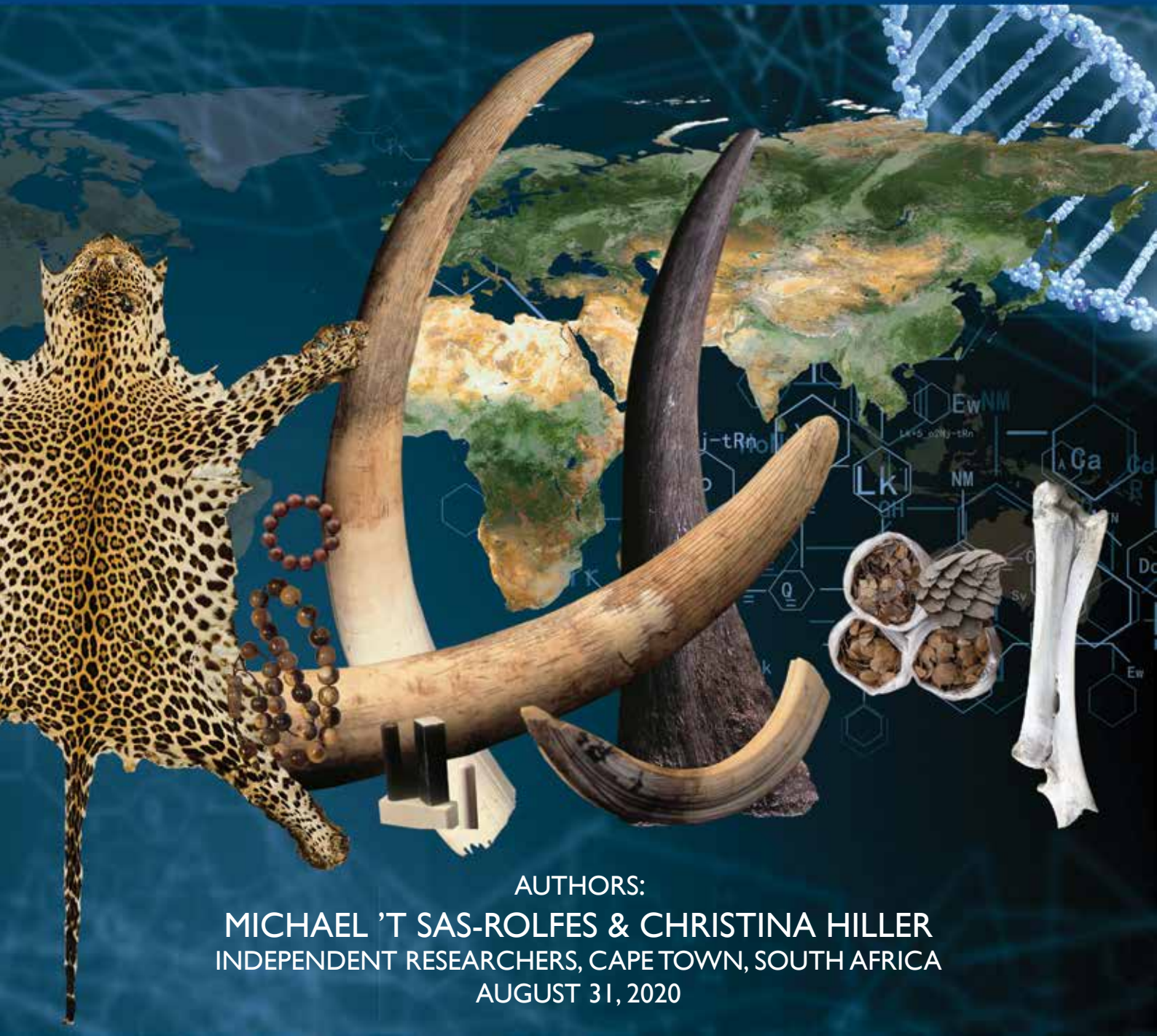




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LITERATURE REVIEW
ASSESSMENT OF THE IMPACT OF TRADE
RESTRICTIONS AND OTHER POLICIES ON WILDLIFE
CONSERVATION AND COMMUNITY WILDLIFE
STEWARDSHIP IN SOUTHERN AFRICA



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AUGUST 31, 2020



Genetic evidence helps to match confiscated rhinoceros horns to crime scenes, it has been used in scores of successful prosecutions.

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2 Acronyms

CAMPFIRE	Communal Areas Management Programme for Indigenous Resources
CBNRM	Community based natural resource management
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
GDP	Gross domestic product
IGO	Inter-governmental organisation
IUCN	International Union for the Conservation of Nature and Natural Resources
NGO	Non-governmental organization
PIKE	Proportion of illegally killed elephants
RhODIS DNA	Rhino DNA Indexing System
SADC	Southern African Development Community
UNEP	United Nations Development Programme

3 Executive summary

This report comprises a review of published literature that examines the effectiveness of trade restrictions and related measures in addressing wildlife crime and linked threats to species conservation in the Southern African (SADC) region, with a focus on elephants, rhinos, lions, and pangolins. Trade in these species is regulated by CITES and associated domestic laws and further supported by various direct and indirect measures along the trade chain. Given that these species of concern face additional pressure from other factors, including habitat loss and human-wildlife conflict, there is a need to evaluate the impact of trade restrictions and related measures in a broader social-ecological systems context.

We conducted a systematic review of literature detailing evidence-based impact evaluations of trade restrictive and associated measures undertaken in the SADC region. These studies include evaluations of CITES listings, domestic restrictions, and monitoring and enforcement measures; they also investigate the effects of various property and resource rights regimes and attempts to disrupt criminal networks. Following a rigorous process, these studies were all evaluated in terms of the contributions to conservation, local community development, national economies, and reduction of wildlife crime. We further considered other options for tackling wildlife crime, including the provision of legal supply substitutes and voluntary behavior change interventions to reduce consumer demand, as well as how trade pressures relate to the root causes of wildlife decline.

Our review revealed that research on these topics has been uneven, with a focus on the behavioral impacts of trade restrictions and enforcement, and the livelihood and behavioral impacts of community-based natural resource management initiatives, but less focus of the direct conservation impacts of these. In contrast, there was very limited, to no research on the socio-economic impacts of domestic trade restrictions and enforcement measures at community and especially national levels, nor was there any consideration of the impact of international restrictions on local livelihoods.

Evaluations of attempts to disrupt criminal networks were also lacking, and studies that reviewed attempts to reduce consumer demand indicated that this is a nascent area of effort and research, but that success to date has been questionable, especially for wildlife products other than elephant ivory. Studies on the provision of legal and sustainable substitutes were also quite limited and there are clear research gaps on this topic.

The review suggested a number of lessons that have been learned to date. CITES listings alone provide insufficient protection to traded species and may even have perverse effects. To succeed, they must be supported by appropriate domestic measures along trade chains. Domestic trade restrictions are undermined if and when they lack social legitimacy among local communities. In such cases they might provide short term relief to wildlife populations, but the socio-economic costs to local communities can eventually lead to resistant behaviors that undermine these gains.

Threatened species in protected areas are most effectively protected by early detection and apprehension of poachers. Although high penalties for illegal activity can assist deterrence, this is undermined if the probability of apprehension and punishment is insufficiently high. Outside of protected areas, devolution of property and resource rights to enable a sense of ownership and the flow of meaningful benefits from wildlife to local people act as powerful incentives to conserve. To be most effective, collective benefits should be supplemented by benefits delivered at household level. The interface between protected area authorities and neighboring communities requires careful management and benefits from the establishment of trusted communication forums.

Privately protected areas play an increasingly important role in regional conservation and there is scope to improve policy coordination with public and community conservation efforts. The relative conservation and socio-economic contributions of these sectors, as well as of different forms of wildlife use (e.g. hunting versus tourism) remain inadequately researched and poorly understood. There is an urgent need to improve understanding of the institutional aspects of the wildlife economy, to improve the effectiveness of regional conservation governance.

Five key recommendations flow from this research:

- **Enhance local enforcement capacity**, including pre-emptive monitoring, to ensure early detection and apprehension of incursions into protected areas.
- **Empower communities** through devolution of rights, decision-making authority, and wildlife conservation-linked benefit flows to household level.
- **Research the wildlife economy** to better understand the conservation and economic contributions of its different sectors and identify ways to improve their institutional synergy for effective regional conservation governance.
- **Secure sustainable funding sources** by identifying innovative new mechanisms, creating new market opportunities, and exploring establishment of sustainable wildlife product supply chains.

- **Engage with product consumers** by initiating consultative research to explore a full range of policy options, including long-term re-establishment of adequately controlled legal markets, to reduce illegal and unsustainable harvesting of wildlife products.



Poorly controlled and illegal timber harvesting for export results in catastrophic habitat loss.

4 Introduction

This report examines the effectiveness of wildlife trade restrictions and related measures in terms of their impact on wildlife conservation, wildlife crime, and community wildlife stewardship in the Southern African (SADC) region. Wild populations of iconic species such as elephants, rhinos, lions, and pangolins, are receding across many parts of Africa and are perceived to be threatened by poaching for trade purposes. However, there is a need to evaluate this threat and the current attempts to mitigate it in relation to other factors that may drive wildlife decline.

The perceived main threats to Southern African wildlife – and the adoption of trade-related measures to address these – have been shaped by historical events. Excessive hunting for meat, other products, and sport in both North America and Southern Africa, especially during the second half of the nineteenth century, led to growing awareness of overhunting as a threat to species survival and various consequent attempts to prevent this (Beinart and Coates, 2002). However, the perception of trade as a threat to species subsequently developed very differently in the two regions and eventually resulted in significantly divergent wildlife governance models.

The North American public associated the destruction of species such as bison and passenger pigeon with “market hunting” and trade, which resulted in the USA enacting anti-trafficking legislation in the form of the Lacey Act as early as the year 1900. In contrast, after a period of consolidation through area-based state protection, Southern Africa began to embrace market-based approaches to wildlife governance with the onset of game ranching in the 1960s. Southern African countries thus allowed and even encouraged devolved wildlife ownership and use rights (including the right to trade), which underpin the region’s contemporary “sustainable use” approach (Abensperg-Traun, 2009).

The early twentieth-century US policy concern with wildlife trade gradually extended internationally and provided the impetus for the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which came into effect in 1975. CITES aims to regulate trade across international boundaries by establishing protocols between signatory countries. It employs a listing mechanism whereby all international trade in species listed on CITES Appendix II is subject to a permitting requirement, to deter unsustainable levels of exploitation; species considered to be threatened with extinction are listed on Appendix I and commercial international trade in these species is essentially prohibited. Notwithstanding these listings, importing countries are also at liberty to apply stricter domestic measures (e.g. prohibition of imports of Appendix II species).

Whereas crocodylians and spotted cats featured as initial concerns for CITES (Wijnstekers, 2011), rhinos and elephants soon drew attention as species being over-exploited for purposes of trade (Martin, 1983; Somerville, 2016). More recently, pangolin species have similarly gained prominence (Heinrich et al., 2016) and there are growing concerns about possible trade impacts on lions (Williams et al., 2017). Figure 1 (on page 3) of this report provides information on trade-restrictive policy interventions and related indicative trends for these key species over the last fifty years. Numerous other Southern African animal and plant species are also known to be unsustainably exploited for purposes of domestic and international trade. This includes many species for domestic consumption as food (wild meat) and medicine (various herbs), as well as for international trade to supply overseas markets for food, medicine, ornaments, pets, timber, and various other purposes.

A clear upsurge in poaching and trafficking of several species from around the year 2007 (and the concomitant emergence of a new legal export trade of lion body parts from South Africa) eventually prompted various coordinated responses from governments and non-governmental organizations. These responses are ongoing and wildlife trade (both illegal and legal), especially in the charismatic mammal species, now features highly on global conservation policy and research agendas. Whereas CITES provides an overall framework for regulating or restricting trade, governments and NGOs have employed a range of additional measures throughout the trade chain, including anti-poaching measures, efforts to improve criminal detection and strengthen enforcement, and efforts to reduce consumer demand through behavior change interventions. They have also included indirect measures such as engagements with local rural communities that live with wildlife.

Whereas i) shrinking, degrading, and fragmenting habitat, ii) human intrusion, iii) loss of prey (for carnivores), and iv) associated human-wildlife conflict, all possibly aggravated by v) climate change, remain key underlying drivers of wildlife loss, there can be little doubt that wild populations of rhinos, elephants, pangolins, and various other species are at least in some instances also directly threatened by excessive targeted harvesting for the specific purposes of trade. However, when viewed through a social-ecological systems lens (Ostrom, 2009) and assessed in the context of polycentric governance (Ostrom 2010) questions remain over which policy interventions address the full suite of threats to Southern Africa’s wildlife most effectively, holistically, and synergistically. To date, measures to restrict trade in these species do not appear to have been universally successful and, given that they potentially undermine the “sustainable use” model of wildlife management favored by Southern African governments, there is a need to evaluate them carefully.

With this in mind, this report reflects the results of a comprehensive and systematic literature review aimed at providing a clear and structured synthesis of the existing evidence on the impact and the effectiveness of (global) wildlife trade restrictions in Southern Africa in terms of (i) combating wildlife crime, (ii) biodiversity conservation, and (iii) promoting community wildlife stewardship. The review builds on earlier work that evaluated the conservation effectiveness of trade-related policy interventions at the global level (Cheng et al., 2017; UNEP, 2019), but concentrates more specifically on the impact of trade restrictions and related measures in Southern Africa, with a further focus on these in relation to conserving elephants, rhinos, pangolins, and lions.

