

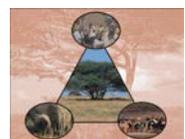
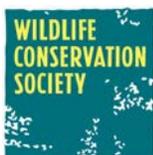


TECHNICAL REPORT

CONSTRAINTS TO CONSERVATION AND DEVELOPMENT SUCCESS AT THE WILDLIFE-LIVESTOCK INTERFACE IN SOUTHERN AFRICAN TRANSFRONTIER CONSERVATION AREAS: A PRELIMINARY REVIEW

Wildlife Conservation Society

Animal & Human Health for the Environment And Development (AHEAD) Program



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Constraints to Conservation and Development Success
at the
Wildlife-Livestock-Human Interface
in
Southern African Transfrontier Conservation Areas:
A preliminary Review

by

D H M Cumming

29 June, 2011

Technical Report to the Wildlife Conservation Society (WCS)

The contents of this report are the responsibility of the author, and do not necessarily reflect the views of the Wildlife Conservation Society or any associated donor organizations.

EXECUTIVE SUMMARY

This review examines three questions. (1) What is the wildlife-livestock-human interface? (2) What would represent conservation and development success at the wildlife-livestock-human interface? (3) What are the key constraints to achieving conservation and development success at the interface? The major part of this review deals with the third question but answers to the first two questions provide a necessary prelude to dealing with the constraints to conservation and development success at the interface in southern African¹ transfrontier conservation areas (TFCAs).

For the purposes of this review the interface is taken to be the interface as it is experienced in the TFCAs of southern Africa that are characterised by core protected areas, such as national parks that carry a wide range of mammal species, within a matrix of human occupied land under agro-pastoralism. There are fourteen TFCAs currently being developed in southern Africa and these range in size from the Kavango-Zambezi (KAZA) TFCA of c. 400,000 km² to the Chimanimani TFCA of 2,056 km². Besides their size, the main features of the fourteen TFCAs are summarised in Table 1. The features include indicators of fragmentation (provided by the number of protected areas and corridors required in each TFCA), land use in the matrix between protected areas, and the established presence/absence of twelve important diseases.

The question of what would represent conservation and development success is examined through the lens of existing statements of TFCA objectives in treaties and memoranda of understanding (MoUs) of four TFCAs as examples. With the exception of one agreement these make little reference to conservation and none have clear, readily measurable, objectives relating to development. Indicators of success are not provided. The same was found to be true of integrated development plans for KAZA and the Great Limpopo TFCA (GLTFCA), which tended to focus on administrative activities to be carried out, instead of what was to be achieved on the ground. As a result of this gap, a brief review is included on indicators for conservation and development success and on trade offs between conservation and development.

The literature relating more directly to **constraints** to conservation and development success in TFCAs and the interface is then reviewed against the following set of simple objectives and indicators²:

1. Secure existing state protected areas (e.g. national parks) against human encroachment
Indicator: No encroachment (e.g. agriculture, settlements) into protected areas - ongoing satellite surveillance
2. Maintain, or where appropriate restore, biodiversity in core protected areas
Indicator: Trends in selected species and habitats of interest (e.g. large mammals, endemic and endangered plant and animal species) stable or improving

¹ Southern Africa is taken to be the area encompassed by Angola, Zambia and Tanzania and the countries lying to the south of these.

² It is unlikely that baseline data at the various scales required is available to assess progress in meeting these objectives and indicators. However, simple as they are, they do encompass, or subsume, the objectives elaborated in TFCA treaties and MoUs, serving to translate them into measurable components of conservation and development progress.

3. Establish functional wildlife corridors between core protected areas where these do not share boundaries

Indicator: Functional corridors in place between TFCA protected areas and evidence of animal movement between protected areas and through designated corridors

4. Establish policies and legal frameworks that provide incentives for local communities and landholders to benefit from wildlife- and natural resource-based enterprises (diversified tourism, and sustainable harvesting of natural resources) to the extent that they can invest in, and sustain, wildlife as a form of land use in the TFCA

Indicator: Positive attitudes towards wildlife increase at local level and result in local people investing in wildlife as a land use; wildland areas maintained or extended in the TFCA matrix; populations of economically important species of plants and animals and their habitats stable or increasing

5. Enhance human food security and wellbeing through improved and diversified production systems (crops, livestock, forestry, non-timber forest products) and development of market chains and infrastructure compatible with the overall biodiversity conservation goals of the TFCA

Indicators: Improving trends in household incomes, nutritional status of children, incidence of disease (in people, domestic animals, and crops), levels of education, declining *rates* of human population growth

The literature review covered 1) Legal and policy frameworks and governance, 2) Wildlife conservation and protected areas (the core of TFCAs), 3) Disease and disease management, and 4) Development and tourism. The following conclusions were drawn:

The constraints to conservation and development success covered in this review operate at three scales. The first is that of international laws and conventions, and national management capacities. The second scale, or level, is that of constraints at the TFCA scale that confront countries and resource managers. The local level, within TFCAs at the wildlife-livestock-human interface, forms the third scale. A brief summary within this broad framework follows.

1. *International and nationally generated constraints*

1. *Legal frameworks and peoples' rights to resources and to engage in planning and influencing land-use and resource access plans.* These are weak in southern Africa (although strongest in South Africa). There is a disconnect between international legal instruments and law and national legislation. National interests are presently overriding international law, and even the SADC instruments, as the recent suspension of the Southern African Development Community (SADC) Tribunal, following its ruling on land reform in Zimbabwe, exemplifies.
2. *The Convention on International Trade in Endangered Species (CITES) and its listings on Appendix I and Appendix II of certain species constrains management options in TFCAs.* For example, KAZA carries close on 250,000 elephant. However, because elephant are listed on Appendix II and the parties to the CITES convention consider it an endangered species, its value to communities at the interface is greatly reduced.
3. *There are wide differences between countries in their capacity to participate in, and contribute to, TFCA development (see Table 2).* This factor also results in shortfalls in funding of protected areas, which should form the core of TFCAs.

4. *Between countries there remain differences in policy and legislation that hamper the management of natural resources across borders and the development of transboundary enterprises and markets.*
5. *Targeted conservation planning is not being implemented at the overall scale of TFCAs which results in disconnects across boundaries and a failure to develop conservation and development plans.*

2. Constraints within TFCAs and at the country level

1. *Existing land resource access rights to natural resources at national levels in most southern African countries prejudice the development of effective natural resource-based enterprises. Perverse incentive structures tend to favour land uses that may be harmful to the environment and unsustainable in the long term. Policies and incentive structures are presently based on inadequate information about the full costs and implications of alternative land use options in TFCAs. This is particularly important in relation to decisions relating to disease control strategies that are aimed at improving conditions for beef exports, at the expense of biological conservation and alternative land-use options.*
2. *There is a lack of sound spatial and temporal information on biodiversity, land use and human welfare (including the incidence and prevalence of diseases) in TFCAs throughout the region. The lack of appropriate information constrains conservation and development planning by resource managers and villagers (see Getz *et al* 1999).*

3. Local scale constraints

1. *Infrastructure is generally poorly developed in border areas, which constrains cross-border interchange between resource managers (security regulations and cross-border travel restrictions are also serious constraints).*
2. *Information on the development of TFCAs tends to be confined to the higher echelons of government agencies, with the result that those on the ground or in a position to make positive contributions to TFCA development are excluded and develop negative attitudes to the process.*
3. *Social capital, trust, and the capacity for self organisation and institution building (i.e. for resource management) at local levels is generally weak and will require time to develop and will involve high transaction costs.*
4. *Diseases and human-wildlife conflict issues tend to be seen as the responsibility of the state and its agents and are managed through centralised command and control systems. The result is that potential local innovations and ownership of solutions to such problems is stifled.*

References to approximately 130 published papers and reports are appended to the report.

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1. Introduction

This review examines three questions. (1) What is the wildlife-livestock-human interface? (2) What would represent conservation and development success at the wildlife-livestock-human interface? (3) What are the key constraints to achieving conservation and development success at the interface? The major part of this review deals with the third question but answers to the first two questions provide a necessary prelude to dealing with the constraints to conservation and development success at the interface in southern African³ transfrontier conservation areas (TFCAs).

The review also briefly summarizes some of the major characteristics of the interface in relation to the fourteen TFCAs being developed in southern Africa.

