Osofsky et al.
CABI One Health (2025) 4:1, 0006
https://doi.org/10.1079/cabionehealth.2025.0006

CABI One Health

REVIEW

OPEN ACCESS

Two decades of One Health in action: Enabling sustainable wildlife conservation and livestock production in southern Africa

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Abstract

The AHEAD (Animal & Human Health for the Environment And Development) program was launched in 2003 at the IUCN World Parks Congress in Durban, South Africa. We defined our mission as serving as "a convening, facilitative mechanism, working to create enabling environments that allow different and often competing sectors to literally come to the same table and find collaborative ways forward to address challenges at the interface of wildlife health, livestock health, and human health and livelihoods." We continue on this mission more than 20 years later, convening stakeholders, helping delineate conceptual frameworks to underpin planning, management and research, and providing technical support and resources for projects stakeholders identify as priorities. As one of the first applied One Health programs, our work is premised upon the fact that the challenge of managing transboundary animal diseases (TADs) often lies at the heart of whether transfrontier conservation areas (TFCAs) will succeed or fail in their aspirations to become the ecologically resilient land-use entities required for long-term delivery of poverty alleviation and related development as well as biodiversity conservation benefits. As the Kavango Zambezi Transfrontier Conservation Area's (KAZA's) remaining key wildlife corridors, needed for wildlife populations to survive and thrive for generations to come, continue to be blocked by veterinary cordon fences, the urgency of improving regional animal disease management cannot be overstated. This is especially relevant for those European donors to TFCAs whose nations set up the veterinary cordon fencing-based disease management system in the first place – starting in the 1950s when today's KAZA partner countries were European colonies or protectorates. The prevailing veterinary fencing paradigm is rooted in the colonial era, but with impacts on KAZA's wildlife that have persisted on up to the present. If we fail to help all countries within a given TFCA actually co-manage disease threats to the livestock sector that all value highly – culturally, economically, and politically – then how can we expect significant progress in terms of fostering habitat connectivity across international boundaries? When a given country fears diseases they believe or know are across the border, how can we lower the perceived or actual risks of the vision of restoring wildlife migrations through removal of segments of the most environmentally damaging fences? The AHEAD program continues to work on these challenges, with recent progress on sectorally integrative approaches providing reasons for cautious optimism.

One Health impact statement

What was arguably the first applied One Health program, AHEAD (Animal & Human Health for the Environment And Development) was launched in 2003 at the IUCN World Parks Congress in Durban – a year before one of us led the drafting of *The Manhattan Principles on 'One World, One Health'* (Cook *et al*., 2004). As AHEAD has recently marked its 20th anniversary, some introspection certainly seems prudent. Our goal, our *raison d'etre*, has been to serve as 'a convening, facilitative mechanism, working to create enabling environments that allow different and often competing sectors to literally come to the same table and find collaborative ways forward to address challenges at the interface of wildlife health, livestock health, and human health and livelihoods' (available at: http://cornell-ahead.org). We continue on our One Health mission to convene stakeholders, help delineate conceptual frameworks to underpin planning, management and research, and provide technical support and resources for projects stakeholders identify as priorities. AHEAD's One Health framing recognises the need to look at health, disease, and the environment together, while always taking a given region's socio-economic, political, and policy context into account.

Keywords: wildlife, livestock, interface, One Health, connectivity, habitat, migration, transfrontier, conservation, fencing, foot and mouth, disease, veterinary, policy, environment, livelihoods, sustainability

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Submitted: 04 August 2024. Accepted: 28 January 2025. Published: 16 April 2025