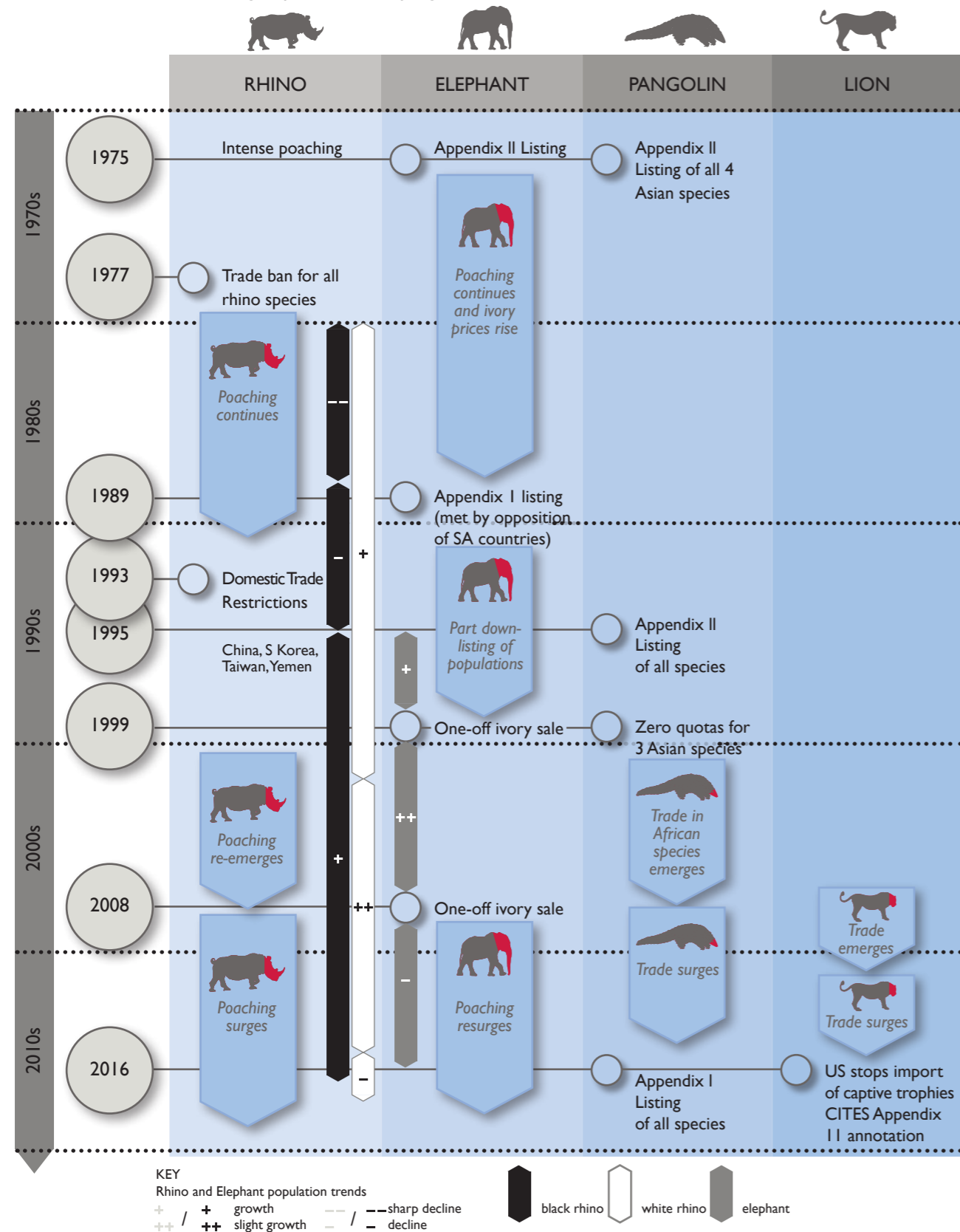


FIGURE 1: Overview summarizing trade-restrictive policy interventions and related indicative trends for key species in the SADC-region over the last fifty years.

5 Methodology

For this review, we first analyzed and synthesized the results of 83 studies that qualified as impact assessments of trade restriction and other relevant measures undertaken between 1970 and 2020. For our stepwise selection process, as well as in-depth data synthesis, we developed a framework (Figure 2) and a corresponding review protocol in line with systematic literature review methods (Galvin et al., 2018; Partelow et al., 2017; Soliku and Schraml, 2018).

Figure 2 (below) depicts the general framework we used to identify, categorize and synthesize existing evidence on the impact and the effectiveness of wildlife trade restrictions on ecological, social, and economic aspects in southern Africa countries. The framework consists of two main parts: the influencing factors (left-hand side of the diagram) and the outcome variables (right-hand side of the diagram). The part of the framework accounting for all relevant wildlife trade-related measures is structured according to a simplified trade chain (‘t SasRolfes et al., 2019).

We synthesized categories used in previous frameworks, to account for all relevant impact factors along the trade-chain dimensions shown on the left-hand side of the framework diagram (Cheng et al., 2017; UNEP, 2019).

From the emergent structure, we identified three distinct “relevance levels” (1: direct trade restrictions; 2: related control measures, and 3: further supporting measures, to reduce illegal wildlife trade). The restrictive legal measures of Relevance Level 1 constitute the core focus and address the research objectives of this literature review. Relevance Level 2 includes two further governance factors that, while not constituting direct trade-restrictive measures, interact with and affect these and the outcome variables in significant ways. Relevance Level 3 factors were excluded from the formal data analysis as they constitute tangential supporting measures that, while trade-related, are not necessarily trade-restrictive (i.e., provision of legal supply substitutes, product traceability measures, and voluntary behavior change initiatives).

We clustered the outcome variables on the right-hand side of the analysis framework diagram (Figure 2, below) to group insights regarding the impact and the effectiveness of wildlife trade restrictions in southern Africa in terms of (i) combating wildlife crime, (ii) conserving biodiversity, and (iii) promoting community wildlife stewardship. Human behavior or attitude are used to infer wildlife crime effects. Variations in biological outcomes at both population and species level account for conserving biodiversity effects (Cheng et al., 2017; UNEP, 2019). Outcomes in terms of rural livelihoods and well-being (DFID, 1999; Donohue and Biggs, 2015; Biedenweg et al., 2016; Cheng et al., 2017; Jones et al., 2017; Leisher et al., 2013; Mooney et al., 2005) together with contributions to national economies reflect effects on community wildlife stewardship.

We conducted a systematic review of wildlife trade literature across the following SADC countries: Angola, Botswana, Namibia, Malawi, Mozambique, South Africa, Tanzania, Zambia and Zimbabwe. In our approach, we followed the general principles and guidelines for systematic reviews, as outlined in Galvin et al. (2018).

Based on the research scope and the theoretical framework described above, we conducted an extensive search on Web of Science, Scopus and Google Scholar using Boolean search terms. These search terms were specified and tested to return publications meeting the scope of the project in terms of the geographic location, relevant wildlife species and terms associated with legal trade restrictions. Our search further targeted specialist websites and databases

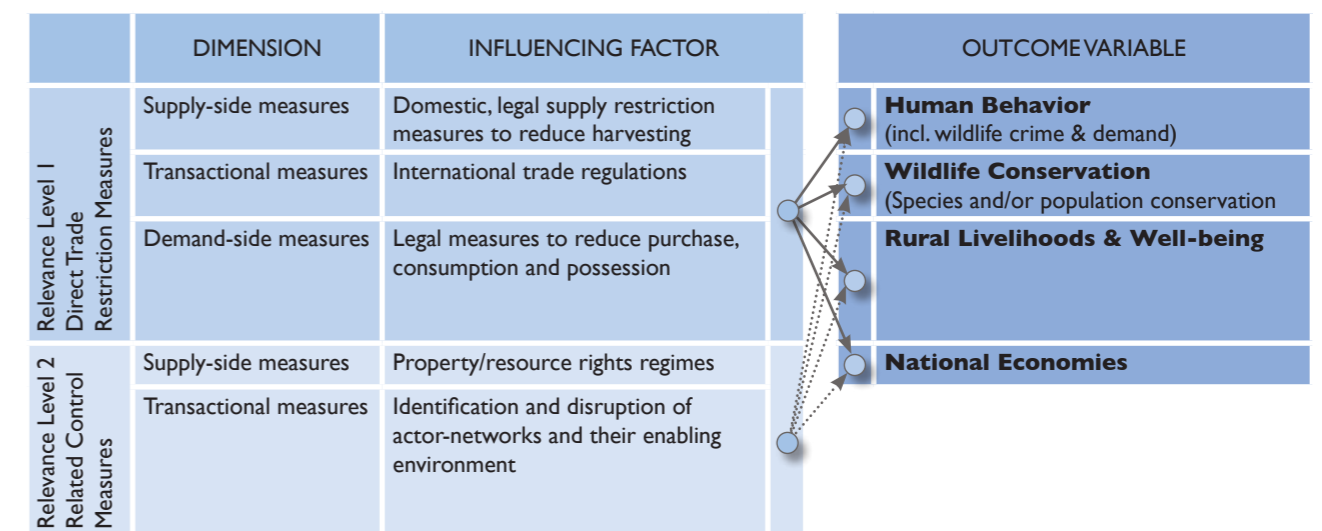


FIGURE 2: General framework for evaluating the existing evidence regarding the impact and effectiveness of trade restriction measures on ecological, social, and economic factors in southern African countries (Angola, Botswana, Namibia, Malawi, Mozambique, South Africa, Tanzania, Zambia and Zimbabwe).

to account for relevant non-peer-reviewed studies, i.e. grey literature, including reports of NGOs, government agencies, or other relevant institutions. During our screening process, where appropriate, we used a snowball approach to add articles referenced in the reviewed publications.

The literature search was restricted to English publications over a limited time frame, i.e., between 1970 and 2020. The decision to start the search from 1970 was taken to ensure coverage of all publications assessing the impact of international trade restrictions linked to the ratification of CITES in 1975 and the years leading up to its inception. Search results were combined into a single dataset. After implementing the search strategy, all papers (originally 5,668) were subjected to a multi-step screening process initially involving titles, then abstracts, and finally full publications. We focused on identifying papers which (a) investigate the effects of influencing factors on the outcome variables and (b) cater for confounding factors to qualify as evidence based (Baylis et al., 2016). In total, 45 studies were accepted for Relevance Level 1 and 38 for Relevance Level 2.

For data analysis and synthesis purposes, we developed a review and data extraction protocol. We identified major themes and synthesized the findings and insights in terms of particular levers or determinants wielding a specific effect on included outcome variables. Finally, the synthesis of results was extended through a verbal discussion relating and contrasting the findings and insights from the various studies that shared common themes. Relevance Level 3 factors were reviewed separately, drawing on previous assessments (t Sas-Rolfes et al., 2019; UNEP 2019) and our own specialist knowledge of the topic. The final integrated results are presented in the following section.



The Asian demand for ivory kills tens of thousands of African elephants every year. Over the past five decades, the African elephant population has fallen from 1.3 million to just 400,000 — International Fund for Animal Welfare (IFAW).

6 Results

The literature search and evidence-based assessment methodology described in the previous section yielded 83 wildlife trade-related impact studies relevant to the SADC region and focused on the highlighted species of concern. The majority (45) of studies fall into the core focus for this review (Relevance Level 1), i.e., they investigate legal measures to restrict wildlife trade along the entire trade chain. A further 38 papers researched the influence of property and resource rights regimes and the identification and disruption of criminal networks (i.e., Relevance Level 2). The geographical focus of this review yielded results with a strong inclination toward the supply-side of wildlife trade. Table 1 provides an overview of the frequency with which certain impact factors on particular outcomes have been studied for SADC range states (i.e., Angola, Botswana, Namibia, Malawi, Mozambique, South Africa, Tanzania, Zambia and Zimbabwe).

For the core focus (Relevance Level 1: direct restrictive measures) most studies investigated whether enforcement measures for laws and regulations have an impact on human behavior (especially illegal hunting) or human attitudes toward wildlife crimes, particularly among rural communities. Several articles studied the effects of law enforcement on biological outcomes at the species or population level. Interestingly, despite an abundance of articles on the topic of “green militarization” only a few studies on the effects on rural livelihoods and well-being emerged from our literature search.

Impact assessments of legal restriction to control supply (such as laws, and policies and guidelines for spatial or species-related constraints such as quotas) yielded several relevant papers with a focus on human behavior and a few studies examining both ecological and rural livelihood effects. Several evidence-based papers investigated the effect of international trade regulations, and these focused exclusively on CITES. Nevertheless, the studies that our literature research unveiled, examined a wide variety of outcomes, including human behavior or attitudes, wildlife-related outcomes, and national economies, but not human well-being.

TABLE 1: Frequency of studies for relevance levels 1 and 2 of the impact assessment framework addressing the SADC range states (i.e., Angola, Botswana, Namibia, Malawi, Mozambique, South Africa, Tanzania, Zambia and Zimbabwe).

KEY		Human Behavior	Biology	Rural livelihoods and well-being	National economics
	● Rare	● Few	● Several	● Numerous	
Relevance Level 1 Direct Trade Restriction Measures	Supply-side measures	Domestic laws, policies, regulations	●	●	
		Monitoring and enforcement	●	●	
	Transactional measures	International trade regulations (including monitoring)	●	●	●
	Demand side measures	Laws, policies, regulations and associated campaigns	●		
Relevance Level 2 Related Control Measures	Transactional measures	Identification and disruption of actor networks	●		
	Supply-side measures: property/resource rights regimes	Community-led wildlife management	●	●	●
		State owned land and resources (esp. protected areas)	●	●	●
	Private land and wildlife ownership		●	●	



Protecting pangolin, the most trafficked wildlife species. Gorongosa National Park established Mozambique's first pangolin rescue facility.

