

Pathways of Human Sprawl in Wilderness Buffer Zones

Cornelis Vanderpost

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Abstract Intensification of human sprawl in buffer zones of globally important African wilderness areas is of worldwide concern. The paper identifies two major conflicting (yet potentially reconcilable) pathways of rural sprawl in African wilderness buffer regions, described as the subsistence pathway and the wildlife-tourism pathway. Containment of rural sprawl near important ecological reserves requires addressing both pathways and their underlying conflicts. Reconciliation of subsistence sprawl with wildlife-conservation based tourism may occur through adequate compensation for community subsistence resource losses by the creation of sufficient alternatives to local communities that may reduce the need to rely on subsistence resources.

Keywords Human sprawl · Protected areas · Africa

Introduction

The need to consider impacts of human sprawl in rural Africa is becoming increasingly urgent as human induced change in African ecosystems has been brought about as a result of change in land-use practices (Graves & Reavy, 1996; Reynolds, Stafford Smith & Lambin, 2003; SCBD, 2006; UNEP, 2006) and changing relationships between people and wildlife-habitat in and outside protected areas (Adams & McShane, 1992; Prins, Grotenhuis & Dolan, 2000).

Earlier work considered geographical aspects of African protected areas particularly with respect to their ecologically insufficient size and the urgent need to involve rural communities in large-scale conservation efforts for these to have any chance of long-term

C. Vanderpost (✉)
Harry Oppenheimer Okavango Research Centre, University of Botswana, Shorobe Road, Pr Bag 285,
Maun, Botswana
e-mail: cvanderpost@orc.ub.bw

success (Adams & McShane, 1992; Myers, 1972; Sherbinin, 1998). Other work emphasized changes in relationships between rural communities and protected areas (Barrow & Fabricius, 2002; Brown & Kothari, 2002; Hulme & Murphree, 2001) or focussed on prospects and problems of community based wildlife management (Adams & Hulme, 2001; Roe et al., 2000). Other perspectives have included the complex links between biodiversity degradation and rural poverty (Adams et al., 2004; Hartman, 2002; Rachman, 2002; Wood, Stedman-Edwards & Mang, 2000) or have considered the (superior) economic benefits of wildlife compared to other land-uses (Prins et al., 2000). Further work has pointed to northern Botswana as being a core area in terms of African mammal wildlife habitat (Hanks, 2003).

The conservation-development interface has emerged as quintessential for future conservation prospects and for rural development in remote African regions (Western, 2003). Conservation has become a balancing act between biodiversity management and improvement of local people's livelihoods (Barrow & Fabricius, 2002). Unless conflicts between these objectives are resolved, long-term prospects for both may be compromised.

More work is needed to determine the precise role of human sprawl and its underlying forces near protected areas in Botswana and elsewhere in rural Africa to provide additional perspectives to the conservation-development debate. This work results from research at the University of Botswana that has provided data and scientific support to the Okavango Delta Management Plan (GOB, 2001; TLB, 2006). This is supplemented with information gathered by the author during 4 years of resident observation in north-western Botswana and informal interviews with government officials, researchers, tourism operators, tourists and representatives of communities and community organisations. The aim of this work is to explore the underlying forces behind human sprawl in protected area buffer zones and to explore options for addressing human sprawl in a conservation-development context.

Human Sprawl and Buffer Zones

Human sprawl, now an accepted concept referring to expansion of settlements, roads, mines and other infrastructure of human civilisation (UNEP, 2002), is considered an important component of worldwide change (Sanderson et al., 2002). Human sprawl is a form of land-use/cover change, which, together with pollution, (over)harvesting, species introduction and climate change are regarded as direct causes of environmental change, influenced by indirect causes that include demographic, economic, socio-political and technological factors as well as variables related to lifestyle, behaviour, values, culture and religion (Geist & Lambin, 2002).

In semi-arid southern African, conservation areas can—in some sense—never be large enough due to regional and periodic variation in resource availability. Migrating herds of herbivores need access to such variable resources over thousands of square kilometres (Myers, 1972). But, growing human populations and economic development compete with wildlife habitat for land. In Africa, remarkable post-1960 population growth (Goliber, 1989) and, more recently, decreasing household size (Liu, Daily, Ehrlich, & Luck, 2003) have been accompanied by an almost insatiable need for land for settlements, farms and other developments.

Such human sprawl now affects hitherto remote and sparsely populated African regions that play an important role as informal buffers for conservation areas, a function threatened by land-use change, sometimes influenced by “discovery” of their pristine environment for global tourism (Wood et al., 2000). In a literature review of buffer zones around

protected areas, Martino (2001) concludes that lack of clear objectives has affected their (lack of) success. While usually created for conservation purposes, development objectives are often added to mitigate opposition against the (implicit) extension of existing protected areas rather than to genuinely support integrated conservation-development initiatives (Martino, 2001).

Conservation-development initiatives represent the most dramatic shift in conservation thinking since the 1960s and 1970s, when most parks in Africa were established (Western, 2003). Current approaches, first, attempt to place protected areas within a wider regional context, seeking to maximize species protection by managing larger portions of surrounding land, even when inhabited by people (Prins et al., 2000; Sherbinin, 1998). Trans-boundary parks such as the Four Corners Trans-boundary initiative between Botswana, Namibia, Angola, Zambia and Zimbabwe are good examples (Hanks, 2003).

Second, there is growing consensus that protected areas can no longer exist in isolation from nearby communities (Brown & Kothari, 2002), or even that (indigenous) people should be integrated into protected areas (Stevens, 1997). In practice, however, several studies (Emerton, 1998, Hulme & Murphree, 2001, Roe et al., 2000) conclude that benefits accruing to local populations from integrated conservation-development programmes are often simply insufficient to positively alter attitudes toward conservation. Many programmes experience problems resulting from tension between the objectives of conservation and improvement of livelihoods of local populations (Barrow & Fabricius, 2002).