Introduction

The *SADC Protocol on Wildlife Conservation and Law Enforcement* (SADC, 1999), signed by the heads of 14 member states on 18 August 1999 in Maputo, Mozambique, has as one of its specific objectives "to promote the conservation of shared wildlife resources through the establishment of transfrontier conservation areas." Since the *Protocol*'s adoption, a number of transfrontier conservation areas (TFCAs) have been established in the region, the Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA or simply KAZA) being the largest and encompassing three spectacular World Heritage sites: the Okavango Delta and the Tsodilo Hills in Botswana, and Mosi-oa-Tunya (Victoria Falls) shared between Zambia and Zimbabwe. The Falls are also listed as one of the seven natural wonders of the world (available at: https://www.kavangozambezi.org). KAZA is actually the world's largest terrestrial conservation landscape, at 520,000 km^2. It represents a bold commitment on the part of five African nations (Angola, Botswana, Namibia, Zambia and Zimbabwe) to conserve biodiversity at scale, in the hopes that nature-based tourism will be an engine for sustainable rural economic development. At the heart of KAZA, also home to the world's largest remaining population of African elephants (~228,000) (Taylor *et al*., 2024), lies the wildlife-rich area of Ngamiland in northern Botswana, an area of AHEAD program focus (Fig. 1).

Since the late 1950s, hundreds of thousands if not millions of the region's wild animals have died along fences that have cut off their ancient migratory routes, needed for seasonal access to, for example, grazing and fresh water. Those fences were put up largely because wild species like the African buffalo (*Syncerus caffer*) carry the foot and mouth disease (FMD) virus, which shuts down a country's beef exports if it gets into cattle. Our policy work has included a focus on the way beef is actually processed in order to keep products virus-free for international sale, aka commodity-based trade or CBT, now endorsed by the Southern African Development Community[1] (SADC, 2012; SADC and AHEAD, 2021) – an approach that does not completely depend on fences, and that is reinforced by good herding practices. Unless these vast fences are addressed, the entire premise of habitat connectivity that underpins the economic and biodiversity conservation promise of this globally important transboundary conservation landscape will remain out of reach.

Wildlife numbers in the region have been declining over at least the last three decades (Grimaud *et al*., 2022). The complexity of achieving and assuring resilience and sustainability of protected areas was captured by Cumming *et al*. (2015b), who described them as socio-ecological systems that are strongly influenced by the needs and perceptions of the affected human population. The TFCA principle of multiple resource uses recognises that assuring a positive attitude towards conservation depends on improving the livelihoods of people living in proximity to wildlife and that not all of them will directly reap the benefits of conservation, like revenues from nature-based tourism. Improving market access for livestock farmers living in areas that are not free of FMD due to the presence of wildlife can contribute significantly to tolerance for wildlife and the sustainability of biodiversity conservation in TFCAs like KAZA (Thomson *et al*., 2013a).

As several of us wrote after more than a decade of AHEAD work (Cumming *et al*., 2015a, p. 243):

> The formerly open rangelands and savannahs of the world are increasingly being enclosed by boundaries that demarcate smaller and smaller parcels of land. The resulting changes in the scales at which these landscapes are managed have impacts on both ecological and social processes, and ultimately on system health and human health and well-being. A One Health approach provides a novel conceptual framework within which to examine the issue of fragmentation in southern African rangelands.

The chapter cited above provides details on the recent fragmentation of formerly vast open landscapes in southern Africa by manmade barriers such as roads, railways, and numerous fences, including veterinary cordon fences. Wire fences have a short history of 150 years in the region, where they were first instituted in South Africa to demarcate farm boundaries. Over the past several decades, southern African countries have been working collaboratively to recreate large, ecologically connected landscapes through the establishment of TFCAs (Osofsky *et al*., 2005; Andersson *et al*., 2013). However, many fences remain, with Botswana's veterinary

Fig. 1. Map showing location of southern Africa's KAZA TFCA (in green) across its five constituent countries.

fences, erected largely to separate wildlife from livestock in order to enable beef exports from the zones thus demarcated as free from FMD, having had particularly detrimental impacts on the region's formerly abundant and unique wildlife populations (Cumming *et al*., 2015a, p. 246):