Very few studies evaluated the impact of legal measures to reduce the purchase, consumption and possession of wild animals or wildlife products on outcomes observable in SADC range states, e.g., illegal hunting behavior, wildlife abundance, rural livelihoods and well-being, or national economies. The studies identified for inclusion in this report focused on demand-related behavior and attitudes in the target consumer countries, mostly in South-East Asia.

For Relevance Level 2, most studies referred to community-led wildlife management regimes. The bulk of this research was directed toward understanding the effect these land and resource rights regimes have on rural livelihoods and well-being, followed by their impact on human behavior and attitudes. However, evidence-based impact evaluations of conservation-related outcomes were rare. This bias toward social outcomes, largely derived from qualitative data, is confirmed by a recent review paper on African community-based conservation (Galvin et al., 2018).

In terms of private land and resource ownership, several papers considered the significance for national or provincial economies, whereas only a few studies referred to species or population-related outcomes. Rural livelihood effects were rarely examined, and, unexpectedly, the impact of private land and resource ownership on poaching behavior did not feature at all. However, as the impact of law enforcement measures is widely investigated (see above), the results for both privately- and state-owned wildlife featured as part of these outcomes. For state-owned land and resource rights regimes, several studies focused on their impact on rural livelihoods and well-being. Conservation outcomes were still investigated in a few papers, while effects on illegal hunting behavior or national economies were either rarely studied or not at all.

As the final category of qualifying impact assessments, measures to identify and disrupt criminal networks and their enabling environments as part of the transactional stage of the trade chain only featured in rare instances in direct relation to the SADC region. Similar to laws and policies restricting the purchase or possession of wildlife products, the effectiveness of such activities might be assessed outside of their specific impact in SADC range states.

Beyond the systematic literature review of qualifying impact assessments for Relevance Levels 1 and 2, several inferences can be drawn from previous reviews and the broader literature regarding Relevance Level 3 factors. Broadly speaking, the literature suggests that supply expansion and supporting traceability measures, although considered controversial (and widely opposed) for iconic animal species, remain poorly researched and understood. It further suggests that voluntary behavioral change measures aimed at "demand reduction" are only starting to be adequately researched and that the success of such measures in relation to tangible conservation benefits for the iconic species in the SADC region to date is questionable. These findings are explained in further detail in the relevant sub-sections that follow.

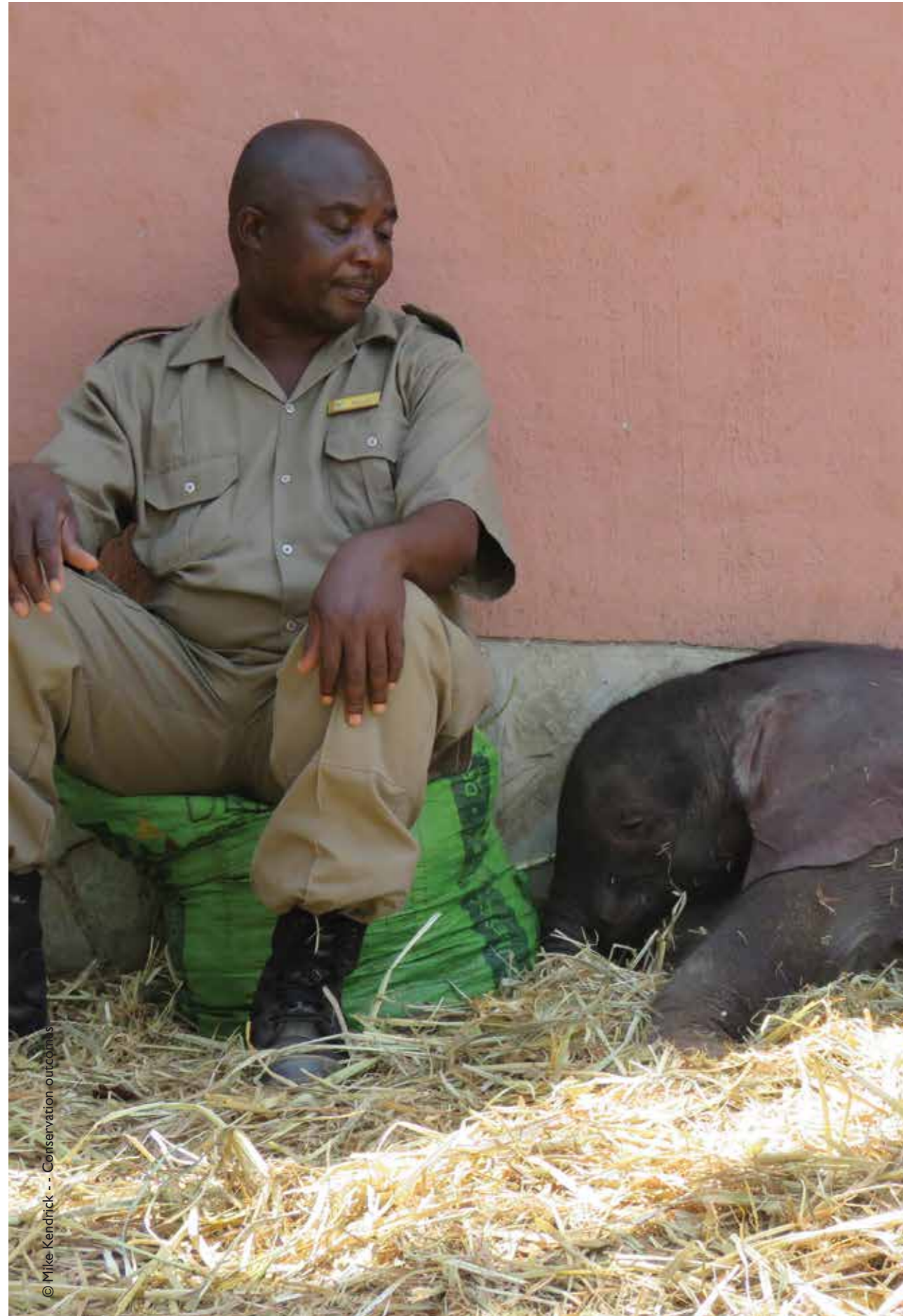
Section 6.1 discusses research that investigated either direct impacts on species and individual populations, or indirect impacts by way of reducing poaching and associated illegal trading activity, within Southern Africa. Section 6.2 discusses studies that examined impacts on rural livelihoods and well-being, as well as national economies. Section 6.3 considers impacts on consumer demand for wildlife products and Section 6.4 considers the role of trade in relation to the root causes of species decline.

6.1 Reduction of threats to species targeted by international illegal trade

6.1.1 International trade restrictions

International trade restrictions tend to be guided by CITES listings and include measures such as bans on cross-border trade for commercial purposes, permitting requirements, and the setting of quotas. Such measures appear to have ambiguous effects and are challenging to assess at the species level. The few existing impact assessments focus almost exclusively on the impact of CITES trade bans (i.e., Appendix I listings). The results of these studies vary considerably in their assessment of the human behavioral, ecological, and economic effects of trade regulations at the macro level. The assessment dilemma is grounded in the fact that an international trade ban itself does not constitute a valid predictor variable to evaluate effects on either the supply- or demand-side of international wildlife trade (Jachmann and Billiouw, 1997). Instead, a multitude of activities and interventions associated with the ban ought to serve as independent variables. This substantially compromises the ability to infer direct links relating to the impact of international-level regulations.

The effectiveness of the CITES Appendix I listing of rhinoceros species is widely debated. Initially apparently ineffective at preventing the continued loss of Africa's northern white and black rhino populations (t Sas-Rolfes, 2000), support from domestic trade restrictions in consumer countries in the early 1990s appeared to substantially reduce rhino poaching in the latter part of that decade. However, despite such restrictions, demand in East Asian consumer countries resurged, with an increasing number of rhino horns evading law enforcement to reach illegal markets from



Elephant calf, orphaned by poaching, in care.

around 2001 onwards (Cheteni, 2014). The number of illegally killed rhinos escalated exponentially from 2007 following further domestic legal restrictions in South Africa, and despite substantial supporting law enforcement efforts (Emslie et al., 2016; Haas and Ferreira, 2015).

A commonly reported phenomenon that international trade bans simply tend to drive markets underground instead of exerting a discernible positive influence on species populations (Conrad, 2012) was also confirmed for pangolins. A study by Challender et al. (2015) shows a spike of pangolin trade in Asia just before CITES imposed a zero-quota policy in 2000 and the clear transfer of the pre-ban trade volume to illicit markets after the ban came into effect. This study is relevant insofar as concerns are growing that African pangolin species might suffer the same destiny as the Asian species (Heinrich et al., 2016). Wildlife trade thus far has principally decimated Asian pangolin populations by 94% in China and surrounding countries, with seemingly no impact of the trade restriction on poaching (Pietersen et al., 2014).

Lions have a much shorter history associated with international trade restrictions. Nevertheless, a trade spike comparable to that of pangolins described above occurred in 2016 when the legal export of lion skeletons from South Africa surged in anticipation of a restrictive (potentially zero) export quota for lion products (Williams et al., 2017a), imposed at CITES CoP 17. This peak coincided with and was further fuelled by the decision of the USA to suspend the import of trophies obtained from hunting captive-bred lions (Williams and 't Sas-Rolfes, 2019). Considering a potentially persisting zero quota, concerns were raised that trade in lion products could be pushed into underground markets, similar to rhinos and pangolins (Williams et al., 2017b).

Despite being the focus of considerable attention, African elephants represent a challenging case for assessment. The 1989 CITES Appendix I listing and associated international ban on trade in ivory products achieved at least short-term gains in the form of reduced poaching pressure on many elephant populations (Stiles, 2004; Zhou et al., 2018). However, poaching persisted despite the ban, increasingly significantly from 1998, and most markedly in countries with widespread corruption, civil unrest and/or poor wildlife management, leading to further declines in elephant numbers, particularly in West and Central Africa (Stiles, 2004; Underwood et al., 2013). Somewhat confusingly, early economic models based on data from Zambia had determined that for many countries estimates of elephant populations were consistently higher than economically optimal (Bulte and Van Kooten, 1999), suggesting that such countries might need to reduce those levels, actively (through culling) or passively (through underinvestment in protection).

Lemieux and Clarke (2009) also assert the success of the CITES ivory trade ban in reversing the decline in overall African elephant numbers between 1989 and 2007, but note that these positive population trends did not apply to countries with unregulated post-ban ivory markets; in such countries, elephant numbers declined further, aggravated in several cases by civil wars or corruption. Furthermore, they acknowledge that the overall success of the trade-ban for elephant products did not persist. Discussing the reasons for this, Zhou et al. (2018) suggest that the restricted supply, compounded by Chinese measures to intercept ivory trafficking in 2011 and 2012, caused prices for illegal ivory to rise quickly, thereby accelerating elephant poaching rates. Based on a theoretical model and numerical example, Heltberg (2001) added that a trade ban is likely to positively impact elephant populations if it achieves the following four effects: (i) a widespread moral effect reducing demand; (ii) improved interception of smuggled products; (iii) insignificant increases of stockpiles from official sources; and (iv) no reduction in law enforcement efforts. From another theoretical model's perspective, a successful trade ban would need to deal effectively with the so-called free-rider problem (Khanna and Harford, 1996). The authors classify consumer nations placing a high existence value on elephants without actually investing in their survival as free-riders. They argue that an international transfer payment mechanism for enforcement efforts would be expedient to conserve the species.

6.1.2 Domestic legal restrictions

Several papers investigated measurable effects of legal restrictions on wildlife harvesting in the SADC-region, reporting varied results. In the case of elephants, levels of legal protection appear to correlate with a positive effect on the species. The illegal killing of elephants varies according to the level of regional legal protection in addition to other factors such as human access, the corruption perceptions index, and ecosystem type (CITES Secretariat, 2007). Nowell (2012) suggests that South Africa and Zimbabwe have bolstered such positive effects for elephants by improving their CITES compliance through introducing stricter legislation, trade controls, and penalties. However, positive effects for rhinos have been noticeably weaker, with Hübschle (2017) citing lower social legitimacy ("contested illegality") as an undermining factor.

Among the most commonly used domestic instruments are hunting moratoria, with a demonstrable positive impact on strained animal populations. The controversial 3-year hunting moratorium in Zambia between 2013 and 2015 resulted in a general increase of the diminished lion population in Luangwa National Park. It improved the

survival rate for adult males markedly (Mweetwa et al., 2018; Rosenblatt et al., 2014). Despite the significant positive effect on the lion population, the authors caution against hunting suspensions as a panacea, due to the expected adverse impact of such restrictions on rural communities. Loss in livelihood and human well-being, they argue, might lead to uncontrolled meat poaching and human encroachment, posing even bigger risks for wild animal populations. Instead, the authors advocate the need for ongoing ecosystem monitoring to determine effective age-based harvesting quotas grounded in the principles of adaptive management. Along those lines, reversing the stance of regulations from “prohibition” to “permission” suggests that rules can help to modulate human behavior in favour of wildlife conservation. Begg et al. (2018) presented results whereby an age-based “bonus-malus” system for lion trophy hunts encouraged hunters in Mozambique to opt for older trophies. Such a system alternately rewards (bonus) or penalizes (malus) the hunter (in this case) according to their behavior. This conduct, in turn, reduced the risk of unsustainable harvests of young, reproducing male lions leading to fewer trophies per annum overall.