1.1 *The wildlife-livestock-human interface*

What is the wildlife-livestock-human interface? Broadly construed the interface may be that humans, livestock, and wild animals come into contact in ways that can result in the transmission of diseases between them. Since some 71% of zoonotic diseases of humans originate from wildlife (Jones *et al* 2008), and new diseases are emerging, the interface is clearly important (Wilcox and Colwell 2005; Smith and Guégan 2010). The interface is mostly restricted to rural areas but is increasingly encroaching on peri-urban areas (e.g. Lyme disease (Schmidt and Ostfeld 2001), echinococcosis (Morgan *et al* 2004), and tuberculosis (Cosivi *et al* 1998; Alexander *et al* 2002). In this review I focus on the interface as it is experienced in the TFCAs of southern Africa that are characterised by core protected areas, such as national parks that carry a wide range of mammal species, within a matrix of human occupied land under agro-pastoralism. The SADC definition of a TFCa is “*the area or component of a large ecological region that straddles the boundaries of two or more countries encompassing one or more protected areas as well as multiple resources use areas.*”

It is at this interface, between wildlife and farming areas, that disease issues of considerable economic importance (e.g. foot and mouth disease, Thomson 2008) come to the fore and have multiple impacts on human livelihoods, livestock health and marketing, and on the conservation of biodiversity (Kock 2004, Kock 2005, Osofsky *et al* 2005, 2008).

While the boundaries of state protected area are clearly mapped and often marked, the boundaries of TFCAs are not and published reports often show marked differences in the boundary for any particular TFCa (Andersson *et al* in press).

1.2 *Characteristics of the interface in southern African TFCAs*

There are presently fourteen TFCAs being developed in southern Africa (Figure 1, Table 1). They range in size from the c. 2,000 km² Chimanimani TFCa bordering Zimbabwe and Mozambique, to the approximately 400,000 km² Kavango-Zambezi (KAZA) TFCa, which includes areas from five countries, namely, Angola, Botswana, Namibia, Zambia and Zimbabwe (Figure 1, Table 1). The Great Limpopo,

³ Southern Africa is taken to be the area encompassed by Angola, Zambia and Tanzania and the countries lying to the south of these.

Mapungubwe and Lubombo each involve three countries while the remainder involve only two countries. All of the areas, except the Kgalagadi Transfrontier Park, include multiple use zones that include small-scale peasant farmers who grow crops and keep livestock. For the most part TFCAs fall within agriculturally marginal zones with limited infrastructure and poor access to markets.

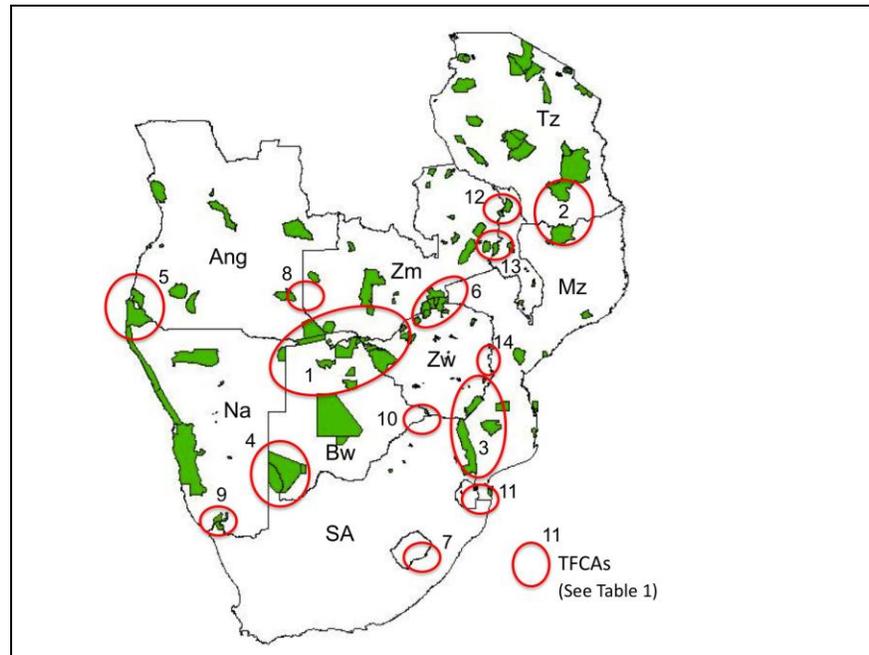


Figure 1. Major national parks and reserves in southern Africa and Transfrontier Conservation Areas (TFCAs) under development in the region. The names of the TFCAs are listed in Table 1. (Source: Cumming and Atkinson - submitted 2011).

The extent and complexity of the interface within TFCAs is reflected in their size, the number of protected areas, the extent of the non-protected matrix or multiple use zone within the projected TFCA boundary and the variety of land uses within that zone (Table 1). Human population densities and social and cultural diversity add further dimensions of complexity. The presence of a wide range of diseases in some cases adds further complexity and serves to highlight the importance of health issues at the wildlife-livestock-human interface (Table 1).

Clearly the largest and most complex TFCA is KAZA with some 44 protected areas that include national parks, safari areas and state forest areas. These are distributed in five clusters but with minimal sharing of international boundaries, which means that the major protected area complexes will need to be joined by wildlife corridors that will pass through communal lands (Cumming 2008). The Lubombo TFCA, although much smaller in area, involves three countries but with several unconnected protected areas and considerable land use and cultural complexity (Table 1; Smith *et al* 2008; Jones 2006). Perhaps the least complex is the Kgalagadi Transfrontier Park (TFP), which has an uninterrupted international border between two countries and involves only three contiguous protected areas (Figure 1, Table 1). It has a long history of cooperative management (Schoon 2008), low human population densities, and limited agricultural activities on its boundaries.

Table 1. A summary of the size and some key features of TFCA in southern Africa. (a) Protected areas within TFCA and indicators of levels of fragmentation, (b) land uses outside of protected areas but within TFCA, and (c) important diseases that influence land use and dynamics at the wildlife-livestock-human interface within TFCA. (PA = state protected areas without resident communities*, CL = Communal Lands, Symbols: - absent or none, + present, / some park boundaries shared across international boundaries, and ? status not known or uncertain) (Sources: Cumming *et al* in press, Cumming and Atkinson in press)

TFCA	No. Countries	Area km ²	Protected Areas				Land use in Matrix					Important Diseases											
			No. State PAs	% of TFCA in State PAs	Shared National Borders	No. Corridors	Human Populat. Density (people/km ²)	Private and/or CL Conservancies	Crops	Livestock	Malaria	African Trypanosomiasis	Bovine Tuberculosis	Foot and Mouth Disease	Rabies	African Swine Fever	Theileriosis	Anthrax	Malignant Catarrhal Fever	Canine Distemper Virus	Rift Valley Fever	Brucellosis	
1. Kavango-Zambezi	5	400,000	38	22	/	5	<5	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2. Niassa –Selous	2	96,200	2	91	-	1	5-25	-	+	-	+	+	?	+	+	+	+	+	?	+	?	+	
3. Great Limpopo	3	87,000	5	53	/	1	5-250	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4. Kgalagadi TFNP	2	37,256	3	100	+	0	<5	-	-	-	-	-	-	-	-	+	-	+	+	+	+	+	+
5. Iona—Skeleton Coast	2	32,000	2	100	+	0	<1	-	-	-	-	-	-	+	-	?	-	+	-	-	+	-	-
6. Mana-Lower Zambezi	2	25,000	9	80	+	0	5-25	-	+	-	+	+	-	+	-	+	+	+	-	+	?	+	+
7. Drakensberg-Maloti	2	13,000		?	/	0	0-250	-	+	+	-	-	-	-	+	?	-	+	-	-	?	-	+
8. Liuwa Plain-Mussuma	2	10,000?	1	?	?	0	5	-	?	?	+	+	?	+	+	+	-	+	?	+	?	+	+
9. Ais-Ais – Richtersveld	2	6,681	2	76	+	0	5	-	+	+	-	-	-	?	-	-	+	+	-	-	?	-	-
10. Greater Mapungubwe	3	4,872	3	40	/	1	5-25	+	+	+	+	-	-	+	+	+	-	+	+	+	+	+	+
11. Lubombo	3	4,195		?	/	?	5-250	?	+	+	+	-	+	+	+	?	+	+	+	+	-	?	+
12. Nyika-Mwaza Marsh	2	4,134	3	70	/	3	<5-	-	+	+	+	+	?	+	+	+	+	+	-	-	?	-	+
13. Kasungu-Lukusuzi	2	2,316	2	60	-	1	5-250	-	+	?	+	+	?	+	+	?	+	+	-	-	?	-	+
14. Chimanimani	2	2,056	2	?	+	0	5-250	-	+	+	-	-	?	+	+	+	+	?	-	?	?	?	?
Total		755,910																					

Note: In southern Africa there are two trypanosome species, one causes nagana of domestic stock and the other human sleeping sickness.