Adams and Hulme (2001) further warn that although community conservation is evolving as a concept and a practice, it is not something that can be simply accepted or rejected because key questions remain about who should set conservation objectives and how different local interests should be balanced. The aim to fulfil people's legitimate needs for livelihood improvement while reconciling conservation and economic development remains a formidable challenge (Adams & McShane, 1992). Human sprawl as a spatial reflection of development is in this context a major issue.

Human sprawl in rural Africa is a reflection of both economic development and of poverty, which should not be regarded narrowly as lack of money–income but also in terms of access to (or loss of access to) environmental resources. Moreover, links between population, poverty and environmental degradation must not be oversimplified. According to Hartmann (2002) one has to be careful in labelling poor peasants and pastoralists as destroyers of the environment as, in some cases, external demand for a region's resources (minerals, timber, crop-land, wildlife) may drive environmental degradation more than local poverty or population growth. Blaming population growth and poverty disproportionately for environmental degradation can lead to coercive conservation measures, where local people are forcibly denied access to resources on which their livelihoods depend.

Environmental resources constitute the wealth of the rural poor (FOEI, 2005) as they are important sources of food (fruits, game-meat), building materials and firewood. Any degradation or loss of access to natural resources deprives them of livelihood potential; thus, it is not in poor people's interest to degrade their environment (De Souza, Williams, & Meyerson, 2003). But, when external economic factors (such as logging or international tourism) limit available land, people become compelled to consume some of their wealth (e.g. cut trees that provide fruits) and, in the process, become the poorer for it.

While most studies of human sprawl focus on urban sprawl and suburbanisation of the countryside (UNEP, 2002) and limited research has addressed proliferation of settlement in sparsely populated rural Africa (but see e.g. Madulu, 2001) and resulting impacts on globally significant wildlife habitats, this work examines conditions of human sprawl in an African frontier setting, using as a case study the Moremi game reserve and surrounding

buffer areas in Botswana’s Okavango-Ngamiland region, relatively pristine until recently, but undergoing rapid demographic and economic change.

Study Area

Many of the “best” remaining African wilderness areas were until recently remote from centres of economic development. There were good reasons for them to remain “undeveloped”. Malaria and tse-tse flies kept Kruger Park in South Africa, Selous Reserve in Tanzania and Luangwa Park in Zambia “pristine”. Our study area, Moremi Game Reserve and surrounding Okavango wetlands in the Ngamiland (sub)district of Botswana (Fig. 1),

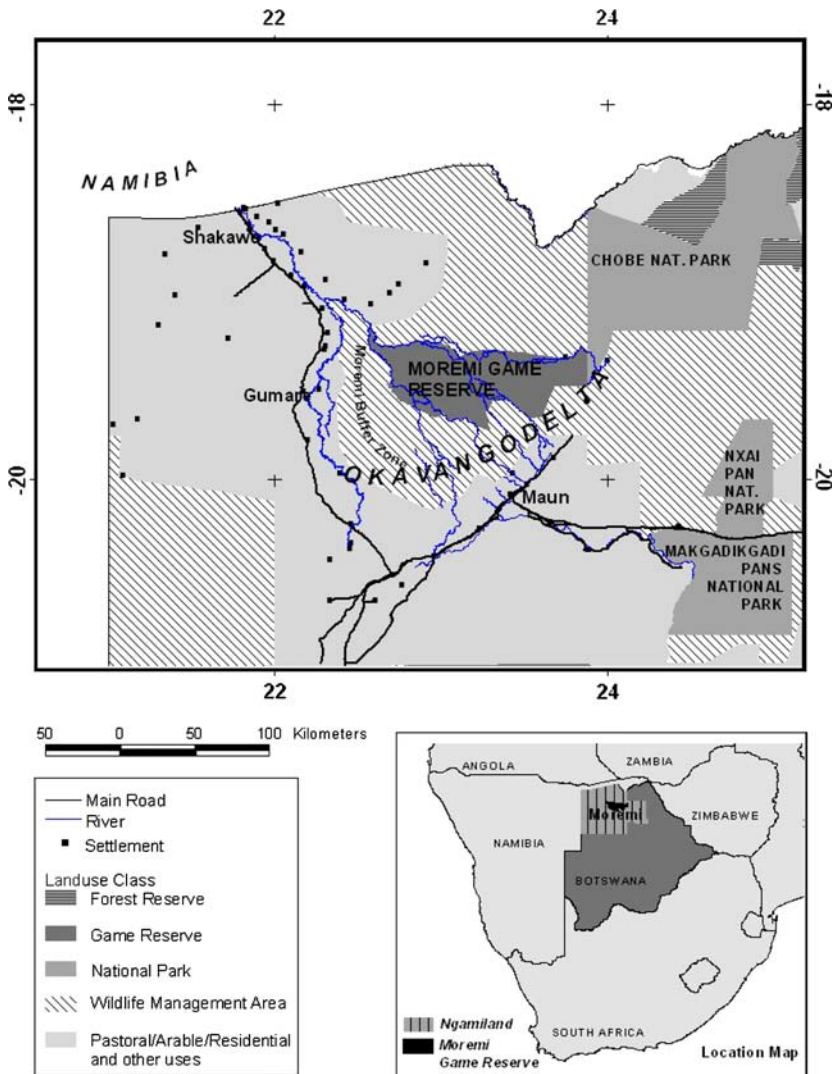


Fig. 1 The study area in regional context

remained mostly untouched because of sleeping sickness, malaria and foot and mouth disease (Potten, 1975). But, nowadays, medical advances and modern infrastructure have diminished such barriers and change comes rapidly, even in remote Africa. The “taming” of the Okavango (Tlou, 1985), is illustrative for ways in which wilderness areas across Africa were incorporated into the global economy, although not necessarily to the benefit of resident populations (Madulu, 2005).

