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Editorial: Climate change creates cooler havens for disease vectors: shrubland expansion, thermal moderation, and one health risk in Africa's drylands

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A cooling signal in a warming landscape

Although vegetation slows the warming trajectory in Africa's drylands, it does not halt it. Thirty years of Landsat-based land-cover analysis from Tiaty Sub-County, Baringo County, Kenya, documents the expansion of sparse shrubland from 36.1% to 44.8% of total land cover between 1994 and 2024. This expansion, driven partly by reduced grazing pressure from livestock shifts, produced measurable thermal moderation across Tiaty's semi-arid terrain (Kipterer *et al.*, 2026a). The mean temperature anomaly grew from 0.016°C in the

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1994–2003 baseline to 0.063°C between 2014 and 2024, with structural temperature breakpoints in the 2013–2014 period. This clearly showed the role of vegetation dynamics in moderating the warming. Generalised extreme value modelling projects extreme maximum temperatures rising from 30.72°C at the five-year return period to 31.44°C at the 20-year horizon (Kipterer *et al.*, 2026a). The public health implication is direct. In ASAL environments where people, livestock and wildlife share the same landscapes, vegetation cover shapes the thermal conditions under which disease vectors breed and pathogens cross species boundaries. Treating vegetation management as a One Health intervention is not a conceptual stretch. The data make the case.

A disease burden the siloed systems cannot read

Six years of KHIS/DHIS2 surveillance records from 32 ASAL counties (Ministry of Health, Kenya, 2026), with data provided in the supplementary material, show that climate-driven vector-borne disease in Kenya is both large and geographically concentrated. Confirmed malaria accounted for 5,946,487 cases, 99.5% of the total vector-borne disease burden across the study period. Three counties; Turkana, West Pokot and Kilifi, contributed 82.4% of all confirmed malaria cases; Turkana alone accounted for 58.9% (3,503,245 cases), a distribution consistent with the established relationship between temperature, precipitation and Anopheles vector ranges. Visceral leishmaniasis (kala-azar), transmitted by sandflies whose habitat requirements are tightly coupled to vegetation cover and soil moisture, nearly doubled between 2021 and 2025, from 3,309 to 6,495 annual cases (a 96.3% increase) and represented 0.32% of the total vector-borne disease burden across the period (Ministry of Health, Kenya, 2026). West Pokot, Turkana and Wajir together accounted for 64.8% of all visceral leishmaniasis cases. Chikungunya, at 0.12% of the total burden, rose 471% in a single year between 2021 and 2022, from 356 to 2,034 cases, a spike far larger than its aggregate share and a clear signal of acute epidemic risk. Cutaneous leishmaniasis, trypanosomiasis and Rift Valley fever added a further 5,651 cases, each below 0.1% of the total, but together showing the range of vector-borne exposure across Kenya's ASALs. Across all six diseases, the six-year surveillance window recorded nearly six million confirmed and suspected cases (Ministry of Health, Kenya, 2026). What these numbers expose is not simply the size of the burden. A small number of counties, one dominant disease and brief rainfall episodes account for most recorded cases, and disease-specific surveillance systems, by design, have no way to see that.

Inter-annual variability in case counts reflects the episodic rainfall dynamics typical of ASAL systems, where a single wet season can compress several years' transmission risk into a few months. The trend line across the surveillance period points consistently upward, consistent with the progressive expansion of vector-suitable habitat, the same process that Kipterer *et al.* (2026a) document at the sub-county level in Tiaty. The shrubland expansion that moderates temperatures in that landscape is also expanding the habitat on which sandflies, Anopheles and Aedes vectors depend. The 96.3% rise in kala-azar, the persistent malaria caseloads and the chikungunya spike do not sit in separate disease registers by coincidence. They are what vector ecology looks like when it moves with vegetation cover and thermal regime and no single surveillance system in Kenya is currently watching, a facts supported and validated in the Kenya Climate Change and Health Strategy 2024–2029 (Ministry of Health, Kenya., 2024).