> Botswana [the British Protectorate of Bechuanaland until independence in 1966], a semi-arid country of some 600,372 km^2, was mostly an open system almost devoid of fences, but since the building of the first veterinary cordon fences in 1954 and 1955, and the 300 km Kuke fence in 1958, the management of FMD in the country has been dominated by fences. The fences serve to control animal movements and so create and maintain FMD-free areas to meet the requirements of a subsidized beef export industry (Osofsky *et al*., 2008; Gadd, 2012). Whilst successfully meeting the requirements of the beef industry, the fences contributed to the collapse of populations of wild ungulates by interfering with their seasonal movements and blocking access to water in dry years (Osofsky *et al*., 2008; Gadd, 2012). For example, between 1978 and 2003, formerly abundant mobile populations of wildebeest and red hartebeest in the Kalahari system in western Botswana declined by an order of magnitude (Perkins, 2010). Wildebeest declined from 315,000 to 16,000 and hartebeest from 293,000 to 45,000 as a result of fragmentation of their range by game fences. Similar impacts occurred in the Makgadikgadi system as a result of cordon fencing (Perkins, 2010). Fencing around the western, southern and south-eastern edges of the Okavango Delta presently constrains seasonal dispersal of wild ungulates from the delta at the onset of the rainy season. The result is increased pressure on habitats within the delta that may be contributing to the decline of several antelope species (e.g. Mbaiwa and Mbaiwa, 2006; Hamandawana, 2012).

This intersectoral conundrum has compromised diversification of land uses that involve wildlife and nature-based tourism, and as a result system health, resilience and human well-being (Cumming *et al*., 2015a).

The main economic activities in KAZA are nature-based tourism and agriculture. In Botswana and Namibia, with semi-arid to arid climates, livestock production is by far the most important agricultural activity (Mendelsohn, 2006; Atkinson *et al*., 2019). Before the COVID-19 pandemic severely albeit temporarily constrained travel and tourism, income from nature-based tourism in Botswana far exceeded that from agriculture, but the latter remains the backbone of the rural economy and provides household income and livelihoods for a much larger number of people (Atkinson *et al*., 2019), as relatively little direct income from tourism reaches local communities (Mbaiwa, 2017). However, for those living in proximity to wildlife usually viewed as the source of transboundary diseases (especially FMD), the economic potential of their livestock has for decades been severely limited by international regulations restricting trade in livestock commodities from countries or zones not free from diseases like FMD (Perry *et al*., 2005; Thomson *et al*., 2013a, b). Botswana and Namibia are the major beef exporters in southern Africa, but exports from both countries have been declining (Thomson *et al*., 2013a). Furthermore, as most of the cattle in southern as well as East Africa are produced in areas that are not free of FMD, the amount of beef available for export is limited, and the regions are consequently not competitive (Thomson *et al*., 2013a).

There are other problems for farmers living in close proximity to wildlife, such as crop destruction and livestock predation (Atkinson *et al*., 2019; Meyer and Börner, 2022), and other manifestations of human-wildlife conflict that result from competition for resources like grazing, water and land overall. Human-wildlife conflict is, of course, a complex problem that is not likely to be fully resolved, but it needs to be mitigated to the greatest extent possible to permit integrated land use that includes both agricultural production and wildlife conservation (du Toit *et al*., 2017). Multiple stakeholders are involved in various efforts to improve both wildlife conservation and human livelihoods in KAZA through integrated land-use options like community conservancies to ensure greater income benefits from wildlife-based activities (Meyer and Börner, 2022). This approach is comprehensively described in a collection of chapters edited by Grimaud *et al*. (2022), but although low prices for livestock products and lack of marketing opportunities are identified as challenges, the issue of limitations on opportunities caused by transboundary animal diseases and associated restrictive disease control measures is not discussed. This is likely because the focal countries of that study, Zambia and Zimbabwe, although subject to these constraints, do not have FMD-free zones. The need for countries that do have such zones to protect them to maintain beef exports to the EU and other higher-end markets exacerbates the inequality between cattle farmers in these priority zones and those in contiguous FMD-infected (or "red") zones that have historically been excluded from accessing higher-value markets.