The study area is home to several population groups. By the mid 18th century Wayeyi people were well established, having migrated from the north (Tlou, 1985). Their oral traditions confirm that Bushmen (San) were already living in their new homeland. Hambukushu people also migrated from the north, being mostly cultivators. By 1800, Tswana groups from the east established themselves as the Tawana near Lake Ngami. As pastoralists they expanded cattle grazing to all land along the southern margins of the Okavango Delta that was free of tse-tse fly. However, by 1850, the population in the entire Ngamiland region did probably not exceed 10,000 (Vanderpost, 2004).

In 1849 Livingstone visited Ngamiland (Livingstone, 1857). Many adventurers, explorers, traders and hunters followed. Hunting became a commercial enterprise resulting in enormous plundering of wildlife resources by European traders and local collaborators. Soon, new arrivals complained about lack of trophy material as rhinoceros became extinct and too few elephant remained to satisfy the hunger for ivory (Tlou, 1985).

In 1894, Ngamiland became part of the British protectorate of Bechuanaland. Access roads and airfields were constructed and police posts established. Maun became the tribal and administrative capital. Inhabitants started to partake in the cash economy by working for the colonial government and for the South-African mines through the Shakawe recruiting office.

Hunting continued unabated, increasingly threatening wildlife populations. Crocodiles, for example, were hunted almost to extinction during the 1950s and 1960s (Potten, 1975). The need for protection of the Okavango was articulated from 1950 by visionary foreigners and local tribal authorities. Timing was opportune as the British had decided that reserves were needed before colonies became independent (Myers, 1972). The idea for a game reserve in the Okavango Delta originated in 1961. The BaTawana tribe approved the idea and in 1963 Moremi was operational. Following extensions in 1976 and 1991, it currently covers 4,610 km².

Moremi is not an ecological entity (ROB, 1991) and surrounding areas are required to provide sufficient habitat for zebra, wildebeest, buffalo and elephant, depending on conditions of rain and drought from year to year. The government created a buffer zone around Moremi, allowing animals to move from the unfenced reserve to surrounding so-called wildlife management areas (WMA's) (Fig. 1). These WMA's are cattle free and their designated use varies from (commercial or community-based) photographic safaris to wildlife utilisation which includes hunting within strict quota assigned by the Department of Wildlife. As Martino (2001) noted, the hidden agenda behind the creation of this buffer may well have been factual extension of protected areas. This idea is supported by subsequent resettlement of WMA inhabitants and continued efforts by authorities to persuade the few remaining residents to also resettle (ROB, 2003).

In the north and east, Moremi forms part of Botswana's extensive (72,500 km²) northern conservation zone that includes Chobe, Nxai Pan and Makgadikgadi Pans National Parks (Fig. 1). But according to ecologists (Albertson, 1998; Crowe, 1995), in the west and south the WMA buffer is inadequate as it does not permit wildlife access to fertile grazing areas further west. This is also where most people are concentrated. Veterinary cordon fences separate livestock areas from wildlife areas primarily to control the spread of

foot-and-mouth disease (Scott-Wilson, 2000), but also to separate people from wildlife. The fences form a 430 km boundary, locally known as the ‘‘Buffalo Fence’’, encircling Moremi and surrounding WMA’s. Through construction of this fence and restrictions that apply to people in the WMA’s, the area beyond the fence became the real buffer zone, a transition zone from where people (often illegally) access resources within the WMA’s and through which wildlife attempts to access western grazing areas through remaining corridors (Albertson, 1998). This zone is part of the protected Okavango Ramsar site.

Although few people live permanently within the WMA buffer, especially after several resettlements, the majority of the regional population lives within 25 km of the Buffalo Fence in this transition zone between Okavango wetlands and western grasslands. In this work, this 25 km zone is regarded as the wilderness Outer Buffer Zone. Various conflicts have become evident along the Buffalo Fence in recent decades, mostly where prime wetland and grassland resources are contested between people, their cattle and wildlife. The Fence has become a front line and, although intended to solve wildlife-people conflict, has become part of the problem.

Human Sprawl in the Study Area

While landuse change in Africa is influenced by economic and socio-political variables (Geist & Lambin, 2002), demographic factors are also important. As elsewhere in Africa, protected areas in Botswana were initially situated in regions with few inhabitants. When Moremi was created, the total population of Ngamiland was only 42,500 (CSO, 1972), while a few hundred people were living in Moremi itself. However, like in most of Africa, once the demographic transition gained momentum, population growth reached higher levels than anywhere else in the world (Goliber, 1989).

Before 1960, growth remained moderate due to high mortality related to diseases such as malaria, sleeping sickness transmitted by tse-tse flies, tuberculosis and bilharzia (Potten, 1975). Later, mortality dropped but fertility remained high and growth accelerated, in line with established demographic transition theory (Caldwell, 1982).

Ngamiland’s annual population growth rate reached a high of 3.3% in the 1981–1991 decade, declining to 2.8% by 2001 (CSO, 2002). This resulted in the population trebling from 42,000 in 1964 to 125,000 in 2001 (CSO, 2002). Simultaneously, Botswana’s diamond revenues permitted infrastructure development such as construction of roads, veterinary fences and boreholes. Both people and infrastructure converged along water resources that are similarly favoured by wildlife. Population growth, combined with declining household size (Table 2) and infrastructure development, produced favourable conditions for human sprawl. In the study area, this comprised mostly of rural settlement expansion, some urban growth and infrastructure development (Vanderpost, 2004).

Rural sprawl in Africa entails mostly the emergence of small rural settlements (UNEP, 2002) resulting from growing rural populations accessing land for subsistence crop cultivation and livestock grazing (Madulu, 2001). Development of tourist camps and lodges, usually with associated living quarters for employees, also contributes to rural sprawl. Table 1 illustrates the situation in the study area.