In contrast, unaligned individual elephant hunting-quotas in Greater Mapungubwe Transfrontier Conservation Area between Botswana, South Africa, and Zimbabwe have proven unsustainable (Selier et al., 2013). The study predicted that the loss of trophy bulls over time is likely to have detrimental effects on social structures if each country determines its own quota based on limited data. Other research results indicate negative effects of hunting bans on wildlife populations. For example, Schlossberg et al. (2019) assert that monitoring efforts in Botswana between 2014 and 2018 have confirmed that elephant poaching has intensified significantly since the hunting ban. To identify and combat the poaching outbreak, the authors recommend swift, militarised anti-poaching interventions. Further research found that restrictive regulations can potentially antagonize other measures dedicated to conserve wildlife and thus reverse achieved progress (Gaodirelwe et al., 2020a, 2020b). Villagers of community-based natural resource management (CBNRM) communities regressed to progressively antagonistic attitudes towards wildlife. They believed poaching to be on the rise as a result of the ban. However, members of non-CBNRM communities perceived a decline in poaching levels.

6.1.3 Domestic monitoring and enforcement

Most evidence-based research relating to SADC range states assesses the impact of monitoring and enforcement measures to reduce illegal harvesting and protect vulnerable species – and also reports mixed results. Law enforcement, in most cases, implies patrol efforts in the field to detect, deter or prevent illegal hunting. In some cases, researchers chose a broader understanding of the term and included sentencing strategies or intelligence measures. Overall, researchers assert the effectiveness of enforcement measures, as summarized in this section, with a few notable exceptions.

Impact studies noting positive effects of law enforcement measures to combat wildlife crime and/or to achieve species conservation ascribe this success to well-funded law enforcement interventions (Gandiwa et al., 2013; Jachmann and Billiouw, 1997). According to these studies, markedly increased law enforcement efforts and investigation operations helped both stabilize elephant numbers in Luangwa Valley in Zambia and minimize poaching levels in and around Gonarezhou National Park in Zimbabwe. The latter outcomes could be achieved even during times of economic collapse in Zimbabwe, when, as expected, illegal hunting and fishing soared in many parts of the country due to economic hardship (Lindsey et al., 2011). Similarly, Packer et al. (2013) found that lion populations are highest in reserves with the largest management budgets.

Another study establishes government effectiveness as well as human development at country-level as determining factors impacting the Proportion of Illegally Killed Elephants (PIKE) Burn et al. (2011). Similarly, Milledge (2007) highlights rapid response measures in protected areas as a useful means to recover rhino horns. However, it should be noted that, as in Milledge (2007), the effectiveness of anti-poaching patrol units is sometimes measured in terms of discovering illegal activities ex-post when the lives of targeted animals have already been lost. Furthermore, the number of even those reactive discoveries made by patrol teams tends to diminish for long patrol periods beyond ten days in the field (Siamudaala et al., 2009).

Other studies show that in situations where capable guardianship is lacking, poaching remains a constant and severe problem. This direct relationship between law enforcement and poaching has been investigated for a variety of species, mainly rhinos and elephants (Leader-Williams et al., 1990), but also for species such as abalone (Warchol and Harrington, 2016). Early studies in Zambia’s Luangwa Valley between 1979 and 1985 confirmed the significant impact of patrol effort (Leader-Williams et al., 1990; Leader-Williams and Milner-Gulland, 1993). Effects were found both on the distribution of illegal actions, particularly a reduction in the number of fresh carcasses, and the rates of change in abundance of elephants and rhinos alike. Simultaneously, this analysis highlighted that local anti-poaching units were markedly understaffed to deal with poaching levels effectively and, in combination with very mild prison sentences for convicted poachers, this resulted in drastic declines of both rhino and elephant numbers during the study period (Leader-Williams, 1996). These studies suggest that poachers are significantly more at risk of injury by aggressive

wildlife while on an illegal hunt than by encountering anti-poaching rangers. Their overall likelihood of being injured at all is negligibly low (Knapp, 2012). Furthermore, the financial risk of having to pay fines was insignificant relative to the high monetary rewards from poaching, especially in comparison with other livelihood activities. Nevertheless, the study found an effect of law enforcement on the perceptions of poachers insofar that their fear of anti-poaching units positively correlated with the number of hours a poacher had to remain concealed to avoid detection.

The ability of rangers to conduct anti-poaching effectively does not depend solely on the number of performed enforcement hours during a 24-hour day (Warchol and Harrington, 2016). Ranger qualifications and the commitment to a career as a field ranger are additional determining factors. A focus on leadership and intelligence in combination with sufficient funding are deemed to be the most influential factors to bring about low poaching levels (Ball et al., 2019). Adopting a leadership style that generates a highly committed, loyal and long-term staff workforce limits the access of poachers to inside knowledge of security systems. A simultaneous focus on intelligence flips anti-poaching activities from a reactive to a proactive mode whereby the poacher can never be sure what information the security force already has. In addition to intelligence information, several conservation experts point out that regular monitoring of animal populations can help to identify poaching hot spots and worrying trends – and is thus a crucial element for law enforcement success (Bauer et al., 2015; Ferreira et al., 2018; Wasser and Gobush, 2019). For example, Bauer et al. (2015) demonstrated that the most severely depleted lion populations across Africa were the least monitored.

Finding a balance between law enforcement and illegal hunting levels to at least stabilize endangered animal populations is challenging. Some studies demonstrate that even extensive law enforcement efforts do not necessarily result in an apparent reduction of illegal activity (Martin, 1993). Others, in turn, conclude that continued investment in law enforcement could reduce poaching, but is unlikely to succeed without action to simultaneously reduce demand and tackle corruption and poverty (Hauenstein et al., 2019). A study by Barichiev et al. (2017) presents a seemingly paradoxical result. They found the level of patrol effort to be higher around known “poaching hotspots” prior to poaching incidents. Only nights constituted an exception when poaching sites correlated with significantly lower patrol presence. The authors’ hypothesized explanation for their counter-intuitive results is, however, in line again with a common view that sufficient law enforcement resources were lacking. Patrol density was intermittent and the field rangers were increasingly at the right place but simply at the wrong time, potentially even suggesting ranger complicity. The authors, therefore, conclude that regular, even high presence in a poaching area does not deter organized rhino poaching gangs.

Despite these studies with ambiguous results, various modelling approaches support the link between capable law enforcement resources and poaching levels or species abundance. For example, Di Minin et al. (2015) used generalized linear models to predict rhino poaching in South Africa under different policy scenarios. According to their model, poaching levels were most sensitive to the GDP per capita in Far East Asia, the fine upon conviction and anti-poaching efforts. Consequently, the authors point out the importance of suitable law enforcement measures to curb rhino poaching under scenarios of increasing wealth in the Far East.

Previously, Milner-Gulland and Leader-Williams (1992) built an economic model correlating incentives for illegal exploitation with poaching levels and elephant and rhino abundance. Their simulations suggest that organized crime gangs and local meat hunters have very different reactions to law enforcement. Their simulations indicate that although the actions of local hunters can be much better influenced through local investment schemes than law enforcement, organized crime gangs can only be deterred with strong law enforcement measures. Two main components constitute strong enforcement: (a) increasing the risk of detection, a finding also supported by Lopes (2015) and (b) serious harm. Lopes’ (2015) bio-economic model also indicated that the price of ivory on the black market did not drive the number of planned poaching tours of organized crime gangs. In the case of rhinos and elephants, Milner-Gulland and Leader-Williams (1992) suggest that the potential costs of poaching would need to be raised exponentially as an effective response to the vast gains, including a shoot-to-kill policy, a result confirmed by a later economic model developed by (Messer, 2010). Furthermore, based on these model simulations, sentencing strategies ought to vary with output (i.e., number of trophies captured, or animals killed) instead of applying a fixed penalty for illegal hunting. However, it would be more impactful if dealers instead of poachers were sentenced, shifting the focus to intelligence rather than field patrolling.

Beyond simulated outcomes of economic models, the possible effects of severe penalties as a poaching deterrent have been illustrated for the case of Temminck’s ground pangolin in Zimbabwe (Shepherd et al., 2017). The stark response from Zimbabwean authorities to confiscation of pangolins appears to limit the number of individuals being taken from the wild to satisfy the demand of the black market. Globally, however, large-scale prosecutions for wildlife crime tend to be rare (Nowell, 2012).

Whereas most impact studies aim to better comprehend a direct, causal effect between law enforcement activities and conservation-related outcomes, Tanghe (2017) approached rhino poaching as a complex, social problem going beyond a primarily rational/economic approach to human behavior to reduce poaching. Through in-depth, qualitative, social research, the author examined how different societies construct their relationship with the rhinoceros. This relationship, in turn, may result in different “moral protection levels” of the species, thereby influencing the effectiveness of anti-poaching measures. These findings align with those of Hübschle (2017), which highlight the significance of social legitimacy factors in supporting or undermining domestic law enforcement efforts.

Finally, there is a growing number of articles referring to the use of technology to support anti-poaching efforts (Bondi et al., 2018; Hart et al., 2015; Linchant et al., 2015; Mondol et al., 2014; Mulero-Pázmány et al., 2014; Pimm et al., 2015; Sibanda et al., 2016). However, the literature search yielded no evidence-based studies investigating the impact of these technological developments on the effectiveness of law-enforcement measures to combat wildlife crimes. While DNA-matching technology has been used to demonstrate how poaching affects social structures of elephant populations (Mondol et al., 2014), most other studies are confined to field tests of different tech-solutions under experimental conditions (Pimm et al., 2015). Such studies suggest potential advances in terms of detection rates of illegal hunters using thermal imaging (Hart et al., 2015), Remotely Piloted Aircraft Systems fitted with cameras or AI-based applications (Bondi et al., 2018; Linchant et al., 2015; Mulero-Pázmány et al., 2014), and GIS and remote sensing to monitor poaching activities (Sibanda et al., 2016).

6.1.4 Property and resource rights regimes

Trade restrictions and supporting monitoring and enforcement measures operate within institutional contexts, which can determine both their relevance and effectiveness. The significant role of institutions such as property and resource use rights in shaping human behavior is increasingly recognized (North 1990; Ostrom 1990) and is the subject of a growing body of research in the environmental domain. Within Southern Africa, most such research has focused on community-based natural resource management (CBNRM) regimes; in turn, most of the research on CBNRM has focused on its behavioral, social and economic effects, with ecological outcomes only peripherally featured. Smaller samples of research focus on state and private regimes.

6.1.4.1 Communal regimes

Murphree (2009, p. 2553), defines CBNRM as “communal management of natural resource commonages where the grasp of direct state management does not reach”. Despite varied institutional structures, these initiatives are built to provide benefits on three levels to communities to change their behavior from taking to conserving wildlife (Gibson and Marks, 1995):

- Direct benefits at household-level (e.g., alternative livelihood income, meat, returns from wildlife ownership rents)
- Indirect benefits at community-level (e.g., schools, clinics, maize mills, etc.)
- Empowerment through self-determination/decision rights

Overall, and in line with various case study reports and other literature reviews (Galvin et al., 2018; Gibbes and Keys, 2010; Murphree, 2009; Roe, 2015), the CBNRM-assessments in this review found that:

- Community-based conservation approaches are not a panacea and often yielded mixed socio-economic results, while ecological outcomes were mostly described as positive.
- Success was more likely to occur when the project was designed and implemented according to the specific context.

Echoing Galvin’s et al. (2018) review on community-based conservation, papers rarely report results on conservation-related outcomes of CBNRM-regimes, and dedicated impact assessments are missing altogether. However, more literature is available on how communities benefit from wildlife diversity (Naidoo et al., 2016, 2011). In cases where ecological outcomes were included, this was done in a narrative or descriptive fashion and combined with other results such as rural livelihoods and well-being, or human behavior change. In most instances, CBNRM was associated with positive ecological outcomes (Galvin et al., 2018). For example, several articles described how wildlife populations recovered in different areas in Namibia after the implementation of CBNRM, referring in particular to springbok, oryx, Hartmann’s mountain zebra, elephants and black rhino (Boudreaux and Nelson, 2011; Schnegg and Kiaka, 2018; Weaver et al., 2010; Weaver and Skyer, 2003). Weaver et al. (2010) and Weaver and Skyer (2003) attributed growing numbers of springbok, oryx and Hartmann’s mountain zebra in the Nyae Nyae Conservancy, and the successful recovery of elephants, black rhino and lions in different parts of the country, to an increasingly positive attitude towards conservation as a result of the conservancy model. Furthermore, Schnegg and Kiaka (2018) summarized how diversity and numbers of wildlife have increased, attributed to the influence of CBNRM in Namibia. In the case of Zimbabwe, Taylor (2009) noted that in CAMPFIRE areas, elephant numbers had increased, and buffalo numbers were stable or only slightly decreasing. Considering the extensive amount of literature on CBNRM, the gap in dedicated research towards its impact on biodiversity conservation is surprising.