This pattern fits continental projections of a 25%–75% rise in zoonotic and vector-borne disease burden by 2080 (Redding *et al.*, 2024), the steepest increase projected for any continent. While clinical data sit in DHIS2, livestock records with veterinary departments and land-cover data with remote sensing agencies, none of these systems talk to the others. None of them is built to ask whether the pattern they are recording has a shared cause.

Thermal moderation as a one health argument

Kipterer *et al.* (2026a) provided the empirical grounding that takes the thermal moderation argument from plausible to documented, and that grounding touches all three health axes at once. For example, reduced surface temperatures maintain rangeland productivity and lower livestock heat stress, while shrubland cover reduces the bare-ground conditions that sandflies and other vectors prefer and maintains the soil moisture that constrains thermophilic pathogens. These same conditions determine where and when vector-borne and zoonotic diseases establish.

The relationship between thermal moderation and vector biology is bi-directional. At the regional scale, shrubland expansion pulls land surface temperatures away from extremes that suppress vector activity and toward ranges where vector biology is more efficient. At the micro-habitat scale, the same vegetation creates the conditions that key vectors need for breeding, resting, latency and survival. Malaria transmission by Anopheles peaks at approximately 25°C and declines sharply above 34°C (Mordecai *et al.*, 2013). In the semi-arid Tiaty of Baringo County, bare-ground temperatures during dry months regularly exceed this upper bound. Expanding shrubland canopy reduces those temperatures toward the optimum, while shaded pools beneath shrub cover enhance larval survival. A specific shrub species accelerates this further. Indeed, Barber *et al.* (2017) reported that experimental removal of flowering *Prosopis juliflora* branches produced a threefold drop in the abundance of infective Anopheles mosquitoes.

For sandflies, the link is equally direct. *Phlebotomus martini* and *P. duboscqi*, both leishmaniasis vectors documented in Baringo County, require shaded soil with stable temperatures and organic litter for larval development, conditions that expanding shrubland creates (Hassaballa *et al.*, 2021; Sangiorgi *et al.*, 2012). For ticks, the savanna evidence is unambiguous. For instance, as woody encroachment converts grassland to shrubland, tick abundance and pathogen prevalence rise (Sikhosana *et al.*, 2025; Ebert and Becker, 2025).

The 90.3% rise in Kala-azar across 32 ASAL counties (Ministry of Health, Kenya, 2026) is not incidental to the thermal moderation story or insinuations; it may be a partial product of it. Turkana, West Pokot and Baringo counties carry the highest combined Kala-azar and malaria burden among the counties where shrubland dynamics are most directly documented and are also the counties where the land-cover and climate dynamics documented by Kipterer *et al.* (2026a) are most directly applicable. This alignment is the clearest available evidence, short of direct entomological surveillance, that the amplification mechanism is operating at a population scale.

The shrubland expansion driving these vector dynamics has been actively shaped by community-level decisions. Tiaty's shift from cattle to drought-tolerant camels and goats and beekeeping adopted by roughly 52% of households reduced grazing pressure and charcoal dependence, contributing to the shrubland expansion that produced the thermal moderation effect (Kipterer *et al.*, 2026b). What one sub-county achieved without policy support could be easily replicated with it. With policy support including appreciating the Kenya Climate and Health Strategy 2024–2029, there is opportunity and recognition of locally led livelihood shifts as core components of climate-smart adaptation and highlights the potential for community actions to deliver co-benefits for health and ecosystem restoration when linked to formal support (Ministry of Health, Kenya., 2024). In addition, the WHO One Health Joint Plan of Action provides a workable framework, but implementation in ASAL landscapes remains aspirational and NDCs rarely connect vegetation restoration to disease surveillance. These framework gaps have direct downstream consequences: veterinary services, identified as a critical unmet need by 61%–64% of pastoral households, remain chronically underfunded, leaving brucellosis to move through the livestock-human interface unchecked and leishmaniasis range expansion remain undetected until case loads climb.