* The six conservation areas in Angola have resident populations within their borders and are not included in the figure of 38 state protected areas for the KAZA TFCA

2. Conservation and development success

What would represent conservation and development success at the interface?

The success or otherwise of conservation and development interventions can only be judged effectively and reliably against clear baseline data established at or before the intervention and in relation to clear objectives and indicators of success. While many objectives have been propounded for transfrontier parks (TFPs) and transfrontier conservation areas (TFCAs) in southern Africa (e.g. Hanks 2003), international treaties and memoranda of understanding for the creation of TFPs and TFCAs, there is a dearth of baseline information and clearly enunciated indicators against which to evaluate progress. Progress reports against stated objectives are generally lacking or unavailable and published information on constraints to achieving conservation and development success in TFCAs is consequently scarce (Griffin 1999, Singh 1999). There is, however, a considerable social science literature relating to the concept of peace parks, international governance and cooperation relating to TFCAs (e.g. Duffy 2006, Schoon 2008, Büscher and de Beer 2011, Schoon and York 2011).

2.1 Conservation objectives

Conservation success could be defined in terms of maintaining, or restoring, biodiversity at several scales from the level of genes, through species populations, to habitats and functional ecosystems and services (Noss 1990) within a land use mosaic covering the scale of the TFCA in question.

In very general terms the primary objective of TFCAs is to conserve biodiversity in conjunction with sustainable development for the people living within the areas they encompass. However, the conservation of biodiversity is not always clearly stated as a specific objective in the international agreements between countries. For example, neither the treaty for the Great Limpopo Transfrontier Park (GLTP), nor the MoU for the Kavango-Zambezi TFCA, explicitly includes the conservation of biodiversity (or fauna and flora) as an objective.

The six objectives contained in the Great Limpopo Transfrontier *Park*⁴ treaty do not include the word “conservation.” Instead they focus on ecosystem integrity and processes, ecosystem management, and management of biological resources as reflected in the first three objectives (the remaining three objectives deal with social and development matters and are listed in the following section) as quoted below with the emphasis in bold added:

- (a) foster trans-national collaboration and co-operation among the Parties which **will facilitate effective ecosystem management in the area** comprising the Transfrontier Park;
- (b) **promote alliances in the management of biological natural resources** by encouraging social, economic and other partnerships among the Parties, including the private sector, local communities and non-governmental organisations;
- (c) **enhance ecosystem integrity and natural ecological processes** by harmonising environmental management procedures across international boundaries and striving to remove artificial barriers impeding the natural movement of wildlife;

⁴ Conservation and development objectives for the GLTFCA do not appear to have been formally developed by the GLTP Joint Management Board. The Treaty does, however, make provision for the later development of a transfrontier conservation area.

Similarly, the MoU for the KAZA TFCA does not mention conservation or biodiversity and focuses on ecosystem management, and enhancing ecosystem integrity and processes as indicated in the following three objectives.

- (a) Foster trans-national collaboration and co-operation in **implementing ecosystems** and cultural **resource management** through the establishment and development of the TFCA;
- (b) **Promote alliances in the management of biological and cultural resources** and encourage social, economic and other partnerships among their Governments and stakeholders;
- (c) **Enhance ecosystem integrity and natural ecological processes** by harmonizing natural resources management approaches and tourism development across international boundaries.

The KAZA website (<http://www.kavangozambezi.org>) includes a brief statement on measures of success with the following measure relating to conservation “ *having a secure core conservation estate with corridors for wildlife movement.* ”

Given that international treaties and MoUs may deliberately not include very specific objectives and measures of success, it would be reasonable to expect these to appear in the management plans that are developed to give effect to the treaties. However, the Integrated Development and Business Plan for the Great Limpopo Transfrontier Park (2009) is silent on conservation objectives for the park, let alone for the larger TFCA. The plan deals at length with administrative and management activities but does not expand on what these activities are expected to deliver in terms of conservation outcomes. Similar considerations apply to the Integrated Development Plans for the Zambian and Zimbabwe components of KAZA (Government of Zambia 2008, Government of Zimbabwe 2010).

2.2 Development objectives

Development success at the interface can be defined in terms of improved livelihoods and welfare of people living within a TFCA, as well as in terms of the TFCA contribution to local, national and regional economies.

The social, cultural and development objectives as stated in the GLTP Treaty are as follows:

- (a) Facilitate the establishment and maintenance of a **sustainable sub-regional economic base** through appropriate development frameworks, strategies and work plans;
- (b) **Develop trans-border eco-tourism** as a means of fostering regional socio-economic development; and
- (c) Establish mechanisms to **facilitate the exchange of technical, scientific and legal information** for the joint management of the ecosystem.

and those for the KAZA TFCA are:

- (a) **Promote** alliances in the management of biological and cultural resources and **encourage social, economic and other partnerships among their Governments and stakeholders**;
- (b) Enhance ecosystem integrity and natural ecological processes by **harmonizing** natural resources management approaches and **tourism development across international boundaries**;
- (c) **Develop mechanisms and strategies for local communities to participate meaningfully in, and tangibly benefit from, the TFCA**; and

(d) Promote cross-border tourism as a means of fostering regional socio-economic development.

Article 1 of the Maloti-Drakensberg TFCA MoU between Lesotho and South Africa provides the following objectives:

“ARTICLE 1
OBJECTIVES

(1) The objective of the MoU is to establish a framework for collaboration between the Parties for the purpose of conserving biological diversity and promoting sustainable development in the Area.

(2) To attain the objective set forth above, the Parties undertake -

- (a) to identify those portions of the Area containing important elements of biological diversity and to secure their long term conservation status by preparing and implementing a management plan for key components while countering critical threats;*
- (b) to retain the Area as far as may be possible in its natural state as an undivided ecosystem for the benefit of biological diversity, research, tourism and the community at large, with particular focus on those communities living therein;*
- (c) to institute the integrated land-use planning and management programmes for the protected areas and their transition zones;*
- (d) to develop and expand an integrated community-based conservation and development programme;*
- (e) to facilitate a sustainable (including environmental, social and economic sustainability) nature conservation development and ecotourism investment programme based on the natural, social and cultural resources of the Area;*
- (f) to facilitate cooperation between Lesotho and South Africa on sustainable development.”*

Here the focus on conservation is emphasised and stated more clearly than in the previous Treaty and MoU for the GLTFCA and KAZA, respectively.

The “General Trans-Frontier Conservation and Resource Area Protocol” between the governments of Swaziland, Mozambique and South Africa for the Lubombo area grew out of a Spatial Development Initiative (Jourdan 1998; Koch *et al* 1998) and its major focus is on development rather than conservation. The fourteen objectives listed in Article 2 focus entirely on development issues, with environmental matters arising only in relation to their importance in underpinning development, as for example in the second objective

“The TFCA Objective of the parties with respect to the region as particular TFCA are (sic) to create an enabling framework to facilitate the following:”

“(2) ecologically and financially sustainable development, the sustainable utilisation of the natural resource base, and the maintenance of ecosystem function through holistic and integrated planning and management;”

and

“(10) the recognition and accommodation of traditional activities and culture of local communities in the TFCA’s (sic) taking into account the maintenance of ecosystem integrity.”

The preamble to the Protocol recognises “the significant interdependence of economic development and conservation in the region” and the “harmonisation” of “approaches and regimes ... of conservation and land management.” The preamble recognises the biological importance of the Maputoland centre of endemism and the need to promote the objectives of international conventions such as the Convention on Biodiversity (CBD) but these are not effectively captured in the objectives under Article 2 of the Protocol.

In summary then it is clear from this sample of four TFCAs in the region that, apart perhaps from the Maloti-Drakensberg TFCA, the primary focus is on development and that both conservation and development objectives are generally vague and without clear indications of what might be expected on the ground.

None of the four sets of objectives deal explicitly with the legal basis, in international or national law, under which they operate other than to mention international conventions such as the Convention on Biological Diversity (CBD). They are mostly silent on issues of the rights of people living within TFCAs - a matter that is taken up below under section 5.1 Legal and policy frameworks and governance issues.

2.3 Indicators of TFCA conservation and development success

The Convention on Biodiversity (CBD), the Millennium Development Goals (MDGs), the New Partnership for Africa’s Development (NEPAD) and related conventions and international programs have generated a “growth industry” in the development of indicators to assess progress towards their goals. These have influenced the indicators used at national levels to report progress against these goals and at sub-national levels by environmental and agencies, particularly in South Africa (Le Maitre *et al* 2002). However, these developments, and the very extensive literature on the topic, appear to have had little influence on the TFCA movement⁵. A possible exception is the Maloti-Drakensburg TFCA where at least one intensive study of the applicability of a sustainability assessment was conducted (Letsela 2008). Environmental and development indicators were developed with communities in Lesotho as a central part of Letsela’s (2008) study.

