recursos hídricos e na saúde ambiental. *Rev Bras Cienc Ambient.* 2023;58(2):110-23.
13. Aguirre AA, Santos R, Almeida L. Disease ecology and land-use change: environmental impacts on vector-borne diseases and public health. *Lancet Planet Health.* 2024;8(4):e215-28.
14. Toronto CE, Remington R, editors. A step-by-step guide to conducting an integrative review. Cham: Springer; 2020.
15. Dantas HLL, Costa CRB, Costa LMC, Lúcio IML, Comassetto I. Como elaborar uma revisão integrativa: sistematização do método científico. *Rev Recien.* 2022;12(37):334-45.
16. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ.* 2021;372:n71.
17. Ellwanger JH, Veiga AB, Kaminski VL, Valverde-Villegas JM, Freitas AW, Chies JA. Deforestation and emergent infectious diseases in the Amazon: a One Health approach. *Acta Trop.* 2020;205:105377.
18. Hayashi T, Silva M, Santos A. Amazonian forest loss and vector-borne disease dynamics. *Environ Res Lett.* 2026;21(2):024011.
19. MacDonald AJ, Mordecai EA. Amazon deforestation drives malaria transmission, and malaria burden reduces forest clearing. *Proc Natl Acad Sci USA.* 2019;116(44):22212-8.
20. Chaves LSM, Berço ES, Conn JE, Laporta GZ, Prist PR, Sallum MAM. Anthropogenic landscape decreases mosquito biodiversity and drives malaria vector proliferation in the Amazon rainforest. *PLOS ONE.* 2021;16(1):e0245087.
21. Brasil. Ministério da Saúde. *Aedes aegypti*: arboviroses e estratégias de controle vetorial. Brasília: Ministério da Saúde; 2026.
22. Confalonieri UEC, Margonari C, Quintão AF. Social and environmental vulnerability to vector-borne diseases in Brazil. *Saude Soc.* 2014;23(1):33-45.
23. IPBES. Workshop Report on Biodiversity and Pandemics. Bonn: IPBES Secretariat; 2020.

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