In the Outer Buffer zone, extending 25 km beyond the Buffalo fence bordering the WMA buffer are located 253 settlements (including Maun) with 92,403 people (Table 1). They cover virtually every portion of the south-western Outer Buffer, an almost stereotypical case of human sprawl. Only 59 settlements are classified as villages (CSO, 2002), while over 80% are widely scattered ‘‘non-village settlements’’ such as cattle-posts,

Table 1 Increasing human sprawl, 1981–2001: Ngamiland, Outer Buffer Zone, Moremi Buffer

	Ngamiland region		Outer 25 km buffer		Moremi and WMA buffer	
	1981	2001	1981	2001	1981	2001
Population	68,063	124,712	47,000	92,449	1,299	2,688
Settlements	362	574	180 ^a	253	30 ^a	57
Fences (km)	450	1,570	0	390	0	370
Bore holes	306	1,200	114	493	1	36
Tar roads (km)	0	540	0	234	0	0

Source: CSO (1982), CSO (2002)

^afrom available Census data only an approximate estimate can be made

Table 2 Decreasing household size, 1981–2001: Botswana, Ngamiland, Maun

	Ngamiland	Botswana	Maun
<i>Year/household size</i>			
1981	5.0	5.5	5.9
1991	5.1	4.7	5.5
2001	4.7	4.1	4.4

Source: CSO (1982), CSO (2002)

lands-areas, camps and various hamlets, inhabited mostly by people living from subsistence resources (Kgathi et al., 2004).

Historically there were some settlements in what is now the Outer Buffer (Tlou, 1985), but construction of fences and tarred roads (together with eradication of tse-tse flies) produced further concentration, often in a linear pattern, in this fairly narrow zone along the Delta fringe (Fig. 2). It is here that most people-wildlife conflicts occur. A typical radio news-item, for example, reported that residents of Nokaneng village had requested government representatives to better maintain and electrify the Buffalo Fence because the poor state of the fence caused them problems with elephant and lion damaging crops and killing livestock (News-item, Radio Botswana 23 June 2004).

A second significant trend, though less extensive in area, is the expansion of larger settlements. The regional capital Maun's population increased tenfold from 4,591 in 1964 to 49,822 in 2001 (CSO, 2002). Other settlements (e.g. Gumare, Shakawe, Etsha) also increased substantially. Most relatively large villages are located within the Outer Buffer, the 10 largest settlements in the district accommodating 52% of the population. This semi-urban growth is driven by influx of mostly young people seeking employment. As the Tawana tribal capital and district administrative centre, in combination with its development as a hub of tourism, Maun is the main attraction.

The young age structure of the population is one reason for a decreasing household size; in Ngamiland, the average household size declined from 5.1 persons per household in 1991 to 4.7 in 2001 (CSO, 2002). The process occurs more rapidly in urban areas, the household size having declined to 4.4 in 2001 from 5.5 in 1991 in Maun (Table 2), in line with global trends (Liu et al., 2003). A smaller average household size requires increased average living space per person, a powerful human sprawl factor.

The third significant trend of human sprawl in Ngamiland concerns the expansion of infrastructure. During recent decades, 540 km of tarred roads were constructed and over 1,200 boreholes drilled (Table 1). In terms of tourism infrastructure, there are currently over 60 lodges in the Delta (Fig. 3), most with an airstrip, and many kilometres of access

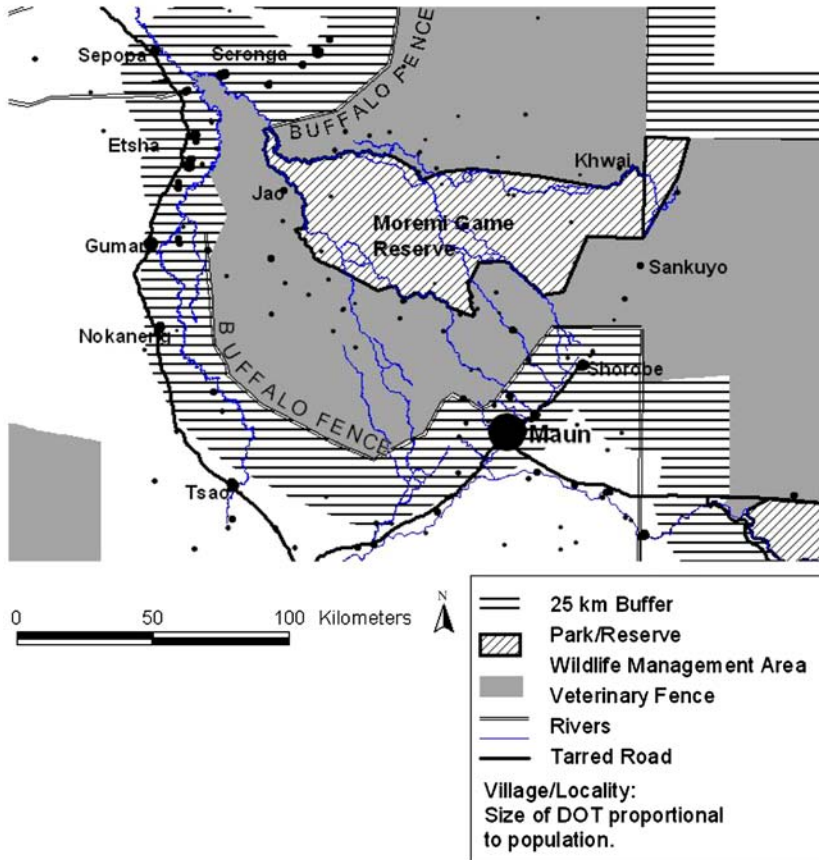


Fig. 2 Settlements in the Moremi buffer and Outer (25 km) buffer

road and game-viewing tracks have been opened up. In addition, over 1,200 km of veterinary fences have been erected that separate cattle grazing areas from wildlife areas (Fig. 2). The impact of these fences on wildlife is considered substantial, mostly because they fragment habitats (Albertson, 1998, Scott-Wilson, 2000).