2.3.1 Biodiversity and conservation

Biodiversity and conservation indicators arose with the increased concern at the loss of biodiversity and the rise of the environmental movement in the 1970s and early 1980s. Noss (1990), in a landmark paper, presented an enduring definition of biodiversity and provided guidelines for selecting biodiversity indicators. He argued that it was necessary to develop a matrix of indicators that covered at least four scales (regional landscapes, community-ecosystem, population-species, and genetic) with three types of indicator at each scale (composition, structure and function). More recently the Cambridge Conservation Forum (Kapos *et al* 2008) and the Biodiversity Indicators Partnership (a consortium of leading conservation agencies) have generated a range of material and manuals to assist in improving the planning, monitoring and assessment of conservation action (Bubb *et al* 2010, 2011). It is clear from the

⁵ For example a Google Scholar search for “Biodiversity indicators” + TFCAs provided seven hits, three of which related to CBD reports and none related directly to TFCAs.

recent literature that planning conservation outcomes and establishing indicators and associated indicators of performance should be a highly participatory process that involves all stakeholders. Experience indicates that the standard practice of project implementers setting targets and designing indicators without the full involvement of those on the ground, the *de facto* resource managers, seldom works (e.g. Hogkinson 2009, Bubb *et al* 2010 and 2011).

Despite the difficulties of establishing acceptable and workable indicators for conservation success in southern African TFCA, there are some that could readily be implemented. Perhaps the most important is the **trend in land use and land cover change** within TFCA and at the interface between protected areas and the surrounding matrix. The baseline benchmarks could readily be set using past satellite imagery and would meet Noss's regional landscape scale dealing with composition and the "identity, distribution, richness and proportions of patch (habitat) types and multipatch landscape types" and changes in these with time. Structure of the landscape could also be monitored remotely to reveal such features as heterogeneity, connectivity, and levels of fragmentation. Aspects of function and disturbance (fire, flooding, erosion, land degradation and land use change) at the regional landscape scale can also be monitored using remote sensing. For many TFCA data are available on trends in large mammals. For the KAZA TFCA aerial censuses of large mammals, particularly elephants have been conducted regularly since 1980 in the Zimbabwe components of the TFCA as well as in northern Botswana. As part of the development of communal conservancies in Namibia regular monitoring of large mammals populations is taking place. However, while these data provide valuable information, they are not being used to inform any clearly enunciated objectives or indicators. Marked declines in many species populations have been reported for the Okavango Delta (Chase 2011) and for Hwange National Park (Valeix *et al* 2007). Comprehensive, long-term environmental data are available for the Kruger National Park (e.g. Du Toit *et al* 2003) but comparatively little is available for the remainder of the TFCA. Information on national trends was summarised by Cumming (1999a, 2004).

A comprehensive assessment of biodiversity in the KAZA TFCA (The Four Corners Area) by the Zambezi Society and the Biodiversity Foundation for Africa was undertaken in 2003-2004 (Timberlake and Childes 2004a, 2004b). The assessment covered geomorphology, ecological processes, vegetation and a wide range of vertebrate and invertebrate taxa, as well as issues relating to elephant movement and impact and large mammal migrations in the area. While successfully synthesizing a great deal of information on the KAZA area the report does not provide a set of baseline data against which progress in biodiversity conservation within the TFCA can be measured.

2.3.2 Development

Indicators for development success at the wildlife-livestock-human interface are more complex than those relating to conservation and involve a wide range of capital assets, as well as measures of human wellbeing; these do not appear to have been developed for any of the southern African TFCA. A socio-economic baseline survey was conducted at selected sites in the Caprivi Strip and the Sioma-Ngwezi area in Zambia in the central part of the KAZA TFCA in October-November 2006 (Scovronick *et al* 2007). A survey of tourism in the KAZA TFCA, conducted in 2004 by Suich (2008), noted that out of a population of more than one million people approximately 5,500 were employed in the tourism industry. Martin (2006) completed a detailed study of potential returns to communities in the Mudumu Complex in the Caprivi from wildlife-based enterprises. He also developed a business plan for the Kafue National Park and neighbouring Game Management Areas that showed a potential to increase tourism income in the area from less than \$5 million a year to nearly \$50 million a year over twelve years (Martin 2007).

Reports of baseline surveys for other TFCAs relating to development and human welfare at the interface have not been located.

Specific information, let alone baseline data and indicators, for human health at the wildlife-livestock-human interface for southern African TFCAs does not appear to be available other than for the long term studies on the western boundary of the Kruger National Park⁶. However, these studies are more related to health and welfare in a densely populated lowveld communal area than with interface issues.

2.3.3 Conservation and development trade offs

Pristine wilderness areas with no human impacts do not exist in Africa. Hominids have shaped the continent and its flora and fauna for more than a million years. Livestock, in the form of cattle, sheep and goats, are a relatively new component of ecosystems in southern Africa and only reached the region with the arrival of Bantu iron-age cultures approximately 2,000-2,500 years ago. The still more recent creation of protected areas, in which human activities and impacts are minimised, is less than a century old and in most of the TFCAs in the region, less than 70 years old. The wildlife-livestock-human interface in relation to conservation is thus a very recent phenomenon. Interactions between wild animals, domestic livestock and humans have been greatly magnified by rapidly growing human and livestock populations, expanding agriculture, and land use-land cover change over the last century - changes in Zimbabwe provide an illustrative example (Figure 2).

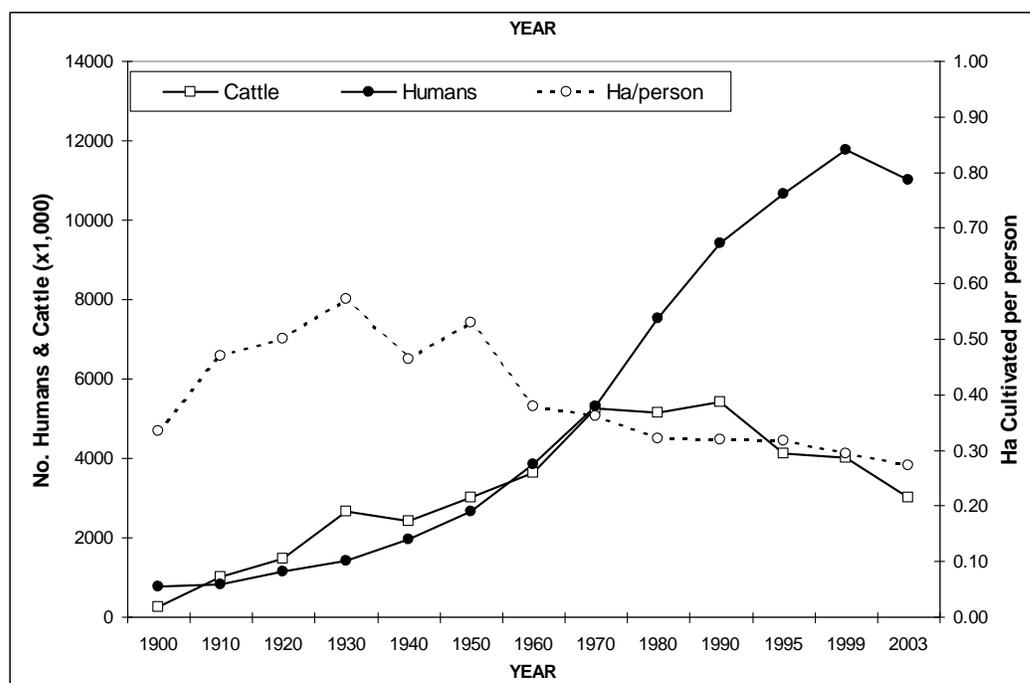


Figure 2. Changes in human and cattle numbers between 1900 and 2003 in Zimbabwe and changes in hectares (ha) cultivated per person in Zimbabwe. (Source: Cumming 1995).

⁶ See the Agincourt studies - <http://www.wits.ac.za/Academic/Health/PublicHealth/Agincourt/>

Despite their large size many key conservation areas continue to experience declining populations of large mammals (e.g. sable, roan and tsessebe in Kruger NP, mesoherbivores in Hwange NP and the Okavango Delta). The causes are necessarily directly related to human activities, such as illegal hunting, within protected areas. Soule *et al* (1979) long ago drew attention to the loss of species from East African protected areas; more recently Western (2006) has catalogued the decline of large mammals in Amboseli National Park; and Ogotu *et al* (2011) the decline in the Mara region of Kenya. A key issue then is whether, in southern Africa, the creation of larger landscapes devoted to conservation and development can reverse these trends, and whether the issues arising at the interface can be mitigated to the benefit of both conservation of biodiversity and the human populations living in these areas.