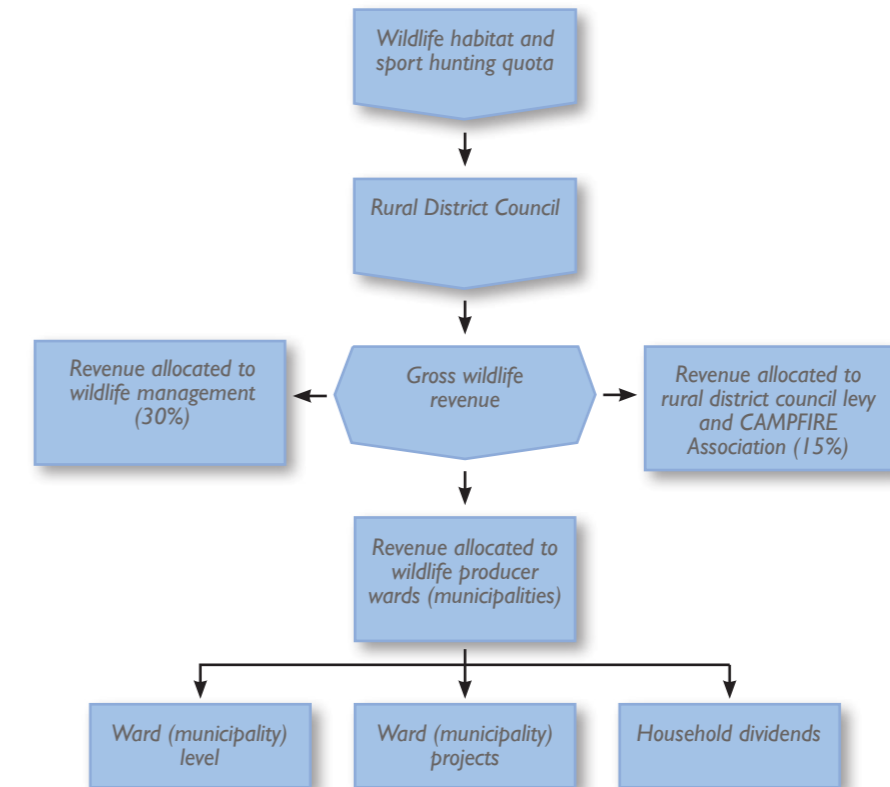


FIGURE 3: The CAMPFIRE model for income generation and allocation. Source: Russel Taylor, Biodiversity and Conservation 18, 2563-2583 (2009).

Whereas few cases discussed the recovery and growth of wildlife populations directly attributable to the implementation of CBNRM initiatives, several researchers observed changes in wildlife-related human behavior or attitudes associated with such governance regimes, reporting mixed results. Most assessments, across various SADC countries, found that rural villagers typically continued hunting in CBNRM areas. An early study in Zambia showed initial promise as poaching numbers dropped and villagers appeared to develop a positive attitude towards village scouts (Lewis et al., 1990); however, this finding was later refuted, and CBNRM programs deemed less successful than hoped at changing hunting behavior (Gibson and Marks, 1995; Lewis and Phiri, 1998). It turned out that while poaching of large mammals had sometimes diminished, hunters had not reduced their overall wildlife off-take; this was often met by intensified enforcement measures, further alienating community members.

Overall, researchers attributed the lack of lasting individual behavior change and ensuing high levels of snaring to a failure to adequately address factors identified as essential for increased levels of perceived well-being at household level. Community-level benefits from CBNRM initiatives proved ineffective, as they do not constitute an incentive for individuals to stop hunting. A person can still utilize these common goods while continuing their hunting activities (Gibson and Marks, 1995; Kaaya and Chapman, 2017). Studies in other SADC range states widely confirm the Zambian findings. For example, Nielsen and Meilby (2013) found that inactive hunters in Tanzania had stopped poaching based on the fear of being arrested rather than because they were receiving livelihood benefits; inactive hunters also tended to be wealthier (from other sources) with more to lose than active ones. Illegal hunting persisted in other cases when benefits at household-level did not materialize, whereas individuals who received direct benefits from a micro-credit scheme were less likely to consume poached meat (Kaaya and Chapman, 2017). In another case in which households received direct benefits from the CBNRM in Botswana’s Okavango Delta, subsistence poaching declined initially but was reportedly revived following the hunting moratorium of 2014 (Gaodirelwe et al., 2020b).

Mutandwa and Gadzirayi’s (2007) research on CAMPFIRE in Zimbabwe similarly demonstrated that the program contributed to an improved attitude towards wildlife conservation, despite meagre improvements to village households. However, actual hunting practices persisted since certain well-being needs were not being met, suggesting that the influence of attitudes on behavior are not straightforward (Ajzen, 2011). Similar patterns were described for San people in Botswana (Taylor, 2007). Continued hunting was attributed to hunting practices being an essential marker of Basarwa identity and the need for game meat as part of the San diet. Such defiance of hunting restrictions also emerged in Namibia, even though Weaver and Skyer (2003) postulated a fundamental positive shift towards wildlife and reduction in poaching associated with the national conservancy legislation. A recent study of three Namibian conservancies showed that local hunting continued to occur on a regular basis, whereas “poaching” was reported to decline in the event books of the conservancy governance (Lubilo and Hebinck, 2019). The authors emphasize that this ongoing and simultaneously covert behavior cannot be attributed solely to dietary or income needs but is hinged on

pride and identity as part of culture-nature interactions. Nonetheless, research has also confirmed that adequately meeting community needs positively influences the attitudes and behavior of rural villagers. Also based on research in Namibia, Scanlon and Kull (2009) presented a corresponding analytical framework to examine the relationship between wildlife benefits and attitudes or behaviors. This framework illustrated the emergence of positive attitudes and behavior when three conditions were met: (i) benefits appropriate to people's needs at household-level, with a particular emphasis on meat provision, (ii) local control, and (iii) a context conducive to fostering a sense of identity, pride and hope. Similarly, Wilfred (2017) elicited villagers' responses to achieving higher levels of community participation in conservation. Their study confirmed the importance of addressing livelihood needs at household-level, as well as instilling a sense of program ownership within the community.

6.1.4.2 Public protected areas

National Parks and other state-owned protected areas are the principal institutional structure for governments to conserve biodiversity and natural resources on designated land areas. This review found few studies assessing the outcomes of protected areas for species conservation, consistent with a general dearth of such studies globally (Geldmann et al., 2013). However, wildlife numbers can drop significantly in protected areas, as reported by Lindsey et al. (2013) for Zambia between 1997 and 2012, and more broadly for Africa between 1970 and 2005 by Craigie et al. (2010).

The few assessments included reported mixed results. A study focused on leopards demonstrated that the survival rate is higher in the core area of a protected area than the periphery, where prey depletion due to illegal hunting is more likely (Rosenblatt et al., 2016). Another study found similar results for lions (Loveridge et al., 2017), noting that probability of death from anthropogenic causes was highest at the periphery of Hwange National Park in Zimbabwe. Human-related mortalities accounted for 88% and 67% in male and female lions, respectively. The authors note a potential trade-off between the severity of different anthropogenic mortality causes. They emphasize that it might be easier to reduce risks of unsustainable trophy hunting through careful management of off-takes than to cope with threats related to snaring as a result of growing human populations at the edges of protected areas, making trophy-hunting the lesser of two evils.

Whereas public protected areas are known to have well-established structures and processes to manage biodiversity conservation, several studies reported a lack of direct community benefits flowing from such areas; instead, they noted increased livelihood costs for adjacent rural communities. For example, a significant proportion of community members living next to South Africa's Hluhluwe–iMfolozi Park described experiences negatively impacting their livelihoods (Nsukwini and Bob, 2019). Their main grievances included: (i) a lack of employment opportunities; 90% responded that they do not work in the park, (ii) restricted access to land and resources, (iii) damages and harassment caused by wildlife and, to a lesser degree (iv) harassment by conservation enforcement personnel. As a result, and similar to cases of CBNRM, local communities developed negative attitudes towards the park and conservation in general.

Similarly, rural villagers expressed disappointment with Kgalagadi Transfrontier Park in Botswana, stating that they received very few benefits and were unable to secure immediate help in cases of wildlife-inflicted damages or attacks (Moswete et al., 2012). Only a few, selected individuals – often the community's elites – worked for tourism and trophy hunting ventures owned and managed by outsiders, even though the park was created with a goal to benefit adjacent communities. Missing benefits, inadequate management of human-wildlife conflict, and ineffective dealing with repeat offenders can drive reluctance to report suspected poaching of high-value species such as rhinos, while illegal hunting for household consumption and trade continues unabated (Vundla, 2019).

Several studies also reported that community members' experiences with the management of public protected areas constitute a driving factor for their perceived well-being and attitude towards these areas and biodiversity conservation in general (Moswete et al., 2012; Vundla, 2019). In cases with no community involvement in management activities (despite a stated goal to share ownership and management), community members not only expressed disappointment in the management of the park but associated this situation with the lack of direct benefits to them (Moswete et al., 2012). In many cases, it was found that communities are generally positive towards the specific protected area (Lekgau and Tichaawa, 2019; Vundla, 2019). Therefore, in instances where communities experience the park to be well-managed, villagers not only perceived wildlife crimes to diminish but were generally less accepting of such activities. Conversely, negative perceptions of park rules made environmental crime more morally acceptable (Ntuli et al., 2019).

In other examples, policies were reportedly enforced without having been communicated, resulting in conflict with park officers, while missing strategies to proactively manage human-wildlife conflict led to frustration and under-reporting of suspected illegal activities (Moswete et al., 2012; Vundla, 2019). In contrast, a focus on communication through forums, liaison officers, and other dedicated structures to include communities in management and governance matters positively influenced perceived community well-being in the Kgalagadi Transfrontier Park, whereas some centralized institutional arrangements at national level represented barriers to community involvement (Lekgau and Tichaawa, 2019).



Communication and benefits sharing with affected communities are critical to anti-poaching strategies.

6.1.4.3 Private land and wildlife ownership

The approach of various Southern African countries to grant private ownership of wildlife in addition to land is unique. As a consequence, wild animals may no longer be classified as open access or common property, and fencing has become the primary mechanism to implement this resource rights regime (Snijders, 2012). The significant growth of wildlife numbers, especially wild ungulate species in Southern African countries, has been widely associated with this special wildlife ownership approach (Lindsey et al., 2013). For example, van Hoven (2015) claims wildlife numbers in South Africa to be the highest today in over 200 years. The author describes the growing number of private game reserves in South Africa, from 10 in the 1960s, to over 11,000 during the first two decades of the new millennium, covering 18% of the country's land surface. According to another recent study of wildlife ranches in South Africa, the coverage is slightly less, at 14%, i.e., roughly 170,000 km² with almost six million herbivores living on these ranches (Taylor et al., 2015). The same study reports that 6% of wildlife ranches constitute intensive breeding camps.

Similar trends relating to ownership effects were recorded in Namibia and Zambia. An early study by (Barnes and De Jager, 1996) indicated a positive influence of private conservancies in Namibia on wildlife stocks, with an 80% growth of game numbers and 44% increase in the number of game species over a 20-year period, and this is supported by a subsequent survey that describes an increase in most wildlife populations on wildlife-dedicated farmlands in Namibia (Lindsey et al., 2013). Similarly, ungulate numbers in Zambia have significantly increased on wildlife ranches while the same species experienced sharp declines in state protected areas (Lindsey et al., 2013). Lions constitute another example of the effectiveness of private, fenced reserves. Bauer et al. (2015) published increasing lion numbers for Southern Africa, associated with significant growth rates of small, fenced populations under private ownership. By comparison, the lion population trends looked bleak for the rest of Africa, especially in the West and Central regions without comparable private ownership regimes.

According to Cousins et al. (2008), relevant stakeholders claimed the biggest conservation value of game ranching to be the conservation of areas of natural habitat. However, it should be noted that the positive outcomes summarized earlier all focus on population trends of financially valuable species, whereas the quality of the habitat in terms of ecosystem functioning did not feature in the research. Some experts raise concerns that the commercial nature of private wildlife ownership could hamper its ability to effectively contribute to long-term conservation outcomes (Clements et al., 2019; Cousins et al., 2008; Rubino and Pienaar, 2017; Van Der Waal and Dekker, 2000). Cousins et al. (2008) identified predator prosecution, a bias toward specific biomes such as savannah, and bias towards species with high economic value (e.g. the "Big Five") as potentially distorted ecological outcomes of this resource rights regime. Van Der Waal and Dekker (2000) also reported a lack of scientific, adequate ecological planning and management. Rubino and Pienaar (2017) postulate that decision-making of private landowners is driven by financial considerations, which in turn influences conservation outcomes for species such as rhinos, which will be conserved where benefits outweigh the costs. This conclusion raises concern for cases in which the costs of anti-poaching exceed any revenues generated by rhinos.

6.1.5 Other measures

The conservation effectiveness of other measures is both challenging to evaluate and under-researched, even though such measures are frequently advocated. There has been some limited (mostly theoretical) research on the disruption of criminal networks and provision of legal substitutes, but virtually none on product traceability and any tangible species conservation benefits of attempts to reduce consumer demand through regulation and voluntary behavior change interventions. Demand reduction can only be assessed by proxy, as discussed below in Section 6.3.

6.1.5.1 Identification and disruption of criminal networks

Even though the importance of intelligence-led enforcement to pro-actively interrupt and inhibit illegal hunting activities is regularly emphasized (Hübschle, 2016), the literature search yielded comparatively few papers assessing the identification and disruption of criminal networks. Another article confirms this outcome stating that there is limited statistical information on measures to detect, arrest, and prosecute people implicated for organized wildlife crime (Nanima, 2019). The few relevant studies exclusively report on human behavioral outcomes, particularly rates of detection, arrest, and conviction.