Although settlement distribution is guided by a land-use plan (MLHE, 2001) and a settlement strategy (ROB, 2003), implementation with respect to addressing rural sprawl and its causes is weak. Particularly, the concentration of infrastructure (fences, roads) and settlement in a narrow zone around the Delta, is ecologically significant. The resulting high human impact zone bisects important (eastern and western) wildlife habitats, leaving very narrow connecting corridors. If continued rural sprawl were to result in closing of these corridors, wildlife viability will be seriously curtailed and (potential) wildlife resource use options cut off (Albertson, 1998).

Pathways of Sprawl

This section explores the main pathways of human sprawl in buffer zones of African protected areas that contribute to conservation-development conflicts. The distinct ways in

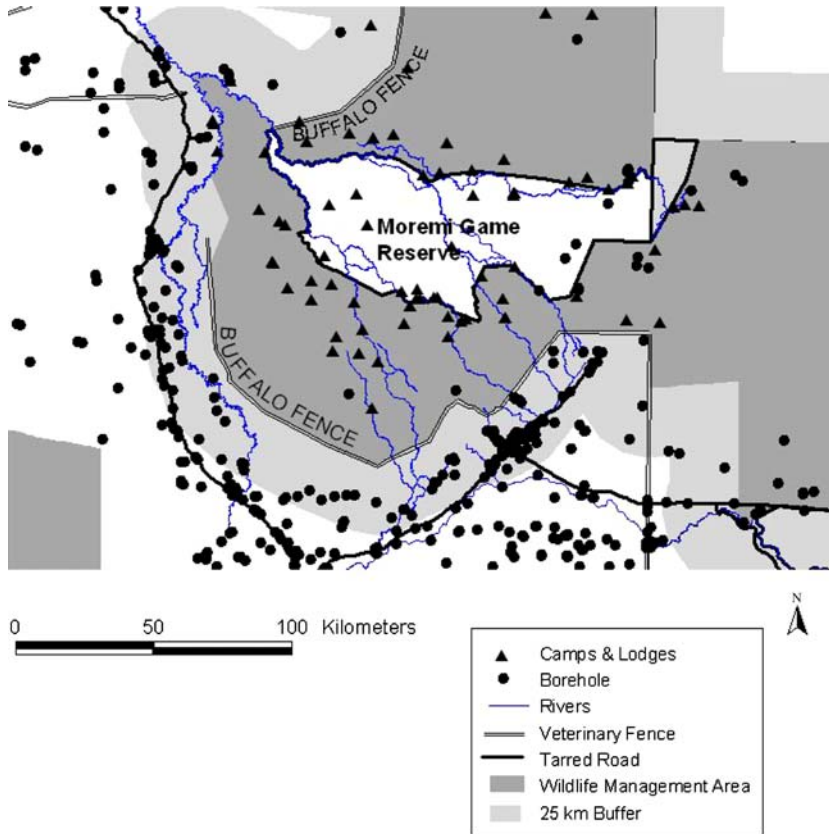


Fig. 3 Boreholes and tourism facilities (camps & lodges) in and near Moremi

which development or poverty reflect as human sprawl can, for analysis purposes, be usefully disaggregated into constituent components.

African societies experience unsynchronised economic and social transformations (Woods, 1982). Demographic transition that has resulted in lower mortality but not (yet) an equivalent lowering of fertility (Caldwell, 1982) and has thus caused rapid rural population growth, is an important factor in rural sprawl. Economic transition, even in remote rural Africa, has resulted in modern economic pursuits linked to the global economy coexisting with traditional subsistence patterns. Such partial transformation of the rural economy, sometimes through tourism development that employs remoteness and wilderness qualities as assets, is another force behind human sprawl. Thus, it can be expected that human sprawl in protected area buffer zones proceeds along two pathways, one based on growth of the subsistence rural economy and the other related to expansion of commercial activities such as wildlife-tourism.

A quantitative analysis of Ngamiland’s sprawl presented elsewhere (Vanderpost, 2004) concluded that, in terms of area affected, urban sprawl is of minor significance, while sprawl related to rural settlement and infrastructure constitute major components, with boreholes and small settlements as most abundant sprawl elements. This agrees with field observations that rural settlement sprawl in the Outer Buffer Zone is mostly related to rural

households seeking subsistence resources. Most boreholes, for example, are used for water supplies for people and their livestock in small localities, established to access communal subsistence lands for grazing livestock (cattle-posts) and for small-scale (shifting) cultivation (so-called lands-areas). Small groups of people (mostly Hambushu) clear crop-land at some distance from an existing small village or set up new hamlets away from an existing village to be closer to bush resources.

Infrastructure sprawl in Ngamiland, on the other hand, is linked to expansion of commercial activities such as cattle ranching but especially wildlife-based tourism. Tourist camps and lodges and associated staff quarters/villages and infrastructure (tared roads, game-viewing tracks, boreholes, fences) play a major role supporting the tourism industry.

Because investment-money is available in Botswana on account of diamond income, conditions in Ngamiland are special compared to other African regions. At macro level everything is in place to develop a viable conservation-tourism economy that can provide a decent living to residents: protected areas, wildlife and supporting infrastructure and legislation. Moreover, Botswana is regarded as a shining example of democracy, is one of few middle income countries in Africa, has financial reserves and low international debt (Kgathi et al., 2004).

Yet, like elsewhere in Africa, a large portion of the population depends partly or wholly on subsistence (i.e. non-commercial) exploitation of environmental resources, including land (for cultivation and livestock-grazing), vegetation (e.g. fruits, poles for building, thatching-grass, firewood) and wildlife (e.g. meat and skins) (Kgathi et al., 2004). To improve living standards, their choice is between searching for scarce employment opportunities or expanding subsistence consumption, i.e. use more resources in the same area or move (sprawl) to new areas with “fresh” resources. This results in either rural sprawl or increased pressure on existing resources, while enhancing possibilities for conflict with conservation objectives.