More details on the regional history of FMD and related issues are provided in Supplementary Material 1.

Engagement via a One Health approach

The World Organisation for Animal Health (formerly OIE, now called WOAH) provides standards under World Trade Organization auspices for its 183 member countries related to international trade in commodities (including beef) that are a potential source of animal disease agents. In 2015, based on more than a decade of science-based advocacy work by AHEAD and regional partners (e.g. Osofsky *et al*., 2005; Beauty and the Beef (https://www.youtube.com/watch?v=lLZ-uhy_JeQ); SADC, 2012; SADC and AHEAD, 2012), WOAH updated its Terrestrial Animal Health Code and made it possible for African countries with wild species like buffalo that naturally harbour FMD viruses to be able to trade beef *without necessarily requiring the physical separation of wildlife and livestock through the extensive veterinary cordon fencing* that has characterised animal disease management in southern Africa since the colonial era. While there is still much to be done to make new value chain approaches to safe beef production a routine option, as per our *Guidelines* that have now been released as an official SADC document (SADC and AHEAD, 2021), this policy change facilitated the unprecedented possibility of access to new beef markets for southern African farmers and pastoralists as well as unlocked the potential for restoring migratory movements of wildlife, thus enhancing prospects for long-term wildlife population viability within individual countries and in transboundary landscapes like KAZA. This new flexibility represents a true 'win-win' for sustainable and diversified land use and livelihoods, especially given the likelihood of ongoing worsening of droughts as per regional climate change models (Steinberg, 2023).

To be clear, this work is not about "removing all fences," but this new, more flexible policy paradigm represents a vitally important opportunity for the wildlife and livestock sectors to work together on collaborative land-use planning, knowing that removing specific fences or fence sections impacting important wildlife habitat corridors is now an option – since beef export market access can be attained utilizing new meat-processing value chain-based approaches, regardless of whether buffalo or other wildlife live in or near a particular locality or not. There is now, for the first time in several generations and based on our One Health approach (Cook *et al*., 2004), an opportunity to find ways to optimise land-use choices in the interest of system resilience and diversified livelihood opportunities. Neither the livestock nor wildlife sectors should seek to dominate the other. Instead, it is time to make land-use decisions that will be socially, ecologically and economically sustainable for generations to come (Osofsky, 2019).

Based on the expectation that CBT implementation will continue to progress, the Government of Botswana reconvened its high-level (Director- and Deputy Director-level) interagency fencing committee in 2018 (aka, the National Committee on Cordon Fences). This platform is meant to coordinate developments with regard to the evaluation, construction, maintenance, realignment, as well as

removal or decommissioning of fences in the country. Importantly, it enables constructive engagement between historically competing sectors (such as wildlife and livestock), and more informed decision making on fences which have had long-standing environmental and socioeconomic impacts. AHEAD provides administrative and technical support to and has a seat on this committee.

AHEAD and regional partners have been reviewing the original intent of key veterinary cordon fences, many of which were constructed decades ago in response to disease threats that may or may not still be relevant. In collaboration with key veterinary and wildlife officials from Botswana and Namibia, AHEAD and regional partners have also collated historical and recent veterinary disease prevalence and outbreak data from areas where there are major fences. This consortium, working under the auspices of the official KAZA Animal Health Sub Working Group, has just finalised a qualitative livestock disease risk assessment exploring a range of veterinary cordon fence scenarios (Rosen *et al*., 2024), including comparing the status quo with removal of specific fence sections previously identified as most damaging to key wildlife movements (Atkinson *et al*., 2022), with a focus on FMD and CBPP (contagious bovine pleuropneumonia). Peste des petits ruminants (PPR), a viral disease of small livestock, was also considered. This new analysis delineates in detail how *the risk of important livestock diseases might change, or not, if these specific fence sections were removed to promote habitat connectivity across the greater KAZA landscape* (Rosen *et al*., 2024). Our critical next step is to focus on supporting more widespread adoption of managed livestock herding as a key disease risk mitigation approach (as per the *Herding for Health* model, e.g. https://www.clawsbotswana.org/what-we-do/, accessed 12 July 2024), along with community consultations with respect to specific fence sections that Botswana and Namibia government stakeholders have acknowledged could be removed (Fig. 2) if, for example, improved community livestock herding can be demonstrated, based on the fencing scenarios disease risk assessment work just completed (Rosen *et al*., 2024). Anticipated positive outcomes would include improved national and regional economic development as underpinned by sustainable, sectorally integrated (i.e., taking advantage of livestock and wildlife) land uses.