One paper described the development of a theoretical concept using social network analysis to disrupt trans-national criminal networks (Haas and Ferreira, 2015). The model's outcomes were illustrated using rhino-related data from the Kruger National Park in South Africa. Based on the test results, the authors argue for the establishment of a federated database containing criminal evidence data as a crucial element to disrupt criminal networks effectively. They also identify mutual trust between different jurisdictions as a key ingredient for such a coordinated approach to be realized.

Milliken (2014) describes how using intelligence information serves as a principal method to detect and seize large shipments of ivory and rhino horn. However, this report notes that in Africa intelligence information is seldom

augmented by complementary risk assessment activities such as scanners, X-ray devices, sniffer dogs, etc. As a result, very few large-scale seizures prompt successful investigations or arrests – and almost no convictions. A further challenge is that legal provisions accommodate prosecution only within national borders, as exemplified by a review of corresponding legislation in South Africa (Nanima, 2019). Whereas it is crucial to sentence the dealers and not only the local poachers, a lack of extraterritorial jurisdiction allows higher echelons of crime syndicates to escape prosecution outside the country. Hübschle (2017) confirms that dealers and kingpins in organized crime benefit from a lack of coordinated intelligence activities and inadequate legislation to prosecute individuals, and their activities also involve various legal actors along the trade chain.

6.1.5.2 Provision of legal and sustainable substitutes

As an alternative to complete and permanent trade bans, the provision of legal and sustainable substitutes – when certain favorable circumstances exist – is an approach advocated by economists. Potential sources of such substitutes include storable stockpiles of harvested products (Kremer and Morcom, 2000), wildlife farming (Bulte and Damania, 2005), natural substitutes (e.g. mammoth ivory to replace elephant ivory), and substitutes produced by synthetic biology (Chen, 2017). The success or failure of this approach depends on a multitude of complex interacting factors and will vary with species, geographies, and time (Cooney et al., 2015). Furthermore, the effects of maintaining existing legal supply sources (e.g. trade in hunting trophies and lion body parts) may differ from the effects of relaxing existing trade restrictions to allow for legalization (Fischer, 2004).

Assessments of the legal lion skeleton export trade supplied from captive-bred animals in South Africa find no detrimental effect on wild lion conservation and even hypothesize a potential positive buffer effect (Williams et al., 2015; Williams and 't Sas-Rolfes, 2019). Similarly, an assessment of legal mammoth ivory trade in East Asia argues that it has depressed illegal elephant ivory prices and sales, with likely consequent damping effects on African elephant poaching levels (Farah and Boyce, 2019). Also, Bulte et al. (2007) analyzed seizure data and national elephant mortality statistics following the 1999 approved ivory one-off sale and found that it had not significantly impacted poaching rates. Past examples of trade bans followed by successful reintroduction of legal trade include crocodylians and the vicuña (UNEP, 2019). In these cases, CITES coupled strict trade restrictions with efforts to support nations in establishing sustainable use programs, including ranching and farming post-ban (Lichtenstein, 2010; Moyle, 2013; Thorbjarnarson, 1999).

6.2 Impact on rural livelihoods and national economies

6.2.1 International and domestic trade restrictions and enforcement thereof

There is very limited research on the impact of international trade restrictions such as CITES listings and trophy import bans on rural livelihoods, even though such impacts are plausibly significant in some cases. This significance is indicated by the recent survey results on effects of the USA suspension on captive lion trophy imports from South Africa (Williams and 't Sas-Rolfes, 2019) and a sensitivity analysis relating to the complementary benefits of tourism and hunting in Namibia (Naidoo et al., 2016). Regarding impacts on national economies, Barnes (1996) estimated that, by eliminating certain direct use-values, the international ivory trade ban of 1989 had effectively almost halved the potential economic contribution of elephants in Botswana over a 15-year period.

At domestic levels, restrictions of wildlife hunting have overwhelmingly demonstrated negative impacts on rural livelihoods and well-being, as described by Strong and Silva (2020) in Mozambique and Namibia, where a majority of survey respondents voiced negative attitudes towards anti-hunting regulations. Such restrictions were associated with negative material impacts in terms of (a) food, (b) assets and (c) direct income from illegal rhino hunting. Similarly, the 2014 hunting moratorium in Botswana had negative effects on household well-being due to increased crop-raiding and predation, job losses, and decline in income, resulting in increasingly negative attitudes towards wildlife (Gaodirelwe et al., 2020b). Hunting restrictions are thus often ineffective in altering behavior, as exemplified by the Basarwa in Botswana for whom hunting is a part of their identity and provides an essential part of their diet (Taylor, 2007). The Zambian hunting moratorium (2013-2014) yielded similarly negative results for the rural population (White and Belant, 2015). That study showed that the sport hunting industry typically supplies rural communities with meat above and beyond mandated expectations. In addition to the lost meat, the hunting moratorium meant that villagers lost out on (seasonal) income possibilities, thus aggravating the adverse consequences for livelihood and well-being in already poverty-stricken areas, and thereby raising the risk of illegal meat hunting.

Concerning enforcement, researchers have identified ambiguous impacts of illegal hunting and corresponding law enforcement efforts on rural well-being (Hübschle, 2017; Massé and Lunstrum, 2016; Vundla, 2019; Witter and Satterfield, 2019). Whereas rural communities may perceive poaching as a means to achieve (financial) security supported by kingpins who often provide quasi-public services (Hübschle, 2017), illegal hunting can also represent a cause for fear of losing relatives and negatively affect the social fabric of the community (Hübschle, 2017; Vundla, 2019). The research emphasizes that whole villages are not necessarily involved in or complicit with illegal hunting of

high-value species – normally only certain individuals are involved. This insight is particularly important for cases where research has found evidence of adverse treatment of villagers by law enforcement staff and a growing fear of violent anti-poaching tactics (Witter and Satterfield, 2019). The authors highlight that villagers are in general negatively affected by the militarization of anti-poaching, as for them it is irrelevant whether houses of community members in Mozambique had been burnt by park rangers or by poachers. In their most extreme form, conservation-related enforcement measures can be used as a means for renewed dispossession and displacement of rural communities (Massé and Lunstrum, 2016; Witter and Satterfield, 2019).

6.2.2 Property and resource rights regimes

A substantial body of research examines the socio-economic performance of CBNRM initiatives, with some further studies on protected areas and private wildlife estates. Given that the CBNRM research is mostly indirectly indicative and tangential, rather than central, to the question of how trade restrictions impact upon livelihoods and national economies, an abridged summary of those studies is provided here.

Numerous research papers reported on the importance of monetary and non-monetary incentives for CBNRM projects to succeed in socio-economic terms (Galvin et al., 2018; Gibbes and Keys, 2010; Mhlanga, 2009; Taylor, 2009; Wirbelaeur et al., 2005); success depends on community members' perceptions that the perceived benefits of a CBNRM regime outweigh its perceived costs (Murphree, 2009). When benefits do not materialize at household level, villagers do not perceive livelihood improvements, as typified by certain CAMPFIRE projects where most income was spent on activities in Rural District Councils, often distant from the communities who actually bear the costs of living with wildlife (Mutandwa and Gadzirayi, 2007). Similar experiences have been reported across Southern Africa (Gibson and Marks, 1995; Kaaya and Chapman, 2017; Lewis and Phiri, 1998; Moswete and Thapa, 2018; Musumali et al., 2007; Nielsen and Meilby, 2013; Nsukwini and Bob, 2019). However, at least some positive results have been reported in, for example, Botswana (Wirbelaeur et al., 2005; Gaodirelwe et al., 2020b; Mbaiwa, 2015), and Namibia (Bandyopadhyay et al., 2009; Boudreaux and Nelson, 2011; Mufune, 2015; Weaver and Skyer, 2003). Mixed outcomes are reported from Mozambique, Tanzania, Zimbabwe, and other parts of Namibia (Zafra-Calvo and Moreno-Peñaranda, 2018; Hasler, 1999; Mufune, 2015; Schnegg and Kiaka, 2018).

Whereas both tourism and trophy hunting appeared to provide similar and complimentary benefits at an aggregate level in Namibia (Mufune, 2015; Naidoo et al., 2016), hunting contributed more directly to individual households and produced benefits more quickly than tourism and in areas with low densities of wildlife or unappealing or inaccessible areas for photographic tourism. In Zambia a positive effect on household income was only achieved in prime areas, i.e. those with the highest diversity of wildlife stocks, with a disproportionate advantage for wealthier households (Richardson et al., 2012), highlighting a need to link perceived livelihood improvements, especially for poorer households, to non-monetary incentives or to otherwise reducing the disincentives of living with wildlife (Roe, 2015). Skewed distribution of benefits and elite capture are widely reported (Balint and Mashinya, 2008; Musumali et al., 2007; Mutandwa and Gadzirayi, 2007; Taylor, 2009); in Tanzania, for example, wealthier households gain most from higher food security (Pailler et al., 2015). In general, however, expectations to meet the full needs of Africa's rural population largely through wildlife stewardship were deemed unrealistic – such stewardship benefits should rather be seen as a supplement to rural livelihoods (Mhlanga, 2009; Murphree, 2009).

Although one of the defining principles of CBNRM is the devolution of rights to communities, the assessments of rural livelihoods and well-being throughout the SADC range states unanimously reported that nowhere had these rights been fully devolved (Gibbes and Keys, 2010; Mufune, 2015; Murphree, 2009; Musumali et al., 2007; Mutandwa and Gadzirayi, 2007; Nelson and Agrawal, 2008). Frequently, governments retained the rights to plan for the use of wildlife, e.g. by setting quotas or by negotiating with stakeholders (Boudreaux and Nelson, 2011; Mufune, 2015; Musumali et al., 2007). In such cases, beneficiation was restricted to selling those quotas or photography rights to tour operators, turning communities at best into intermediaries for wildlife sales. In other instances, communities were deprived of receiving the full benefits as wildlife owners or lacked decision-making rights to deal with problem animals and/or the distribution of the remaining benefits (Boudreaux and Nelson, 2011; Gibbes and Keys, 2010; Mufune, 2015; Musumali et al., 2007; Mutandwa and Gadzirayi, 2007). Reasons cited for this failure to empower communities include a lack of trust in their abilities to manage natural resources and assume stewardship of wildlife responsibly, and/or hesitation in relinquishing personal benefits by rent-seeking officials (Benjaminsen and Svarstad, 2010; Mhlanga, 2009; Nelson and Agrawal, 2008).

Regarding public protected areas, research findings from South Africa highlight their recreational benefits. For example, people from villages next to Hluhluwe–iMfolozi Park in South Africa appreciated the possibility to see wildlife (Nsukwini and Bob, 2019). According to Swemmer et al., (2017) protected areas create more intangible benefits for people at local, regional, national, and international levels, while tangible benefits related to rural livelihoods tend to be scarce. The authors further argue that local communities are the beneficiary group faced with most of the actual costs

of wildlife conservation and will only value the intangible benefits when their real livelihood needs are met. However, negative influences can extend beyond missing benefits or having to bear the costs of living with wildlife. Conservation can be used to justify continued repossession or resettlements disguised as voluntary decisions for villagers living within park boundaries (Massé and Lunstrum, 2016). In the case of Mozambique's Limpopo National Park, Witter and Satterfield (2019) found patterns whereby park management behavior led people to feel they had no choice but to leave even though their location destinations were not ready. In particular, these patterns included the reallocation of investment away from existing villages earmarked for voluntary relocation, or the fear of intensified anti-poaching tactics by conservation enforcement agents, for which communities feel unjustly blamed and thereby suffer detrimental effects on their well-being.



Crocodile farms in Zambia, generate a turnover 29 times larger than public game management areas.

Studies on private wildlife ranching mostly emphasized its positive contribution to national economies, notably in South Africa. Revenue is mainly generated through live sales, trophy and biltong hunting, game meat production, and game farm tourism, and the industry provided roughly 65,000 jobs over recent years (Taylor et al., 2015; Van Der Merwe and Saayman, 2003; Van Der Waal and Dekker, 2000). Overall the industry's revenue has grown significantly on an annual basis, contributing 0.25% to South Africa's GDP in 2012 (van Hoven, 2015). At the same time, a structural path analysis suggests that the wildlife ranching industry could provide significant impulses to other sectors of South Africa's economy (Rossouw and Cloete, 2014).

In Namibia, Barnes and De Jager (1996) reported overall positive economic results despite low financial margins in their early study of private wildlife ranching. In more detail, the study revealed that wildlife viewing was more profitable for large private conservancies, adding more economic net value than livestock-game ranching for consumptive use. A later study by Lindsey et al., (2013a) reported that the financial contributions from wildlife, including associated tourism, may have already surpassed those of livestock farming. Lindsey et al., (2013b) described the economic importance of wildlife and crocodile farms in Zambia, generating a turnover equivalent 29 times larger than public game management areas. They further argued that, despite its overall positive contributions to Zambia's economy, the commercial wildlife sector still fares comparatively poorly due to unfavorable government regulations compared with livestock farming. They also noted that it enables economical use of land with little agricultural potential, especially in the semi-arid areas of the country.

For the rare cases where the influence of private wildlife ranches on community livelihood and well-being featured as a study focus, mixed results emerged. As one example, Snijders (2012) claimed that commodifying wildlife through private ownership effectively meant a setback for farm dwellers in South Africa: as wildlife farms and reserves only created employment for a few people, rural communities were denied access to or fenced out of grazing land they previously used. Similarly, Pasmans and Hebinck (2017) described how the privatization of wildlife in South Africa encouraged the development of global and local elites enjoying exclusive hunting and wilderness experiences without necessarily generating additional rural employment. In contrast, Lindsey et al., (2013a) referred to the important role that the wildlife and crocodile farming industry plays in Zambia for rural well-being in terms of employment and the provision of significant amounts of meat to local communities and staff.