As pointed out by Geist and Lambin (2002), there are many factors that may exacerbate or mitigate such effects. For example, political decisions about land-use may affect the land-base available for subsistence use. In Ngamiland, the land-use map, in its most simple form, divides the region into portions available and portions not available for communal use as these contain commercial land-uses, mostly tourism or ranching. On communal land, rural subsistence sprawl is rooted in traditional land-use practices such as (shifting) cultivation, extensive livestock husbandry and even hunting-gathering (Hitchcock in Prins et al., 2000), while urban sprawl is a new development. On non-communal land, infrastructure sprawl is connected with the development of commercial ranching and, within the Outer Buffer Zone, especially, wildlife-based tourism.

It is thus useful to disaggregate these two conceptually and land-use distinct pathways along which human sprawl in transitional regions between protected areas and communally used areas, such as Ngamiland, plays out. The first may be referred to as the subsistence-pathway, the second as the wildlife-based-tourism-pathway.

The Subsistence Pathway

Buffer zones around African protected areas are needed both to accommodate seasonally variable ecological needs of uniquely African migrating herbivores and to sustain the subsistence requirements of growing rural populations. The forces supporting these needs

are, however, of unequal strength. While tourism revenue is often regarded as imparting sufficient economic value to natural ecosystems to warrant their protection (Myers, 1974), subsistence resources are seldom ascribed economic value, while people's (traditional) use rights are often not formally recognised (De Souza et al., 2003; Hitchcock in Prins et al., 2000; Taylor, 2000).

Many Africans of necessity remain embedded in subsistence living, utilising local environmental resources through cultivation, fishing, livestock-grazing and bush-food gathering (including hunting or poaching). They also, significantly, depend on these resources for house construction and household energy (firewood) (De Souza et al., 2003), making the availability of free bush-resources extremely important to their livelihoods, even if only as a fall-back option during times of need (Western, 2003). In Ngamiland, 49% of households use thatching grass or reeds for roofing, while over 85% of rural households use firewood for cooking and over 40% keep livestock on communal lands (CSO, 2002).

Subsistence sprawl occurs when the population grows or household size declines (Liu et al., 2003) as this requires additional residential plots, more land for crops, livestock and for bush-product harvesting. Ideally, fresh areas are required, but, alternatively, in-filling of land between villages occurs, leaving only narrow wildlife corridors, which eventually also disappear. Roads facilitate sprawl by improving accessibility and produce linear sprawl (as along sections of the Sehitwa-Shakawe road (Fig. 3)), which promotes habitat fragmentation as it blocks wildlife migrations between Ngamiland's eastern wetland resources and western nutritious grazing areas (Albertson, 1998).

Environmental resources constitute the wealth of rural populations (FOEI, 2005). But this resource base is threatened in many areas by expansion of other, more powerful commercial resource exploitation initiatives resulting in loss of access to traditional resources and, thus, increased poverty. This occurs because their value for the rural population is usually underestimated, while the expansion of subsistence resource use is considered incompatible with wildlife-tourism and conservation (De Souza et al., 2003). Like elsewhere in Africa (Madulu, 2005; Wood et al., 2000), in Ngamiland pressure is increasing on people's subsistence habitat, affecting especially the poor, who then become compelled to over-exploit local resources or to engage in illegal activities because few fresh communal areas remain, while other options, such as wage employment, are not available (De Souza et al., 2003). Conflicts between subsistence farmers and wildlife-tourism result from trespassing, the (perceived) illegal harvesting of flora and fauna and habitat destruction near protected areas, while communities are mostly concerned about wildlife destroying crops or killing livestock (TLB, 2006).

From information gathered for the Okavango Delta Management Plan (TLB, 2006) can be learned that the following factors affect the contemporary character of subsistence living and rural sprawl, contribute to increased poverty and negative community views on wildlife habitat conservation, resulting in trespassing, poaching and negative attitudes toward tourists and outsiders employed in tourism.

1. Land-use change: decline of subsistence land resources due to expansion of protected areas;
2. Legislation disallowing harvesting of environmental resources (especially wildlife);
3. Unemployment of local residents, while outsiders find jobs in the tourism industry;
4. Problems with community based natural resource projects.

Land-use Change

Like in Kenya and Tanzania (Madulu, 2005; Wood et al., 2000), land available for subsistence living in Ngamiland dramatically declined in recent decades, while the population increased (Table 3). In 1964, theoretically 2.6 km² of land was available on average per person, while only one fifth of that, 0.5 km², was available in 2001. This was a result of a 50% reduction in available land due to the proclamation of protected areas and wildlife management areas and a simultaneous trebling of the population (Table 3).

This occurred in a context of population dispersal (sprawl) facilitated through the development of boreholes that allowed people to live at remote locations (Silitshena, 1982), while the eradication of tse-tse fly facilitated animal husbandry and, later, tourism. By 1971, 69% of Ngamiland's population lived in scattered settlements with under 500 inhabitants (CSO, 1972), while the number of non-village settlements in Ngamiland reached 312 in 1981 and 507 in 2001 (CSO, 2002).

Because of this sprawl (and commercial hunting), setting aside protected areas became necessary from a traditional conservation viewpoint. Hence, the creation of Moremi and, later, the Wildlife Management Areas. Fences were used to separate the WMA's from people's areas, which concentrated conflict along the fences, especially where these bisect areas with resources important to both people and wildlife (Albertson, 1998; Crowe, 1995).

Along the Fence conflict culminates between subsistence cultivators and "invading" herbivores, especially elephant (e.g. at Samochema, Nokaneng, Gumare) and between subsistence ranchers and predators such as lion. Cattle also transgress into wildlife zones and have to be culled due to the risk of foot and mouth disease through contact with buffalo, carriers of the disease. Although farmers receive compensation, such culling does not promote friendly relations with government officials.