At this point in time, with AHEAD having been launched in 2003, it seems prudent to ask ourselves how we and our many critical partners across the SADC region and around the world are doing in terms of addressing this quintessential One Health challenge. One pivotal milestone, as described above, has been WOAH's acceptance of CBT of beef as a new way for even the poorest of farmers living closest to wildlife to be able to access new markets and better prices for their beef without a geographic (fence-based) approach to FMD risk mitigation. With less dependence on fences to mitigate risks of FMD (because CBT focuses on how beef can be safely produced along value chains rather than worrying about whether any buffalo are in the neighbourhood), communities in places like northern Botswana or Namibia's Zambezi Region are simultaneously on the verge of having new opportunities to expand their participation in wildlife economies. Specifically, if CBT has indeed created an enabling environment to revisit veterinary fencing policy, as we believe it has, then ecologically meaningful transfrontier conservation in a landscape like the five-nation KAZA

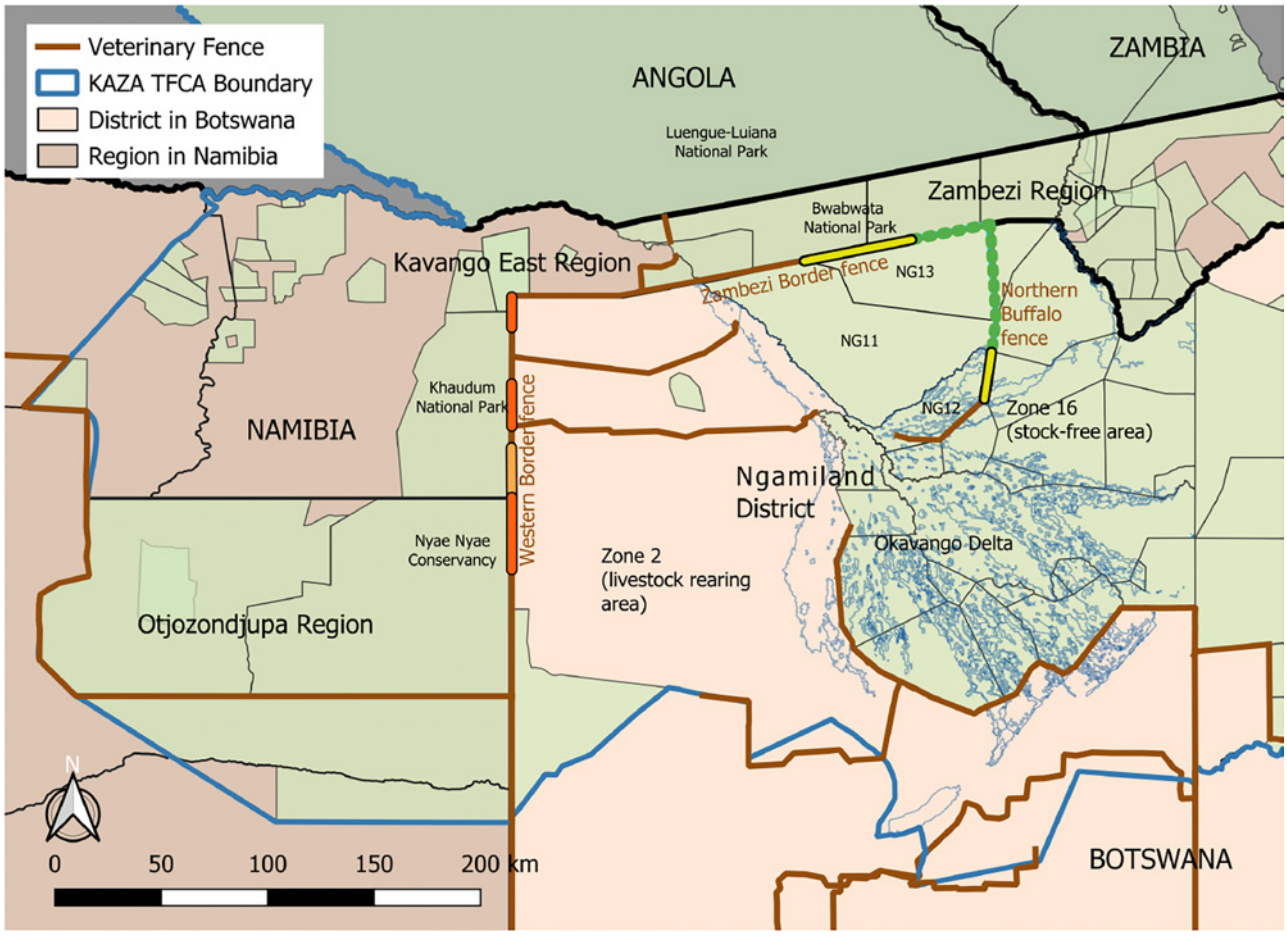

Fig. 2. Fence sections recently recommended for northern Botswana community consultations on potential removal (green) with risk mitigation, or re-evaluation in future (yellow) based on bilateral (Botswana and Namibia) consideration. Sections of the Western Border fence (dark and light orange) were not recommended for removal at this time, though one 23-km section (light orange) was highlighted as being a potential candidate in the future pending further CBPP-related information (courtesy of Rosen *et al*., 2024).