6.3 Reduction of consumer demand

As indicated above (Section 6.1.5) evidence-based studies that assess direct links between regulatory measures (and/or voluntary behavior change interventions) in consumer countries in East Asia and conservation outcomes in SADC range states are lacking. Reductions in consumer demand are thus viewed as a proxy measure to infer reduced threats to species from wildlife crime and unsustainable harvest levels. However, such reductions are also challenging to ascertain, partly because illegal purchase and consumption are clandestine and partly because demand is multi-dimensional in nature and difficult to measure by a single attribute: both sale volumes (quantities of goods sold per unit of time) and product prices are relevant, especially the latter. The net effects of declining volumes accompanied by simultaneously increasing prices can be ambiguous, depending on the price elasticity of demand (t Sas-Rolfes, 2012). Therefore, the only certain measure of declining demand is a confirmed simultaneous decline in both consumer sales volumes and prices.

Some research suggests recent localized reductions in consumer demand for African elephant ivory following legislative interventions in Thailand, which banned the import, export, and domestic trade of ivory from African elephants in 2015 (Krishnasamy et al., 2016), and China, which implemented a domestic elephant ivory trade ban at the end of December 2017, shutting down all licensed ivory carving factories and retailers. A pre- and post-ban survey in Chinese cities indicated both a significantly grown proportion of ivory rejectors and a decline in ivory purchases (Meijer et al., 2018). However, the latter study revealed that a residual number of "diehard buyers" persist. Nevertheless, even before the trade ban, other interventions by the Chinese government to reduce extravagant consumption using radio, film and television are thought to have contributed to a drop in the price of illegal ivory (Zhou et al., 2018), with the younger generation showing signs of adopting negative attitudes towards buying ivory products.

Media campaigns and changing fashions provide a plausible alternative explanation for reversing the decline in Africa's elephant population instead of the ivory trade ban in 1989 (Challender et al., 2015). However, according to Stiles (2004), it was the combination of the 1989 ban and effective anti-ivory campaigns that stigmatized buying or possessing ivory in America, Europe, and Japan, and reportedly reduced demand in these countries; associated indicators subsequently also implied smaller post-ban ivory markets throughout Africa, except for Nigeria.

The evidence for successful demand reduction of other relevant species products is less compelling. Whereas the domestic trade restrictions in Asian rhino horn consumer countries in the early 1990s are believed to

have been effective, the subsequent obvious surge in East Asian consumer prices in the early twenty-first century suggests that the effects were in part only temporary. The full impact of a regulatory intervention in China in late 2011 remains somewhat unclear (Gao et al., 2016) as do revisions of Vietnam's penal code. There have also been at least five distinct NGO attempts at rhino horn demand reduction, using a range of techniques from public awareness campaigns and celebrity endorsements to more targeted social marketing techniques, but independent assessments of these point to various significant shortcomings (Olmedo et al., 2018; Verissimo and Wan, 2019; Dang Vu et al., 2020; Olmedo et al., 2020), and their ultimate impact to date remains uncertain.

Currently, at least five NGOs and one IGO are also involved in various budding initiatives to reduce demand for pangolin products in China and Vietnam. It is premature to evaluate these, although noteworthy that only one is considered to be grounded in a substantial theory of consumer behavior change (Burgess et al., 2020). Research into East Asian consumer demand for lion products is also nascent (Coals et al., 2020), and to date there appear to have been no substantial attempts at consumer behavior change interventions for large felid products such as bones, teeth, and claws. At a worldwide level, to date, there have been relatively few demand reduction interventions grounded in appropriately structured consumer research guided by behavioral science, and even fewer robust impact evaluations of such interventions (UNEP, 2019).

6.4 Trade in relation to root causes of wildlife species decline

As alluded to in the introduction of this report, the role of trade in relation to other factors driving wildlife species decline remains a somewhat uncertain and contested issue. Whereas wildlife trade has recently gained significant prominence as both a perceived threat and a catalyst for conservation activism (t Sas-Rolfes et al., 2019), many assessments of species decline point to habitat loss and fragmentation as the most salient long-term driver. At the time of the 1989 CITES ivory trade ban, economists contemplated whether it would serve as a long-term solution for African elephant conservation and concluded that it would not (Barbier et al., 1990). Around the same time, Wilson (1989) had highlighted the key factor driving twentieth-century biodiversity loss as anthropogenic habitat destruction, driven in turn by the rapid growth of the global human population and associated economic activity.

In a subsequent analysis, Swanson (1994) argued that trade restrictions are most appropriate for genuine open access resources (e.g., marine species), as they provide a deterrent effect to simply slow down the rate of harvesting. However, for terrestrial species that occupy land with other potential uses – and which require the active investment of resources to manage and protect them – the associated opportunity costs with trade restrictions can undermine the long-term economic case for conserving such species. If illegal consumer markets for their harvested products persist, they become increasingly costly to protect from commercial poaching. They may eventually be viewed as economic liabilities rather than assets, especially in the case of species that pose potential threats to the lives and livelihoods of local people. In such instances, reestablishing controlled and sustainably supplied legal trading regimes may be a better long-term option to ensure species persistence.

Following a broader dialogue with inputs from both ecologists and economists, Swanson (1995) noted deep ideological differences over whether biodiversity conservation is best achieved through 1) shielding nature from human development, or rather 2) through human development, which may also influence the perceptions of both relative threats to wildlife and the most appropriate measures to address these. Such differing emphases are reflected in recent global assessments of species threats: for example, one claims that overexploitation is the most prevalent threat currently facing species (Maxwell et al., 2016), whereas another identifies habitat loss as the more salient factor (Tilman et al., 2017). Nevertheless, it is notable that of the eleven categories of the IUCN's current threat classification system¹ only two are associated (indirectly) with wildlife trade: 1) biological resource use, and 2) spread of invasive and problem species, pathogens, and genes.

Turning to the species of specific interest to this report, IUCN Red List assessments identify illegal harvesting for international trade as the central threat to the two rhino species (Emslie 2012; 2020) and a growing threat to pangolins, which are also harvested for domestic consumption and trade and threatened by habitat loss (Pieterse et al., 2019; Nixon et al., 2020). However, the African elephant assessment emphasizes that although illegal hunting for ivory and meat remains a key factor in specific areas, the most important perceived threat is habitat loss and fragmentation, aggravated by increasing human-elephant conflict (Blanc, 2008). The lion assessment lists indiscriminate killing and prey depletion, accompanied by habitat loss and fragmentation, as key factors, with a minor role for poorly managed trophy hunting in some instances (Bauer et al., 2016); it notes only a small role for domestic trade, and some concern over a potential future international trade in lion body parts.

¹See <https://cmp-openstandards.org/library-item/threats-and-actions-taxonomies/>

7 Discussion

The Southern African (SADC) region currently harbors 95% of Africa's rhinos, 80% of its elephants, and a similarly high proportion of its wild lions. Given an ultimate goal of conserving viable free-ranging populations of these species, and others such as pangolins, and given that they are all at least to some extent threatened by illegal and unsustainable harvesting for trade purposes, how is this threat best addressed? What options and strategies might improve the effectiveness of international, regional, and national wildlife trade regulatory mechanisms to sustainably disrupt the illegal wildlife trade in the region? The existing literature offers some guidance on this, but also exposes some glaring research gaps and uncertainties, and further raises questions as to whether certain current trade-related policies provide the most effective long-term strategy for species conservation.

7.1 Trade restrictions

The evidence indicates that CITES listings alone have offered limited protection to species, being constrained by varying perceptions of social legitimacy among market actors. Announcements of blanket trade restrictions may even abruptly increase the threats to species by signalling scarcity to the marketplace, resulting in higher prices and raised incentives for illegal activity, which may then also persist (Rivalan et al., 2007; Hall et al., 2008). To be effective, CITES listings must be supported by a fully aligned range of appropriate measures in range, transit, and consumer countries. The 1977 CITES Appendix I rhino listings failed to prevent the further poaching and decline of Africa's black rhino populations, which only started to recover after four key consumer countries agreed to take measures to close their domestic markets in 1993, following direct diplomatic pressure from the USA. Even so, under complete ban conditions, rhino poaching for horn resurged significantly from 2007 onwards, not only slowing and threatening the recovery of black rhino populations but also starting to reverse the previously impressive southern white rhino recovery that had continued uninterrupted since the 1960s. Importantly, the Appendix I listings also failed to prevent the subsequent extinction of two subspecies, the northern white rhino and north-western black rhino (neither of which occurred in the SADC region).

Despite a reasonable body of research on the topic, the role of CITES in protecting African elephants continues to be disputed. Whereas it is widely agreed that the 1989 Appendix I listing suppressed key consumer markets and slowed the rate of poaching at the time, it is also clear that the subsequent benefits of the ivory ban under the CITES regime have been unevenly distributed. Certain countries with adequately protected and sizable populations carry a disproportionately high burden in the form of management and opportunity costs. Attempts to address this imbalance by way of split-listing – i.e., down-listing populations of well-performing countries to CITES Appendix II and then allowing one-off ivory sales – have created confusion and tension, with critics blaming these for resurgent consumer demand in the early twenty-first century. As a result, no further sales are currently contemplated, and ivory trade policy continues to be fiercely debated. However, recent analyses confirm the importance of other domestic factors (e.g., poverty and corruption) in influencing elephant conservation performance. Furthermore, a comprehensive study of historical ivory prices (Do et al., 2020) suggests that elephant poaching is relatively inelastic – this implies that the overall effect of the CITES ban itself is relatively neutral, neither encouraging nor discouraging poaching significantly. This result appears to be supported by another recent study that shows fairly persistent poaching levels, especially in the Southern African region (Schlossberg et al., 2020).

The effect of the recent CITES Appendix I listing of pangolins is very difficult to determine, as wild population numbers are challenging to monitor, but early signs are not encouraging: since the up-listing substantially higher seizure levels have been reported, suggesting that illegal exploitation persists at worrying levels. The effect of the 2016 CITES decision to restrict lion trade (apart from trophies) to the export of body parts from captive-bred animals in South Africa subject to a quota restriction is the subject of ongoing investigations. However, as with elephants, a confusing inconsistency of policy direction amidst fiercely contested views confounds attempts to analyse this issue with neutrality and reach conclusive results. Nonetheless, at this time there is no substantial evidence that lion body part trade is driving significant levels of poaching at the regional level.

The socio-economic impacts of CITES listings at national and, especially, local community levels is inadequately researched. This is cause for concern, especially given the current lack of long-term vision for trade in elephant ivory and rhino horn, both of which will continue to accumulate in collected stockpiles as long as populations of elephants and rhinos continue to survive and naturally produce these harvestable and storable products. Furthermore, with evidence of persistent residual demand in consumer countries in spite of domestic trade bans, all indications are that these species will require the continued allocation of significant resources to protect them from poaching. Given the budgetary constraints facing many Southern African governments, likely aggravated following the economic impacts of the COVID-19 pandemic, it is unclear that these resources will be available at adequate levels. Consistent reports of severe shortfalls in conservation funding (e.g., McCarthy et al., 2012; Lindsey et al., 2018) suggest that there will be an ongoing if not increasing dependence on external donor support and that this may be both insufficient and insecure,



Poster featuring popular Chinese actor Huang Xuan dressed as a customs officer urging travelers abroad not to bring back ivory items.

factors that may also undermine the incentives of both governments and local communities to embrace a long-term view toward conserving these species.

Research on the impacts of domestic restrictions such as trophy hunting moratoria confirms that these can have conservation-positive impacts in the short term, allowing affected species populations to recover. However, they also typically have negative socio-economic impacts at local levels, which can stimulate illegal activity in response and lead to adverse conservation impacts in the longer run. The research suggests that once populations recover, harvesting should be re-instated under better managed conditions with appropriate incentives in place (such as the bonus-malus system for lion trophy hunts adopted in Mozambique). It also suggests that domestic measures should be co-ordinated across national boundaries in transfrontier conservation areas. It further indicates that certain domestic restrictions may be undermined by a lack of social legitimacy (e.g., the rhino horn trade ban in South Africa and Mozambique). Research on the impacts of domestic restrictions (especially those linked to substantial illegal activity) on national economies is noticeably lacking.

The extensive body of research on domestic monitoring and enforcement confirms that positive site-specific results are correlated with adequate funding (to cover costs of anti-poaching staff and technology), but reaffirms the significance of social legitimacy as a supporting (or undermining) factor. The research also points to high probability of early detection and interception of protected area incursions and other illegal activity as being the most effective deterrent with the highest positive conservation impact. Although increasing severity of penalties has a positive effect, this is substantially undermined if the probability of apprehension and actual punishment is low. Notwithstanding the growing suite of technologies to support monitoring and anti-poaching measures, the ultimate impact of these remains largely unknown and needs to be evaluated relative to their costs and other implementation feasibility factors, to assess potential scalability.