Given the difficulties in conserving the full range of biodiversity in existing protected areas it is clear that there will be substantial trade offs between conservation and the surrounding matrices that form part of the TFCAs. These trade offs will necessarily involve land uses and their distribution with TFCAs, the use of natural resources and the distribution of benefits accruing from their use. From a conservation perspective, the trade off is between what can be realistically conserved in multiple use zones (i.e. in the matrix) as opposed to an area devoted entirely to agriculture and the resulting hard edge against protected areas. A likely scenario is indicated in Figure 3.

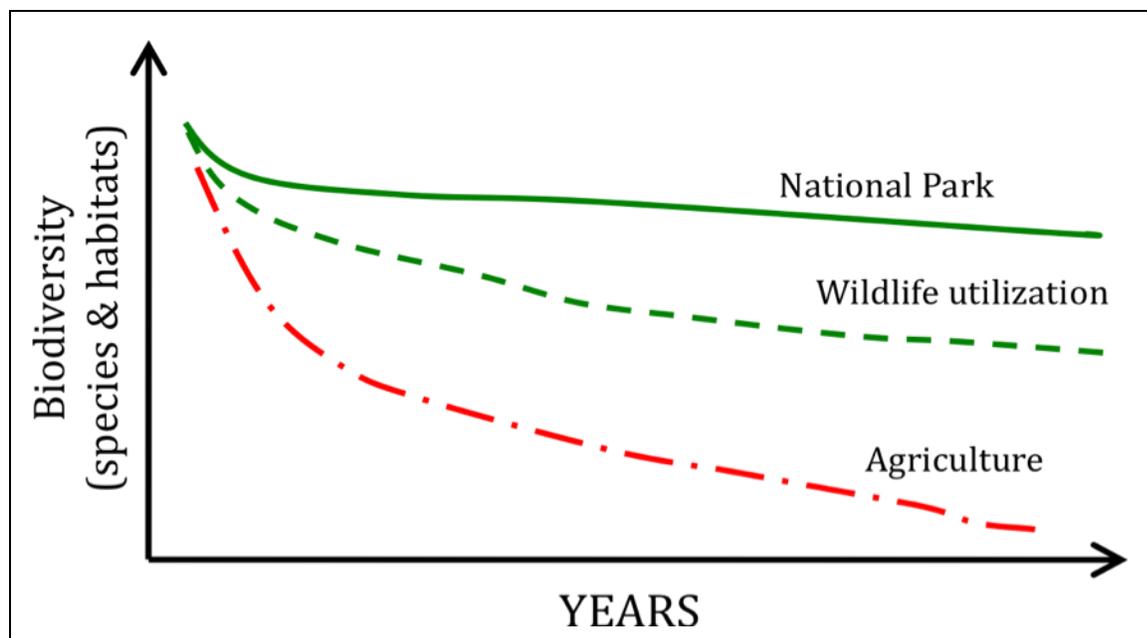


Figure 3. Likely changes in biodiversity under different land uses within a TFCa. (A wildlife utilisation zone could also include livestock and be managed as a multispecies animal production system).

The only study of tradeoffs in the planning of a TFCa appears to be that carried out for the Lubombo (Smith *et al* 2008). Conservation planning tools to critically assess conservation and development objectives and needs have been developed and used in South Africa but, regrettably, not yet in TFCAs (Cowling *et al* 1999, 2003; Knight *et al* 2006a, 2006b; Knight and Cowling 2007; Rouget *et al* 2006).

3. Constraints to achieving success

The KAZA website includes the following statement on measures of success:

The measures for success include; having a secure core conservation estate with corridors for wildlife movements; noticeable stakeholder awareness of KAZA; implementation plans for the development of KAZA in place, costs quantified and sources of funding, including funds generated by the partner countries themselves; appropriate protocols and plans in place; and most importantly a signed Treaty establishing the KAZA TFCA
(<http://www.kavangozambezi.org/faqs.php>) (accessed 6th June, 2011)

Given the lack of clear and explicit overarching measures of success for the southern African TFCA the problem of how to judge conservation and development success arises. And, more specifically, in the absence of clear indicators, how does one assess *constraints* to achieving conservation and development success in southern African TFCA?

For the purposes of this report the broad conservation and development objectives for TFCA will be to⁷:

1. Secure existing state protected areas against encroachment
Indicator: No encroachment (e.g. agriculture, settlements) into protected areas - ongoing satellite surveillance
2. Maintain, or where appropriate restore, biodiversity in core protected areas
Indicator: Trends in selected species and habitats of interest (large mammals, endemic and endangered species of plants, animals, and habitats) stable or improving
3. Establish functional wildlife corridors between core protected areas where these do not share boundaries
Indicator: Functional corridors in place between TFCA protected areas and evidence of animal movement between protected areas and through designated corridors
4. Establish policies and legal frameworks that provide incentives for local communities and landholders to benefit from wildlife- and natural resource-based enterprises (diversified tourism, and sustainable harvesting of natural resources) to the extent that they can invest in, and sustain, wildlife as a form of land use in the TFCA
Indicator: Positive attitudes towards wildlife increase at local level and result in local people investing in wildlife as a land use; wildland areas maintained or extended in the TFCA matrix; populations of economically important species of plants and animals and their habitats stable or increasing
5. Enhance human food security and wellbeing through improved and diversified production systems (crops, livestock, forestry, non-timber forest products) and development of market chains and infrastructure compatible with the overall biodiversity conservation goals of the TFCA

⁷ It is unlikely that baseline data at the various scales required is available to assess progress in meeting these objectives and indicators. However, simple as they are, they do encompass, or subsume, the objectives elaborated in TFCA treaties and MoUs, serving to translate them into measurable components of conservation and development progress.

Indicators: Improving trends in household incomes, nutritional status of children, incidence of disease (in people, domestic animals, and crops), levels of education, declining *rates* of human population growth

The following review of constraints to conservation and development success examines each of the major components, such as policy and legal frameworks, protected area management, returns to rural households, governance issues, and disease management strategies, relating to the development of TFCA. These issues occur at different ecological scales and at different social and political levels. International, regional and national laws and policies provide an overarching framework that has a major, if not overriding influence on the development of TFCA and provide an initial starting point from which to examine constraints. The remaining issues, such as the status of protected areas, land use in the matrix, information and communication, tend to be more localised and specific to particular TFCA or areas.

3.1 Legal and policy frameworks and governance issues

There have been several reviews of the legal and policy basis for establishing TFCA in southern Africa. An early review by Mohamed-Katerere (2001) emphasised international, regional and national law and obligations, and human rights. She examined four critical legal issues: (a) what is the basis for collaboration? (b) what human rights obligations are created in international law that should be taken into account in developing TFCA initiatives? (c) do national law regimes provide adequate support for the realisation of key [human rights] objectives? (d) do TFCA agreements create adequate systems for the realisation of these key objectives [i.e. the incorporation of key rights and values] of international law and the SADC Treaty?

Both international law and the SADC treaty provide an enabling framework for collaboration in natural resource management across boundaries in terms of the responsibilities pertaining to sovereignty, state responsibility and good neighbourliness. However, as Mohamed-Katerere (2001) notes “these must be in keeping with its [SADC Treaty] overall objective, namely, the promotion of economic growth, alleviation of poverty, and enhancement of quality of life for the peoples of southern Africa.” The obligations imposed by international law relate primarily to human rights and “... recognise the need for local participation that is pro-active and that creates opportunities for individuals and groups to participate in the formulation of management strategies as well as in the implementation thereof. Participation is more than simply consultation, but implies some control over outcome” (Mohamed-Katerere 2001). The implications of national legal systems are many but the differences in these in relation to stakeholder rights make it difficult to define legal and policy TFCA initiatives. Some of these difficulties relate to conflicts between traditional and general law, land tenure, land use and planning that constrain effective development of TFCA. And, “In most countries tenure rights of local communities are insecure or non-existent when it comes to wildlife ... this reduces communities’ abilities to develop and diversify their livelihoods and contribute to alleviating poverty” (Mohamed-Katerere 2001). On the question of whether the TFCA agreements establish systems for the incorporation of key rights and values, the agreements are found wanting. The SADC Protocol on Wildlife Conservation and Law Enforcement of 2003 “... articulates important principles but fails to create meaningful systems for their implementation” - a result of a strong emphasis on national sovereignty (Mohamed-Katerere 2001). There are no mechanisms to hold states to the commitments they may make in TFCA agreements about providing benefits to

communities and there are no mechanisms for citizens to hold states to these commitments. In a brief conclusion Mohamed-Katerere includes the following pertinent statement:

“If transboundary natural resource management is to go beyond simply promoting better conservation systems and increased financial benefits to the national level, and create opportunities for improving local livelihoods, then collaboration, and the agreements need to be based on a human rights approach. Human rights approaches must recognise existing rights, and re-establish historically lost rights that people have over, and to, natural resources. People in the area of the initiative need to be at the centre of developing such initiatives, not just through consulting but in defining and designing the programmes. This requires a conceptual and practical shift from the State as owner of the resources to the State as trustee.”