TFCA can finally become a reality. In short, with the advent of CBT and now with a detailed analysis that shows that several key fences are no longer mitigating disease risks as originally envisioned (Rosen *et al*., 2024), the veterinary officials of key, contiguous KAZA partner states have agreed, based on sound epidemiological principles, that there is an opportunity to reopen wildlife corridors to allow for migrations that had been the norm for millennia, long before veterinary fencing began blocking them starting in the 1950s. We believe such restoration would reinforce system resilience.

But what are the ongoing obstacles to a more sectorally integrated approach to land-use planning? Perhaps the most significant one is the basic fact that, across any given TFCA, different member states may each experience, perceive and manage animal disease risks somewhat differently compared to their neighbours. Of course, a TFCA needs to be recognised and managed as one epidemiological unit, meaning that decision makers have to recognise that successful management of an animal disease problem of concern to any one country is likely going to require the active collaboration of all other countries comprising that TFCA.

The good news is that the leaders of departments of veterinary services across a TFCA like KAZA all now recognise and acknowledge this, as does the KAZA Treaty itself (KAZA TFCA Treaty, 2011), which has as one of its objectives 'to promote and facilitate the harmonisation of relevant legislation, policies and approaches in the area of transboundary animal disease prevention, surveillance and control within the KAZA TFCA,' along with the SADC Livestock Technical Committee. Transboundary animal disease management requires transboundary coordination and ideally harmonisation in terms of surveillance, data-sharing, animal movement requirements, vaccination programs, and emergency response. Again, all of our colleagues leading departments of veterinary services in KAZA know all of this – the KAZA Animal Health Sub Working Group, which AHEAD helps to steward in support of the KAZA Secretariat, has been a valuable platform for KAZA's five partner countries to utilise to consider and co-plan on these critical issues.