7.2 Property and resource right regimes

Beyond the research on the direct impacts of trade restrictions on wildlife and economies, work that examines the effects of property and resource rights regimes provides lessons with important implications for wildlife trade policy. The substantial research on CBNRM programs and their impacts points to community engagement being a necessary, if not always sufficient, condition for conservation to succeed in the presence of local rural people with livelihood needs. Whereas there is limited evidence of direct conservation impacts of existing programs, there is sufficient indirect evidence to infer positive effects in many cases. However, to be effective, programs must meet certain conditions, including realistic expectations of what can be achieved within specified periods of time (i.e., depending on the local context, wildlife can typically supplement but not fully provide for local livelihoods). The research suggests that in many cases establishing managed sustainable harvesting (e.g., trophy hunting) contributes greater and faster benefits to communities (including the provision of meat for food) than non-hunting tourism.

Although CBNRM regimes provide communal benefits by way of shared facilities such as schools and clinics, as well as empowerment through self-determination, the research suggests that meaningful household-level benefits are typically of critical importance for success. In many instances, meat hunting forms a crucial part of local identity and may continue at the individual level, resulting in free-rider problems. Many communities are also subject to uneven distributions of benefits due to elite capture and rent-seeking by particular individuals, including administrative officials, highlighting the important role of institutional aspects in CBNRM program design. The widely reported lack of complete devolution of rights and decision-making authority exacerbates this challenge. A previous in-depth description of CBNRM-regimes in different Southern African countries outlined three factors as instrumental to the unwillingness of central wildlife authorities to devolve control over natural resources: (i) high value of wildlife, (ii) unaccountable and non-transparent institutions, and (iii) weak economies with corresponding higher levels of corruption (Nelson and Agrawal, 2008). Even though no Southern African country had entirely devolved natural resource rights to rural communities, in relatively stable and ordered nations like Namibia, Botswana, and pre-crisis Zimbabwe, progress had been most substantial. Conversely, in Mozambique, Tanzania, and Zambia, central control continued to dominate due to weak institutions and the rule of law.

Constantino et al. (2012) identify four critical factors that facilitate the empowerment of rural communities via CBNRM: (i) the value local people place on natural resources, (ii) the degree of rights devolution, (iii) the community's inherent organization and leadership and (iv) collaborating stakeholders. In practice, however, Murphree (2009) argues that most CBNRM projects are designed, implemented and funded by the West. Being heavily reliant on donor funding and based on Western conservation ideals, CBNRM is employed as a means to achieve conservation goals. Rural African communities, however, typically hold an inverse understanding of this relationship, viewing conservation as a means for development. Successful projects approach these differences in an open, constructive dialogue, which guides the project design and implementation.

Public protected areas are conventionally regarded as an effective institutional regime; for example, evidence shows that animals that are hunted and persecuted outside of protected areas (e.g. large carnivores) fare better inside them, especially towards their core. However, research suggests that protected areas face significant and growing headwinds in the region, in part due to funding shortages and in part due to social legitimacy challenges. The latter are often related to historical dispossession and continued resentment from displaced communities. Negative local perceptions of protected areas are exacerbated by poor relations with park managers and heavy-handed approaches toward local poaching but can be overcome with the establishment of competent management, fair park rules, privileged visitation rights for locals, adequate and rapid compensation for wildlife-caused damage, and the creation of appropriate forums of open communication.

Privately protected areas and wildlife ranches play a substantial role in several Southern African countries, most notably in South Africa (but also to varying extents in Namibia, Zimbabwe, Zambia, and Botswana). The benefits of such areas vary with size and management. They are widely recognized as playing an important role in conserving species (notably white rhinos, of which more than 50% are currently estimated to be under private protection) and habitats. However, they elicit concerns over the conservation impacts of excessive game fencing and water provision, intensive and selective breeding, and various other interventionist management practices. Private wildlife reserves and ranches generate apparently substantial economic benefits, both locally and nationally, although the exact extent of this remains inadequately researched. Furthermore, there are concerns that this sector is too elitist, inadequately distributing benefits to previously disadvantaged local rural communities, leading to concerns over long-term socio-economic legitimacy and sustainability.

In general, achieving optimal results outside of protected areas relies on creating conditions for effective private ownership of communal resources. A model example was Zimbabwe's system of natural resource governance, the Intensive Conservation Area movement, which was implemented in 1941 and lasted for more than 40 years (Child and Child, 2015). Based on convictions about the resourcefulness and responsibility of people, resource rights were completely devolved to private landowners, only subject to democratic checks-and-balances at a local, collective level, holding individual members to a high standard. Central government agencies merely provided technical support, guidance and transparency through performance monitoring. As structures became more centralized again, the system degraded and eventually collapsed. The authors claim that this unique conservation movement unknowingly applied Ostrom's (1990) design principles for institutions managing common property resources five decades before they were published. Both Lindsey et al. (2013a) for Zambia, and Child and Child (2015) for Zimbabwe, describe the gradual erosion and untapped potential when these conditions are not met, resulting in negative trends for both wildlife numbers and profitability.

As with the impact of trade restrictions, the most deficient area of existing research on property and resource rights relates to the impact of these varying institutional regimes on national economies. Superficially, it appears that countries with greater devolution of rights and institutional diversity, i.e., an appropriate combination of public,

communal, and privately protected and wildlife management areas (e.g., Namibia), fare better in both conservation and socio-economic terms than countries with more rigid institutional models. Given that the regional conservation of species such as elephants and lions will benefit greatly from the creation of corridors between protected areas, extending across communal and private lands, this is a question that certainly warrants further investigation, including research on ways in which to manage the ecological and economic interfaces between such varying institutional arrangements.

A final evident research gap relates to the relative contribution of wildlife tourism and recreational hunting enterprises to conservation and local livelihoods, both in terms of financial benefits and their geographic reach. Although not directly related to trade restrictions, photographic wildlife tourism is frequently promoted as a suitable replacement for harvesting and sale of wildlife products, including hunting trophies. Western pressure groups (including photographic tourism operators) lobby for blanket trophy import bans, but the replacement potential is currently unclear.

7.3 Other measures

Whereas measures to support trade restrictions such as the disruption of criminal networks and efforts aimed at demand reduction are widely considered to be imperative, the evidence-based research on their effectiveness to date is limited and not especially encouraging for the species of regional concern. Disruption of transnational criminal networks is considered necessary to discourage illegal activity relating to the smuggling of high-value goods such as rhino horn, ivory, pangolin scales, and lion fangs; however, there is no substantial evidence of positive conservation impacts to date or to suggest that disruption can prevent these smuggling activities altogether, especially when these are undertaken by sophisticated networks with compliance from corrupt officials and links to other lucrative criminal enterprises involving, for example, timber, arms, and drugs. Similarly, although the evidence to date on demand reduction suggests some success with ivory, this does not appear to have translated into markedly reduced elephant poaching rates, and tangible impacts on consumer demand for rhino horn are less clear. The evidence suggests that such efforts may reduce demand somewhat, but not eliminate it entirely, leaving open the question of how best to tackle the persistent residual consumers.

The experience to date with demand reduction reveals a potential flaw with past approaches, which have tended to outlaw product purchases first and then attempted to engage with consumers in clandestine illegal market environments. The research also suggests that many initial NGO attempts at demand reduction through paternalistic and culturally insensitive messaging did not reach the critical target audiences and that celebrity-endorsed campaigns have questionable effects. Future attempts at demand reduction might benefit from consumer engagement and associated attempts at voluntary behavior change measures in legal markets prior to the implementation of more coercive restrictions. Future attempts should also be subject to design informed by behavioral science insights and subject to robust impact evaluations.

Although currently unpopular as an alternative option, research suggests that the provision of legal and sustainable substitutes deserves some consideration in the future. Attempts to eliminate consumer demand may not succeed entirely and do nothing to contribute to local livelihoods and national economies in range states. If and where consumer demand persists, local residents may be tempted to engage in illegal activities to supply this demand, an activity from which criminals benefit, but honest people, governments, and wildlife all suffer losses. Carefully structured legalization of trade with appropriate flows of benefits directed to relevant conservation agencies, local communities, and other affected parties could provide eventual support to conservation efforts while discouraging illegal activity.

Unfortunately, the question of legal trade has been plagued by controversy, fueled by strong and polarized positions on the ivory trade in particular. Whereas various southern African countries continue to express interest in selling accumulated ivory stockpiles, many other countries and a strong contingent of NGOs seek to end the ivory trade permanently and advocate the destruction of such stockpiles, claiming that such action incentivizes consumer behavior change. Whereas economists have questioned this and recommended against large scale stockpile destruction (Kremer and Morcom, 2000; 't Sas-Rolfes et al., 2014) numerous countries have ignored this recommendation, notably Kenya, which undertook an especially large public stockpile destruction event in 2016, the effects of which have not been properly assessed, despite appeals to do so (Biggs, 2016). The effects of one-off ivory sales also remain contested. An influential working paper by Hsiang and Sekar (2016) suggested a negative conservation impact of the second (2008) sale and was used in an attempt to influence decisions at CITES CoP17, but to date has not been published in the peer-reviewed literature and its methodology has been questioned (Zhou et al., 2018)².

Whether permanent bans or legal trading regimes are the best option for various species this remains a highly contested and poorly understood topic, necessitating further neutral investigation by appropriately qualified analysts.

² Also see <https://blogs.worldbank.org/impactevaluations/trade-or-not-trade-ivory-s-going-be-question> and <https://faustusnotes.com/2016/06/16/did-legal-ivory-sales-really-boost-ivory-poaching-in-2008/>

Given the findings of Do et al. (2020) it seems likely that, at least for elephants, there can be no clear answers and conservation success will variably depend largely on other local factors, regardless of whether legal trade takes place or not. For other species, if legal trade is to succeed as a conservation measure, it will likely depend on the creation of bespoke institutional arrangements with appropriate control measures, such as single-channel marketing systems, accompanied by source certification and traceability measures to support enforcement and deter laundering of illegal products. Supporting technologies for such approaches have already been developed (e.g., the RhODIS DNA tracking system for rhinos – see Harper et al., 2018) and further research on the effectiveness of chain of custody systems for lion bone exports from South Africa has taken place (as yet unpublished). However, for range states that may benefit from legal trade to win over others that may not, will require further investigation of supporting measures and other necessary assurances. Such research should include likely consumer demand responses, following the example of Hanley et al. (2017), who conducted choice modelling of rhino horn demand in Vietnam and identified preferences for humanely harvested wild horn from the least rare species.

7.4 Conclusion and key recommendations

Whereas several of Southern Africa's iconic species are currently threatened to various extents by excessive illegal exploitation for trade purposes, this threat must be assessed within the broader context of socio-ecological factors driving regional biodiversity decline. Although the trade threat is dominant for rhino species in particular, wild mammal populations are more substantially threatened by the broader forces of an expanding human footprint. Forecasts suggest that, especially in the northern parts of the region, projected human population growth and associated economic development imperatives will place substantial additional pressure on land and natural resources, compounding the existing habitat conversion and fragmentation problem that threatens free-ranging populations of large mammals such as elephants and lions. To mitigate the effects of habitat fragmentation, robust conservation approaches must adopt strategies to enable these species to move freely between certain protected areas across communal and private lands.

Species with valuable harvestable products may be threatened by poaching incursions into protected areas; outside of these areas, such species are most likely to survive in situations where they provide meaningful net benefits to landholders. This suggests that, in the context of developing Southern African economies, realistic achievement of species conservation outside of protected areas must embrace inclusive and innovative wildlife management practices as a means to achieve human development goals. In other words, whereas protected area managers may be mandated to shield conservation from development, this luxury is largely absent outside these areas. In a post COVID-19 world economy, these pressures are only likely to increase (Roe et al., 2020). With this in mind, and drawing on the summary evidence detailed in the previous sections, we offer the following recommendations, divided into five key categories:

■ Enhance local enforcement capacity

Inside protected areas, early detection and apprehension of incursions remains critical. Local enforcement capacity should be developed according to principles of situational crime prevention. Technological advances may assist with monitoring, but new technologies must be carefully evaluated for site-specific fit and cost-effectiveness. Ranger capacity-building, especially leadership, remains a key priority. Intelligence-led enforcement to detect, monitor and apprehend “Level 2” operatives can assist with pre-emptive crime prevention; therefore, building capacity around this objective is also recommended.

■ Empower communities

Local communities provide a potentially powerful first line of defense and community engagement is imperative. Where possible, communities should be empowered with meaningful devolution of property and resource rights and associated decision-making authority. CBNRM projects should seek to accommodate local customs (including traditional hunting) and provide tangible benefit flows at household level. For communities surrounding protected areas, a priority is to develop communication forums and other measures that enable community members and park managers to engage constructively.

■ Research the wildlife economy

The regional socio-economic contribution of wildlife remains poorly researched and understood at all levels: from local human benefit flows and associated conservation incentives through to broader contributions to national economies and global society. There is an urgent need to develop a better understanding of the relative contributions of activities such as recreational hunting, trade (including trophies) and photographic tourism to species and habitat protection at local levels but viewed at a regional scale. Institutional regimes and consequent benefit flows relating to a range of wildlife-based activities thus need to be better understood, to evaluate the consequences of potentially shifting markets and policies. There is also a need to research more innovative ways to manage the ecological and economic interfaces between different institutional and wildlife management regimes to inform land-use planning and trade policy for improved conservation outcomes.

■ Secure sustainable funding sources

There is an ongoing need to research and identify innovative sources of sustainable finance for conservation. This includes both the possible development of new sustainable wildlife product markets and the establishment of appropriate regimes to allow for the legalization of currently banned products to sustainably supply persistent consumer markets.

■ Engage with product consumers

There is a need to realign consumer research to enable non-judgmental engagement as a means to establish the most appropriate strategies for addressing unsustainable levels of consumption.

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