I have dealt at some length with this issue because the land included in most TFCA, as opposed to TFP, comprises a very large proportion of community land and, as I have argued elsewhere, with particular reference to the KAZA TFCA (Cumming 2008), the full engagement of local communities will be crucial to its success.

In a brief global review Singh (1999) identified the following social and economic factors that slow or impede the development of TFCA:

- Lack of funding, high transaction costs and political instability
- Time involved in establishing a TFCA
- Unequal protected area status on either side of the international border
- Unequal management capacity among neighbouring states
- Lack of support from local communities
- Vastly different languages and cultures

Reviews of laws and policies governing the KAZA and the Great Limpopo TFCA were completed by Jones (2008, 2009). He found that for the most part existing legislation provided a basis for effective transboundary collaboration provided adequate attention was given to harmonising approaches in TFCA management plans. However, as Mohamed-Katerere’s (2001) analysis shows, a legal basis for enforcement is lacking. As in the previous studies, Jones (2008, 2009) found that there were shortfalls in legislation and policy governing community rights to the management of wildlife and the benefits they might derive from natural resources.

In the most recent review of wildlife law in the SADC region Cirelli and Morgera (2010) essentially endorse the need for the development of the legal requirements that are reflected in the constraints outlined by earlier authors. There has unfortunately been little movement in addressing the legal and policy issues highlighted more than a decade ago.

None of the reviews referred to above cover the legal aspects relating to conflicting land uses and land-use policies, which emerge as a crucial constraint to the development of TFCA and the conservation of biodiversity. This is particularly true of those TFCA, such as the KAZA TFCA, that encompass large areas of communal land and where domestic livestock form an important component of peoples’ livelihoods (Table 1). Thomson and Penrith (2010) recently completed a comprehensive review of the national policies and laws relating to animal health and the wildlife-livestock interface for those countries

involved in the KAZA TFCA, namely, Angola, Botswana, Namibia, Zambia and Zimbabwe. They noted that the extension of Foot and Mouth Disease (FMD) free zones was still being pursued and there was no indication of a change in policy despite the adverse effects on conservation and biodiversity. The eradication of tsetse also remained an objective. Zimbabwe was planning to re-establish its former FMD free zone and to eradicate buffalo where they occurred in this area. Buffalo form an economically important component of the safari hunting industry and such a move would have serious adverse impacts on the industry. A comparison of the relative values of the beef and tourism industries in Botswana showed that agriculture contributed 1.7% of GDP of which 1.36% was from livestock while tourism contributed 5% to GDP (Thomson and Penrith 2010). Furthermore the predicted growth rates of the two industries over the next few years differed greatly; livestock was expected to grow at 2.2% over the next seven years while tourism was likely to reach 12% of GDP by 2016 (Thomson and Penrith, 2010). The authors concluded that disease control legislation in the five countries “is enabling and could potentially be used to support more or less any animal health policy.”

3.2 Wildlife conservation and protected areas

TFCA in southern Africa vary considerably in the number and type of state protected areas within their broadly defined areas. The KAZA TFCA has some 38 state protected areas, including state forest land, while the Chimanimani TFCA and most other TFCA have only two (Table 1). The overall area of TFCA in the region is of the order of 756,000 km² or more than twice the size of Zimbabwe. Funds to conserve and develop this vast area are simply not available. The existing protected areas in the region are, with few exceptions, grossly underfunded. The primary national parks in the KAZA TFCA (Hwange, Chobe, and Kafue National Parks, and Moremi Game Reserve) were, for example, operating on budget deficits of between 62% and 92% of the amounts required for effective protection and management (Cumming 2008). Furthermore, populations of several species of large mammals in these areas are at very low levels or declining (Martin 2007; Valeix *et al* 2007; Chase 2011).

The funds available to manage protected areas vary greatly in the region and range from approximately \$10 per km² in countries such as Mozambique, Zambia and Zimbabwe to more than \$3,000 per km² in KwaZulu Natal, South Africa (Cumming 2005). Similar disparities occur in the staff complement employed to manage protected areas as well as in the availability of trained scientists. In South Africa the ratio of trained scientists to reserve area is more than one scientist to 300 km² compared to the rest of the region where it is less than one scientist to 3,000 km² of protected area (Cumming unpublished data). The lack of capacity in the region to provide the necessary research and monitoring services to the vast TFCA area in the region will clearly prove to be a major constraint to conservation success. Similar deficiencies almost certainly apply to the field of development capacity.

The data on funds and capacity for conservation raise the issue of disparities in capacity between countries involved in TFCA. Several authors have drawn attention to the difficulties that arise in cooperative venture when the parties involved differ in their resources and capacity to participate (Singh 1999; van der Linde *et al* 2001; Büscher and de Beer 2011). Socio-economic indicators for the southern African countries covered in this review (Table 2) reflect the considerable differences that exist in population densities, employment and wealth in the region and consequently in the ability of countries to effectively contribute to TFCA development.

Zimbabwe, for example, is situated in the centre of the region and has the lowest Human Development Index ranking of 169 out of a 169 countries in the world for which an HDI ranking was developed. The Gross National Income per capita (GNI per capita) for Zimbabwe at \$176 is also an order of magnitude lower than in most other countries in the region (Table 2).

Table 2. Areas and population densities of southern African countries with selected development indicators that highlight the disparities in wealth and human welfare in the countries involved in TFCAs in the region. (The Gini Index is a measure of wealth distribution, the higher the figure the greater the disparity between rich and poor, GDP = Gross Domestic Product, HDI = Human Development Index, GNI = Gross National Income, i.e. GDP + income from other countries).

Country	Area (km ²)	Population Density	% Rural Population	% of Workers Unemployed	Gini Index	% Pop below Poverty line	Agric output as % of GDP	Public debt as % of GDP	HDI Ranking	HDI Index	GNI per capita (USD)
Angola	1,246 700	10.8	41	25%	59	40.5	9.6	20.3	146	0.403	4,941
Botswana	581,730	3.6	39	7.5	63	30.3	2.3	22.6	98	0.633	13,204
Lesotho	30,355	63.4	66	14	63	64	19.7	24.1	141	0.427	2,021
Malawi	118,484	168.8	80	N/A	39	53	33.4	40.0	153	0.385	911
Mozambique	799,380	29.44	62	21	47	70	28.8	40.8	165	0.284	854
Namibia	824,292	2.6	62	52	71	55.8	9.0	20.0	105	0.606	6,324
South Africa	1,290,090	40.2	38	23	65	50	3.0	33.2	110	0.597	9,812
Swaziland	17,366	78.9	79	40	50	69	8.6	8.2	121	0.498	5,132
Tanzania	947,300	45.1	74	N/A	35	36	42.0	12.9	148	0.398	1,344
Zambia	752,618	18.4	66	14	51	64	19.7	24.1	150	0.395	1,359
Zimbabwe	390,757	30.9	62	95	50	68	19.5	149.0	169	0.140	176
Sources:	a	b	a	a	a	a	a	a	c	c	c

a. CIA - World Factbook <https://www.cia.gov/library/publications/the-world-factbook/geos/zi.htm> (accessed 16 June 2011) b. Calculated from population size and area provided in a. c. UNDP Human Development Reports for 2010. Human Development Statistical Tables (pdf): Table 1. Human Development Index and its Components <http://hdr.undp.org/en/reports/global/hdr2010/chapters/en/> (Accessed 16 June 2011)

3.3 Land and land-use policies in communal / traditional farming areas

Land under traditional or communal tenure forms a major component of most TFCAs in the region (Table 1). In KAZA it comprises some 75% of the projected area of the TFCAs. Although much of the area within Botswana and Zambia is legally designated as Game Management Area (GMA) or Wildlife Management Area (WMA), subsistence farmers inhabit these areas. The resources to manage and protect existing state conservation areas are inadequate and states do not have the resources to enforce conservation in the matrices of TFCAs. It is therefore clear that the conservation success of KAZA, and most TFCAs in the region, will depend on the extent to which communal farmers, the *de facto* resource managers in these areas, manage their land in ways that support conservation. They will only do so if it is to their benefit and if those benefits outweigh alternative land and resource uses.