Altering this conservation–subsistence collision course is crucial for securing conservation of wildlife habitat while enabling local populations to improve their living standard (Wood et al., 2000). From the viewpoint of subsistence farmers, the only way this can really work is when adequate alternatives become available in compensation for all the various subsistence resources that are important to people's livelihoods. Besides growing crops and keeping livestock for self-consumption, benefits from the exploitation of "free" local resources include game-meat, bush-fruits and, importantly, bush-materials for cheap housing and firewood (Kgathi et al., 2004). All these need to be considered when losses occur as a result of a shrinking subsistence habitat in favour of wildlife habitat, because loss of access to such free resources affects livelihood security and results in increased

Table 3 Changing land availability for subsistence living

Year	Population Ngamiland	Land available for subsistence (km ²)	Land available per person (km ²)	Conditions
1964	42,500	111,650	2.6	All land "free"
1981	68,000	102,423	1.5	(except where tse-tse fly occurred Population growth & protected areas established: Moremi, Chobe, Nxai-Pan, Makgadikgadi
1991	94,500	58,508	0.6	Population growth & wildlife management areas and commercial ranches established
2001	124,700	58,508	0.5	Continued population growth

Source: CSO (2002)

poverty (Vanderpost, 1995). Adequate compensation is, unfortunately, usually not considered when land-use decisions are made.

Legislation

Diminishing availability of land is not the only threat to subsistence living. Additionally, over recent decades restrictions have been imposed, ranging from the need to acquire permits for subsistence hunting to restrictions regarding tree cutting and access to concession areas within WMA's. Even in communal areas restrictive legislation is in force regarding hunting and exploitation of various plant resources. Permits are required even for hunting ducks, geese and small game, while in community owned WMA's quotas apply (Gujadhur, 2000). This has dramatically reduced the range of resources available to communities (Cassidy, Good, Mazonde, & Rivers, 2001).

Effects are sometimes unexpected. For example, a shortage of traditional steenbok-leather dance costumes has arisen as, due to hunting restrictions, steenbok skins are difficult to obtain (Xguka Chrisjan, NGO representative, personal communication, 15 May, 2005). In many (tourism) concession areas, regulations forbid the use of firewood for cooking by staff employed at camps and lodges, while allowing social fires for tourists. The wildlife department is quite effective in implementing these rules, although poaching does occur.

This legislation, implemented for well-intended conservation purposes, ends up hurting the poorer communities as it restricts access to subsistence resources. This affects negatively the availability of game-meat in the diet or income (e.g. from selling steenbok skins). Apart from resulting in impoverishment, this creates resentment, especially, when, within view of local residents, rich western tourists are allowed to hunt for sport. Compensation is usually not considered when such legislation and rules come into force, although for promotion of conservation-friendly attitudes among the population it is a crucial issue.

Jobs in Tourism

In many African rural areas, according to Emerton (1998) and Hulme and Murphree (2001), residents do not receive adequate compensation for losses resulting from reservation of land for conservation or tourism. Even though in many areas, Ngamiland included, jobs have been created, they have fallen short of the requirements of the growing number of people who need jobs precisely because they lost access to (some) subsistence resources.

Also, salaries tend to be low, with the best paid jobs often taken by outsiders who, unlike most residents, have the required training and experience. While in Botswana's tourism industry the employment of outsiders is only at 4%, they earn the highest salaries (Mbaiwa, 2005). Local employees, because of lower education levels, often earn less than 1,000 Pula per month, an amount regarded as around the poverty level (Mbaiwa, 2005). Resentment from local populations is worsened when contrasts in earnings coincide with skin colour or when many locals remain unemployed.

In Ngamiland, employment levels are insufficient to reduce the need for a substantial portion of the population to continue relying on free subsistence resources, while salaries mostly are insufficient to lure households completely out of the subsistence realm as they do not permit people to purchase energy or housing materials. To ensure sufficient livelihood quality they must continue relying on free resources, at least for house construction and firewood.

It is significant that, in spite of a thriving international tourism industry, the level of poverty in Ngamiland is still high (Mbaiwa, 2005). Clearly, people with limited education or experience have limited chances to switch from subsistence living to cash living and remain compelled to continue subsistence resource exploitation and, hence, to sprawl and cause conflict with conservation objectives.

Problems with Community Based Projects

Community based natural resource management (CBNRM) programmes are regarded as an important avenue toward solving subsistence–conservation conflicts, in spite of their drawbacks (Roe et al., 2000). Barrow and Fabricius (2002) reported about community project problems in southern Africa, while Roe et al. (2000) considered cases across Africa. Arntzen et al. (2003) evaluated the situation in Botswana. Invariably, many problems were identified affecting the success of community based projects. Nevertheless, the conclusion of these studies tends to be that—in spite of the problems—CBNRM is an important (if not the only) way forward and that it must be given time to function (Roe et al., 2000).

In Ngamiland, good progress was made with CBNRM along the eastern margin of Moremi where communities are small, typically under 1,000 people (e.g. Sankuyo and Khwai). In the western section, efforts have run into problems where communities involved are much larger (Arntzen et al., 2003). This applies, for example, to the Jakotsha Trust that administers concession area NG24 on behalf of a community of over 10,000, living mostly in the nearby Etsha villages (B. Leroux, NGO representative, personal communication, April 30, 2005). Here, jobs and other benefits do not reach critical levels necessary to allow people to forego subsistence resource exploitation.

Resentment towards CBNRM—for tourism mostly organised in community–private-sector partnerships—is particularly rife when the number of jobs offered is small relative to the population, as this divides the community, or when outsiders need to be engaged to run the project, as often happens, due to unavailability of skilled local people. In extreme cases, resentment may result in destruction of lodges as happened in the case of Jedibe lodge.