Policy implications

Three policy shifts can be deduced from above evidence. Firstly, vegetation restoration needs to be formulated explicitly as a health intervention in ASAL climate adaptation frameworks. Where shrubland recovery reduces land surface temperatures and limits bare-ground vector habitat, those gains have a calculable epidemiological value that should be costed within the health financing frameworks governing National Adaptation Plans and NDCs. Climate finance mechanisms should treat vegetation-based thermal moderation as a co-benefit pathway connecting adaptation, biodiversity and public health, consistent with the cross-sectoral framing of the WHO One Health Joint Plan of Action (FAO *et al.*, 2022).

Secondly, integrated surveillance across human, animal and environmental data is urgently critical. Diseases such as malaria, leishmaniasis, Chikungunya, Rift Valley fever and trypanosomiasis are not isolated outbreaks; they are co-occurring signals from shared landscapes. A system triangulating HMIS case data, livestock disease reports, NDVI-derived vegetation change and rainfall anomalies alongside land surface temperature and shrubland cover dynamics would enable early warning months before clinical thresholds are crossed.

Finally, funding health security in ASAL contexts need to be multiplied rather than the current trajectory showing a decline. Recent scaling back of disease detection programmes in Kenya, Congo, Uganda and Nigeria has weakened early warning infrastructure as climate change accelerates zoonotic spillover risks (Ortiz-Millán, 2025). The Kenya data are not a projection of future harm; they are a six-year record of harm already occurring, and they show that its ecological drivers are measurable and locatable. Funding retrenchment eliminates the institutional capacity to act on that information.

Conclusion

Bush encroachment is not confined to Tiaty sub-county in Baringo, Kenya. The same expansion of woody and shrub cover across arid and semi-arid East Africa means the Tiaty findings are a localized, quantified instance of a wider regional process (Kipterer *et al.*, 2026b). Where it occurs, it produces the same dual signal: a modest but real and quantified cooling effect (Kipterer *et al.*, 2026a), alongside an expansion of the micro-habitats which vector-borne diseases depend on. Current policy frameworks are not formulated to detect or act on this. Ecological recovery in ASAL landscapes produces disease-risk co-benefits and disease-risk costs at the same time, and both fall outside human health budgets, climate finance windows and the surveillance systems monitoring the communities who live there. The six-year KHIS/DHIS2 record confirms this dual signal at population scale in Kenya: the same landscape process that partially cools pastoral terrain is also expanding the conditions on which malaria, Kala-azar, Chikungunya, cutaneous leishmaniasis, Rift Valley fever and trypanosomiasis depend.

One health policy has the institutional architecture to connect these dimensions. The Tiaty evidence provides the sub-national grounding, while the continental projections supply the scale. Although Africa contributes the least to global greenhouse gas emissions, the continent faces the steepest projected rise in climate-driven disease burdens. Incorporating vegetation-driven thermal moderation into One Health and ASAL adaptation frameworks has been possible for some time. The Kenya data gives it a concrete reason.

Ethics statement and Consent to participate
This commentary is based on analysis of publicly available secondary surveillance data and published land-cover datasets. No primary data collection involving human participants was conducted.

Data availability
The disease surveillance data underpinning this commentary are drawn from the Kenya Health Information System (KHIS/DHIS2), publicly accessible at https://hiskenya.dha.go.ke/. Land-cover and climate datasets are derived from Landsat imagery, CHIRPS and CRU-TS, all publicly available through their respective repositories.

Use of generative AI tools
During the preparation of this manuscript, the authors used generative AI tools to support language clarity. All AI-assisted content was reviewed, edited and approved by the authors, who take full responsibility for the accuracy and integrity of the published work.

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Supplementary material

The supplementary material for this article can be found online.

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