Metcalfe (1999) provided a community perspective on the development of transboundary natural resource management and the creation of TFCA and listed the following ten constraints facing TFCA:

1. “Weak community property rights over land, wildlife and natural resources raise transaction costs. The single greatest weakness of CBNRM [community based natural resource management] is aborted devolution of rights and responsibilities (costs and benefits) to the lowest level of social organisation for common pool resources.
2. Dualistic local authorities (i.e. traditional vs. statutory) contest and raise transaction costs of TFCA.
3. Confusion between governance and tenure raises transaction costs - rights to land and natural resources should be with the landholders and not with the institutions (organisations) that represent them.
4. Community management takes time and has high decision-making transaction costs.
5. Large national programmes may marginalise community participation in planning and implementation. Programmes may be dominated by the interests of authorities, experts and the private sector.
6. NGOs may usurp mandates to fundraise and may not be sufficiently transparent or accountable in the management of access and use of funds.
7. Implementation may be a top-down process and communities, unlike other stakeholders may be marginalised at the local level.
8. Communities will require further skills, capacities and resources to effectively participate in the TFCA management process.
9. Cultural heritage aspects may be subordinated to conservation priorities, but both are equally important.
10. Protected areas may not provide adequate positive incentives to encourage compatible land uses. In some areas, rich protected areas lie alongside overcrowded degraded communal areas.”

There is a vast literature on community based natural resource management (CBNRM) and integrated conservation and development projects (ICDPs). For the most part CBNRM ICDPs have not met the expectations of communities or its proponents (e.g. Western *et al* 1994; Hulme and Murphree 2001; Child 2005; Torquebiau and Taylor 2009; Suich, Child and Spenceley 2009) and this holds true for most TFCA areas in southern Africa. The primary reason is that most countries have failed to effectively devolve resource access rights, benefits, and responsibilities for natural resources to local communities. Namibia is an exception, and the impressive development of community based conservancies and the associated increases in wildlife populations in these conservancies (Weaver and Skyer 2005, NACSO 2010) re-enforce the need for policy revision in the region. An earlier experience in radical and innovative policy reform occurred in the 1970s when South Africa, Namibia and Zimbabwe gave landowners the rights to use and benefit from wildlife on their land (Child 2005, Suich *et al* 2009). The result was rapid expansion of wildlife on private land.

Natural resource-based livelihood opportunities in southern African TFCA that can contribute significantly to rural development are considerable, but require important shifts in policy that will allow these opportunities to be realised (Dhliwayo 2007; Cumming *et al* in press). However, it must be appreciated that TFCA are essentially complex adaptive social-ecological systems and that there are no simple panaceas. Apart from the constraints of existing policies regarding access to natural resources,

there are also inherent constraints associated with building resource management institutions at the wildlife-livestock-human interface where common property regimes predominate (Ostrom and Janssen 2002; Ostrom 2007, 2009). There is considerable cultural and ethnic diversity at local scales at the interface (Andersson *et al* in press). Superimposed on this diversity are the often-opposing agendas and policies of competing ministries, government departments, and development and conservation NGOs. Even within the environmental sector, responsibility for natural resources is often (mostly?) divided between separate departments responsible for fisheries, forestry and wildlife, with the result that communities are disempowered from managing resources in a holistic way (Metcalf 2006; Metcalf and Kepe 2008).

Centrally directed resource management can result in mismatches between social and ecological scales resulting in weak feedback loops between management prescriptions and outcomes (Cumming *et al* 2006, Metcalf 2006). The mismatches lead to ineffective and unsustainable, if not destructive, resource management. The need for good communication between levels (officials, developers and communities) is important in assessing and influencing attitudes (Struhsaker *et al* 2005; Hodgkinson 2009). It is also important in relation to the mitigation of human-wildlife conflict (e.g. Browne-Nuñez 2008).

3.4 Diseases and disease management

The presence of important diseases that influence land use and dynamics at the wildlife-livestock-human interface within TFCA varies across the region (Table 1) and, in general, the larger the TFCA and the more fragmented it is, the greater the likelihood of disease related conflicts that may constrain conservation and development. In terms of regional impacts on conservation and rural development, trypanosomiasis and foot and mouth disease (FMD), and their control, have probably had the greatest impacts.

Historically, the management of disease issues at the wildlife-livestock interface often involved the eradication of wildlife to protect domestic stock. Large-scale game elimination programmes, for example, were used to control tsetse fly and nagana over very large areas of East and southern Africa (e.g. Hocking *et al* 1963; Child and Riney 1987). The eradication of buffalo in the 1960s from most of the southeast lowveld of Zimbabwe was used as a means to control FMD outbreaks (Condy 1979). With the advent of DDT, game elimination, as a means of controlling tsetse fly, was replaced by the use of insecticides. The major effects of tsetse eradication were, however, the opening up of large areas to human settlement and livestock. For example, rapid land use changes followed the eradication of tsetse in the Sebungwe region of northwestern Zimbabwe, with human population growth exceeding 60% in a decade and the area under cultivation increasing by 8% per annum (Cumming and Lynam 1997, Cumming 2008). In terms of conservation, the once rich wildlife resources of the region are now confined to a few ecologically isolated state protected areas under continuing threat. Potentially more economically sound and sustainable land use options based on wildlife were foreclosed in some communal land areas within the Sebungwe (Murindagomo 1997, Cumming 1999b). Similarly, the viability of wildlife ranching in the southeast lowveld of Zimbabwe was undermined by the eradication of buffalo (Child 1998), only to be partially reversed in the 1990s when cattle ranching collapsed in the 1991-92 drought. It became clear that wildlife-based tourism was a more viable and sustainable option than cattle ranching on freehold land (Abel *et al* 2006, Child 2009).

The constraints imposed on conservation, particularly of large mammals, in southern Africa by the interests of commercial cattle ranching and subsidised beef export markets have been, and are, considerable. The major focus has been on the establishment of FMD free zones and the associated game fences that cross the southern continent almost from coast to coast. The adverse impact of fences on conservation has been the subject of a large body of literature, with much of it covered in the recent compilation by Ferguson and Hanks (2010). Export markets, a major driver of FMD control strategies, are changing and Scoones *et al* (2010) have reviewed the likely impacts on beef production and export strategies for southern Africa. The associated problems of single resource decisions with multiple resource consequences have been emphasised by Cumming (2010) and Cumming and Atkinson (in press). Gadd (in press) has critically reviewed the impacts of veterinary fencing on the conservation of biodiversity in southern Africa.

Malaria is widespread in southern Africa and is prevalent in low-lying, marginal areas and in nine out of fourteen TFCA. It is an important cause of human mortality in these areas. Studies in East Africa indicate that land use and land cover change can increase the rates of infection through their effects on mosquito abundance and behaviour (Patz *et al* 2004; McMichael *et al* 2006; Myers and Patz 2009) but no studies appear to have been conducted on the topic in southern Africa.

Bovine tuberculosis (BTb) is emerging as an important disease at the wildlife-livestock-human interface. It is an introduced disease that appears to have reached southern Africa approximately 150+ years ago through imported infected cattle from Europe. The disease was first detected in buffalo on the southern boundary of Kruger National Park in 1990 (Michel 2002; Michel *et al* 2005) and has since spread northwards to the Limpopo River and recently has been found in buffalo in the Gonarezhou National Park (de Garine Witchatitsky *et al* 2010). The disease is also present in the Kafue lechwe in Zambia. Apart from the spread of the disease to other ungulates and to carnivores (e.g. Ferreira and Funston 2010), a major concern is the spread of the disease to domestic livestock and then to humans (Munyeme *et al* 2008), bearing in mind the high rates of HIV infection and compromised immunity in rural populations in the region. The disease is known to occur in at least three TFCA, whilst its status is uncertain in a further five. Brucellosis is widespread in the region (McDermott and Arimi 2002) and occurs in most TFCA. Its control is problematic and, as argued by Godfroid *et al* (2011), requires a “One Health” approach to its control.

Two diseases closely associated with domestic dogs are rabies and canine distemper. Rabies is widespread in the region and outbreaks amongst wild carnivores, domestic dogs, and frequent cases of rabies in humans are often associated with a break down in vaccination campaigns of domestic dogs, which seem to be the major reservoir (Rhodes *et al* 1998; Lembo *et al* 2010). The disease also spills over into wild carnivores with serious impacts on endangered species such as the wild dog. Domestic dogs harbour canine distemper and outbreaks in wild carnivores have had major impacts on populations of lions (Woodroffe *et al* 2007; Craft *et al* 2009) and wild dogs. Alexander and McNutt (2010), in a study in Botswana, reported subtle relationships between human behaviour, domestic dogs and the infection of wild dogs with distemper, and MacDonald and Laurenson (2006) examined the important linkages between human and ecosystem health and disease in endangered species. Malignant catarrhal fever depends on contact between wildebeest and livestock and is limited to those areas where wildebeest and cattle come into contact, which applies to four of the TFCA.