One of the most basic remaining challenges to harmonising disease risk mitigation across a TFCA like KAZA is a pervasive lack of resources (human and financial) combined with a lack of applied cost-benefit analysis, a problem certainly not unique to southern Africa (Bucher *et al*., 2023). For any given KAZA partner country, adequate funding for robust surveillance, data management, vaccination programs, and emergency response is often elusive. Scale those needs across the five KAZA countries, and the challenges, including those related to inadequate staffing, become even more clear. Yet, if we fail to help all countries within a given TFCA actually co-manage the disease threats to the livestock sector that all value highly – culturally, economically, and politically – then how can we expect significant progress in terms of fostering wildlife habitat connectivity across international boundaries? How can we lower the actual (or perceived) livestock health risks of the vision of restoring wildlife migrations by removing sections of the most environmentally damaging fences when a given country fears diseases they know (or believe) are across the border? Even for diseases like CBPP, in which wildlife plays no role, fences are seen as a vital way to separate "my cattle" from "your cattle." What to do?

After two decades of applied science policy work, we urge the conservation community (particularly the largest donors based in Europe) to finally recognise that the challenge of successful transboundary animal disease management often lies at the heart of whether specific TFCAs will ever reach their aspirations to become the ecologically resilient land-use entities required for long-term delivery of sustainable poverty alleviation and biodiversity conservation benefits. Tens of millions of dollars to address conservation as well as climate change are currently flowing into KAZA, but virtually none are available for helping the five countries collaboratively control key animal diseases, which can actually only be done successfully if the five countries are all able to work together in a coordinated manner, and which requires considerable resources. As KAZA's remaining key wildlife corridors, needed for wildlife populations to survive and thrive for generations to come, continue to be degraded and blocked, the urgency of donors recognising that they must help improve regional animal disease control cannot be overstated. This is especially true for those European donors to TFCAs whose nations set up some of the veterinary cordon fencing-based disease management systems in the first place, starting in the 1950s when today's KAZA partner countries were colonies or protectorates. Relatedly, if today's European consumers were aware that some of the imported beef they buy was produced at huge environmental cost to southern Africa's wildlife, they would demand nothing less than a righting of what is arguably an historical wrong with roots in the colonial era but with impacts on KAZA's wildlife that have persisted on up to the present – and that threaten the future.

Rethinking the cost/benefit of fences

The need to reassess the costs and benefits of fences across both the wildlife and livestock sectors is being increasingly recognised (Osofsky *et al*., 2005; Woodroffe *et al*., 2014; Osofsky, 2019; Naidoo *et al*., 2022). In simple terms, the costs of adequate fence maintenance are now largely beyond the means of governments due to the high level of fence damage caused by elephants, vandalism and flooding, and a marked increase in FMD outbreaks over the last two decades suggests little benefit of the fences in terms of disease control (Vosloo and Thomson, 2017; Babayani and Thololwane, 2022). Changing patterns of FMD from a sporadic disease of cattle attributable largely to wildlife contact to a disease that circulates independently in cattle point to a situation that can no longer be managed by cordon fencing. More important preventive tools will consist of better husbandry (especially herding) combined with strategic vaccination of cattle, with fencing being used where it really is needed to mitigate transboundary animal disease or human-wildlife conflict. Protection of livestock from predation and theft is best achieved by professional herding and well-designed mobile enclosures (i.e. kraaling at night) that can enhance grazing and rangeland management. A cost-benefit analysis should also take into account that both nature-based tourism and premium-yielding wildlife-friendly beef production can result in increased income that can likely cover the costs of improved livestock management. With less reliance on fencing, savings resulting from markedly reduced fence maintenance costs could also contribute to improving livelihoods in areas that are not free of FMD. Managed herding itself (as underpinned by planned grazing) is already starting to demonstrate the potential for an extraordinary number of co-benefits in the region, including but not limited to healthier livestock in better condition, an on-ramp to successful CBT of wildlife-friendly beef, preferential beef pricing from local tourism operators, improved vaccination coverage, improved animal identification and thus traceability, decreased losses from predators (with less retaliatory killing of carnivores), avoidance of buffalo and other wildlife by herders, less cattle theft, improved rangeland condition/restoration (good for livestock and wildlife), and enhanced soil carbon sequestration (Heermans *et al*., 2021).