Anthrax occurs throughout the region and is potentially present in all of the southern African TFCA. Major die-offs of wild ungulates occur from time to time in protected areas, e.g. hippo in the Luangwa

National Park, and kudu in Malilangwe in a recent outbreak in the southeast lowveld of Zimbabwe. Zinsstag *et al* (2010) note “the persistence of anthrax in African livestock and humans because of poor quality of locally produced vaccines is in stark contrast with the advancement in our understanding of the genomics of *Bacillus anthracis* motivated by bio-terrorism fears.”

Tick and other vector-borne diseases, such as Rift Valley fever, are important and often neglected in remote rural areas where they can be a major problem for farmers with small holdings of livestock. Theileriosis (Corridor disease) depends of the presence of buffalo and the intermediate tick host for transmission to cattle, in which the disease is fatal.

Goats can form a key component of household stock in tsetse infested areas but their diseases appear to have received little attention and appear to be a neglected aspect of potential disease transmission at the wildlife-livestock-human interface.

3.5 Development and tourism

Much of the emphasis in earlier sections of this report has been on conservation success and constraints to conservation success. Land use and land-use policies play a central role in development but the wider issue of sustainable development and how that may be achieved in TFCA needs to be considered. Clearly, this initial review can do no more than briefly provide some pointers to the literature and the issues.

The objective and indicator for development in TFCA that was suggested earlier (page 11), draws attention to the importance of diversification of production and market chains for products and services. So far, the major official focus of TFCA development has been on tourism as the primary driver. Experience to date suggests that tourism has so far had a limited impact on the livelihoods of rural poor living within TFCA in the region (e.g. Jones 2006; Rylance 2008; Spenceley 2008b; Cumming *et al* in press). The ‘leakage,’ or outflow of revenue, from ecotourism sites is high (Suich 2008) leaving limited amounts to boost local livelihoods. Spenceley (2008a) provides a comprehensive introduction to responsible tourism in relation to conservation and development in southern Africa and highlights many of the constraints (Spenceley 2008c). Constraints to tourism development within the region included such matters as: corruption, laborious regulatory processes, lack of clarity on land rights, existing policies that do not necessarily translate into practice on the ground, capture of revenues by elites.

Spenceley (2008c) also summarises several examples of promising developments towards improved returns to rural communities from responsible tourism based on joint ventures between communities and public and private enterprises and associated supply chains for goods and services. A wide range of natural resource based opportunities exist that, given appropriate policies, could provide substantial returns to local communities (e.g. Cumming *et al* in press). These include the development of public-private-community partnerships in the development of lodges and hotels, photographic tourism associated guided tours and walking trails, safari hunting, the production of meat, and high valued products (e.g. oils for perfumes) from non-timber forest products.

In any consideration of natural resource-based land uses (i.e. Cumming 1999b) there is the critical need to consider issues of scale and sustainability (e.g. Walker 1999) and the critical thresholds of population to resource ratio in planning TFCA development (Cumming 2005). In many areas, existing natural resources are not able to support existing human populations that depend on external subsidies from off-

farm labour. The notion of “sustainable development” in relation to TFCA also requires critical scrutiny. The sustainable development definition suggested by Holling (2001) is one that may be most appropriate to TFCA approaches to development, namely,

“This process [adaptive cycles in a panarchy⁸] can serve to clarify the meaning of “sustainable development.” Sustainability is the capacity to create, test, and maintain adaptive capability. Development is the process of creating, testing, and maintaining opportunity. The phrase that combines the two, “sustainable development,” therefore refers to the goal of fostering adaptive capabilities while simultaneously creating opportunities. It is therefore not an oxymoron but a term that describes a logical partnership.” (Holling 2001).

4. Discussion and conclusion

The potential impacts of climate change and global trends in beef production and disease management have not been examined in this review. The Millennium Ecosystem Assessment for Southern Africa (Biggs *et al* 2004) examined a wide range of likely environmental scenarios under predicted changes in southern African climate. Cumming (2008) examined likely climate changes and large scale planning for the KAZA TFCA. Sustainability studies of southern African TFCA have been neglected. However, Schoon (2008) examined institutional development and robustness of the Kgalagadi and Great Limpopo Transfrontier Parks. He concluded that slow bottom-up institutional development, as occurred in Kgalagadi, resulted in greater adaptability in the face of disturbances than imposed top-down structures as happened in the GLTP. Regarding global trends in beef markets, Scoones *et al*'s (2010) comment is pertinent, namely, that southern Africa is trapped in a colonial paradigm vis-à-vis disease management and beef exports and needs to re-examine its options.

The constraints to conservation and development success covered in this review operate at three scales. The first is that of international laws and conventions, and national management capacities. The second scale, or level, is that of constraints at the TFCA scale that confront countries and resource managers. The local level, within TFCA at the wildlife-livestock-human interface, forms the third scale. A brief summary within this broad framework follows.

4.1 International and nationally generated constraints

1. *Legal frameworks and peoples' rights to resources and to engage in planning and influencing land-use and resource access plans. These are weak in southern Africa (although strongest in South Africa).* There is a disconnect between international legal instruments law and national legislation. National interests are presently overriding even the Southern African Development Community (SADC) instruments, as the recent suspension of the SADC Tribunal exemplifies.
2. *The Convention on International Trade in Endangered Species (CITES) and its listings on Appendix I and Appendix II of certain species constrains management options in TFCA.* For example, KAZA carries more than 250,000 elephant. However, because elephant are listed on

⁸ See Gunderson and Holling (2002)

Appendix II and the parties to the CITES convention consider it an endangered species, its value to communities at the interface is greatly reduced.

3. *There are wide differences between countries in their capacity to participate in, and contribute to, TFCA development (See Table 2). This factor also results in shortfalls in funding of protected areas, which should form the core of TFCA*s.
4. *There remain differences in policy and legislation between countries that hamper the management of natural resources across borders and the development of transboundary enterprises and markets.*
5. *Targeted conservation planning is not being implemented at the overall scale of TFCA*s which results in disconnects across boundaries and a failure to develop conservation and development plans.

4.2 Constraints within TFCAs and at the country level

1. *Existing land resource access rights to natural resources at national levels in most southern African countries prejudice the development of effective natural resource-based enterprises. Perverse incentive structures tend to favour land uses that may be harmful to the environment and unsustainable in the long term. Policies and incentive structures are presently based on inadequate information about the full costs and implications of alternative land use options in TFCA*s. This is particularly important in relation to decisions relating to disease control strategies that are aimed at improving conditions for beef exports, at the expense of biological conservation and alternative land-use options.
2. *There is a lack of sound spatial and temporal information on biodiversity, land use and human welfare (including the incidence and prevalence of diseases) in TFCA*s throughout the region. The lack of appropriate information constrains conservation and development planning by resource managers and villagers (see Getz *et al* 1999).

4.3 Local scale constraints

1. *Infrastructure is generally poorly developed in border areas, which constrains cross-border interchange between resource managers (security regulations and cross-border travel restrictions are also serious constraints).*
2. *Information on the development of TFCA*s tends to be confined to the higher echelons of government agencies with the result that those on the ground or in a position to make positive contributions to TFCA development are excluded and develop negative attitudes to the process.
3. *Social capital, trust, and the capacity for self organisation and institution building (i.e. for resource management) at local levels is generally weak and will require time to develop and will involve high transaction costs.*
4. *Diseases and human-wildlife conflict issues tend to be seen as the responsibility of the state and its agents and are managed through centralised command and control systems. The result is that potential local innovations and ownership of solutions to such problems is stifled.*

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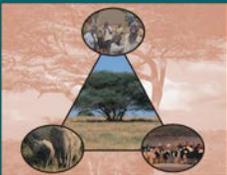
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The Wildlife Conservation Society's Animal & Human Health for the Environment And Development (AHEAD) Program is a convening, facilitative mechanism, working to create enabling environments that allow different and often competing sectors to literally come to the same table and find collaborative ways forward to address challenges at the interface of wildlife health, livestock health, and human health and livelihoods.



We convene stakeholders, help delineate conceptual frameworks to underpin planning, management and research, and provide technical support and resources for projects stakeholders identify as priorities. AHEAD recognizes the need to look at health and disease not in isolation but within a given region's socioeconomic and environmental context.