Integrative approaches by definition should ensure that conservation and tourism activities provide income for populations living with wildlife through the establishment of community-based conservancies (Lindsey *et al*., 2009; Weaver *et al*., 2013; du Toit *et al*., 2017; Osofsky, 2019). In the face of climate change, it is particularly important in areas that are already arid or semi-arid to manage rangelands in the best possible way and to allow wild herbivores to range over a wide enough area to sustainably access necessary grazing (Naidoo *et al*., 2014; Hering *et al*., 2022). Strategic management of livestock is crucial to ensuring a synergistic rather than a competitive relationship with wildlife in shared rangelands (Fynn *et al*., 2016; Pozo *et al*., 2021).

To reiterate, the trajectory of holistic progress envisioned is not about "removing all fences." But we are at the point of an exciting new enabling environment based upon two key facts: (1) expanded beef market access can be attained in unfenced areas utilizing meat-processing value chain-based approaches, regardless of whether buffalo or other wildlife live in or near a particular locality or not, and (2) fencing can no longer be assumed to be an effective livestock disease risk mitigation option, especially given the multiple benefits of a return to a culture of managed herding.

Conclusion

Of course, with great opportunity comes great responsibility. A collective investment in earnest stewardship of natural resources must be made by all sectoral stakeholders dependent on southern Africa's precious land-base. There is now, for the first time in several generations, an opportunity to find ways to optimise land-use choices in the interest of system resilience and diversified livelihood opportunities. Neither the livestock nor wildlife sectors should seek to dominate the other. Both are critically important to and valued by local communities. Instead, it is time to make land-use decisions that will be socially, ecologically and economically sustainable for generations to come (Osofsky, 2019).

There is, of course, still much to do, including proactively developing specific criteria that better define "wildlife-friendly beef" for the marketplace, in partnership with the full range of stakeholders. Ongoing work with southern African partners needs to include further sensitisation of key local, national and regional entities (in both the livestock and wildlife sectors, *et al*.) as to the significance of CBT as a landmark change in international beef trade standards. Communities living in FMD-endemic zones such as northern Botswana must be consulted on their perceptions of fences (past, present and looking to future scenarios) so that their knowledge and concerns can help inform any deliberations regarding specific fence sections that might be able to be removed.

Science-based risk assessments have started to demonstrate that some fences or sections of fences are, today, doing more economic, ecological and/or social harm than good. *We owe it to future generations to take such findings seriously*, before it is too late for KAZA to truly become the resilient source of poverty alleviation and biodiversity conservation it was originally meant to be when the KAZA Treaty was signed by five heads of state more than ten years ago. We are closer to reconciling animal disease-related conflict at the livestock-wildlife interface than we have ever been before, as we continue a One Health journey without parallel in the region.

CONFLICT OF INTEREST

The authors have no conflict of interest.

ETHICS STATEMENT

All ethical issues related to the preparation of this manuscript have been fulfilled.

ACKNOWLEDGEMENTS

Special thanks to Sue Holt for her generosity, and for her commitment to southern Africa and its people and wildlife. We also dedicate this paper to the memory of our dear friend and colleague, Gavin R. Thomson, without whom much of this work would not have been possible.

AUTHOR CONTRIBUTIONS

All authors contributed to the development of this manuscript.

FUNDING STATEMENT

Funding for this work was provided by the Cornell AHEAD Program and the Cornell K. Lisa Yang Center for Wildlife Health (thanks to the generosity of Sue Holt and Lisa Yang) and by WWF. We also thank the many donors who have helped the AHEAD program since its inception in 2003.

DATA AVAILABILITY

Not applicable.

SUPPLEMENTARY MATERIAL

The supplementary material is available in the online version of this article.

Note

[1] The SADC Regional Economic Community is comprised of 16 member states: Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, United Republic Tanzania, Zambia and Zimbabwe.

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