CBNRM in Botswana also allows activities other than tourism, including direct sustainable resource consumption (e.g. reeds, wildlife). Although difficult to monitor, such possible uses need more attention to avoid contradictory situations where wildlife culling becomes necessary to regulate wildlife populations; yet local people are not allowed to hunt for their subsistence pot.

Compensation

Thus, subsistence rural sprawl and its conflicts with conservation-based activities (including tourism) are influenced by the diminishing subsistence land-base, limitations to resource exploitation resulting from legislation, the insufficient quantity and quality (salaries) of jobs in the commercial sector and the limited success of CBNRM projects. The common denominator is the loss of resources to people who do not receive adequate compensatory options.

Addressing subsistence sprawl through restrictive measures is not a solution as it amounts merely to tackling symptoms. It is also likely to be ineffective because subsistence

sprawl involves many, mostly poor people engaged in informal, unregulated activities such as communal grazing and bush-product harvesting, utilising areas that are not usually clearly marked. Rather than symptoms, the underlying causes need to be addressed and that means adequate compensation must be found for subsistence resources and livelihood options lost to communities and strategies must be implemented to avert (increased) rural poverty.

The Wildlife-Tourism Pathway

In remote rural African regions featuring intact wildlife resources, international tourism has become a major exponent of economic development (Wood et al. 2000). From the 1950s, modern roads, telecommunications and government structures opened Ngamiland to the outside world, subsequently permitting the “discovery” of the pristine Okavango wilderness as a tourist destination. Investments in wildlife-tourism infrastructure established an international tourism industry now attracting 50,000 visitors per year to Moremi alone and generating substantial revenue (Mbaiwa, 2005). Like subsistence sprawl, wildlife-tourism-sprawl is influenced by land-use change, jobs in tourism and problems with CBNRM initiatives.

Land-use Change

Wildlife-tourism related human sprawl has a direct and (through its influence on subsistence sprawl) an indirect effect upon wildlife habitat. Wildlife-tourism and conservation were important motivations for expanding protected areas in Ngamiland and elsewhere in Africa, because tourism is regarded as adding economic value to conservation (Myers, 1974). In Ngamiland, protected areas were expanded from 8,000 km² in the 1970s to 50,000 km² in the 1990s, enhancing enormously the wildlife-tourism resource base.

The price for this land-use change was paid by resident communities that had to sacrifice current and future resources (especially wildlife) and areas for future expansion. The highest price was, possibly, paid by (former) hunter-gatherers, whose poverty after resettlement has been documented by Cassidy et al. (2001). In most cases, compensation has not adequately addressed all losses because some were not ascribed any value (e.g. building materials from the bush). While it can be argued that creating protected areas has conserved important resources for the benefit of all, in some respects one may consider this land-use change as a case of taking from the poor to give to the rich.

Having a secure resource base allowed the tourism industry (driven by profit motivation) to expand. This has resulted in sprawl associated with tourism infrastructure. During the past decades over 60 camps and lodges, 40 airstrips and many kilometres of access roads and game viewing tracks were constructed and boating channels cut through papyrus (TLB, 2006). These tend to impact upon the ecological basis on which tourism is founded. Whereas lodges and camps are designed to blend in with the local ecology, access roads, game-drive tracks and airstrips as well as waste and sewage disposal (Mbaiwa, 2003) are potentially more intrusive elements that can contribute to wildlife habitat fragmentation even within protected areas (Vanderpost, 2004).

The expansion of the tourism industry conflicts with the community subsistence sector, first because land that was formerly accessible, is taken away from people and second because the industry (in partnership with conservation interests) tends to make increasing demands on ecological resources outside protected areas (for sound ecological reasons),

i.e. the buffer zones that are required for the ecological survival of wildlife within protected areas but also for the expansion of subsistence activities of growing rural populations. Conflicts take the form of incursions into WMA's allocated as commercial concessions by neighbouring people for hunting, fishing and bush-product harvesting, activities that have largely become illegal as a result of post-independence legislation and the proclamation of WMA's (TLB, 2006).

Jobs in Tourism

Given that conflict is based on community losses of land and other subsistence resources, the tourism industry, as a partly responsible entity, can play an important role in curtailing rural sprawl. Firstly by keeping its own house in order (by ensuring ecologically friendly infrastructure) and secondly by creating conditions that diminish the need for subsistence rural sprawl to occur. This revolves around the issue of fair compensation for, often underestimated, losses sustained by communities. In some cases, for example, people suffer from poor health associated with a poor diet due to loss of access to meat, fish and bush fruits rich in vitamins. This has been documented particularly for (former) hunter-gatherer groups in northern Ngamiland (Cassidy et al, 2001) but also affects other groups. Fair compensation must address all the various losses that communities have incurred.

It is often thought that jobs provided by private industry market forces can be the main mechanism for such compensation (Mbaiwa, 2005), but employment in tourism is a two-edged sword. While some people secure employment (e.g. as guides and canoe-polers) with one estimate claiming that 53% of formal employment in Ngamiland is tourism related (Silitshena & McLeod, 1998), there are always many others in a growing population who cannot be accommodated in this low density industry, the overall employment situation in Ngamiland having worsened rather than improved over past decades (Table 4).

The number of people who cannot secure jobs may be more significant than the number of jobs created as it is a reservoir for resentment and subsistence sprawl. In 2001, of the total potential workforce of 61,000 people in Ngamiland, only 22,500 (37%) were actually employed (Table 4) and thus only 12,000 (assuming 53%), or 1 in 5 persons, had a job in the tourism sector. One problem remains the low education level of the resident population (36% uneducated), while most new jobs require skills or experience. Consequently, many people (most of the remaining 63% without employment) continue a partial subsistence lifestyle. This is not likely to change soon considering that the employment seeking age group is increasing at over 5% per year (CSO, 2002).

The key issue is that the private wildlife-tourism sector as currently operating may not be able to offer a sufficient number of jobs to satisfy the hunger for employment among a young, highly expectant, rapidly growing but poorly educated generation (CSO, 2002) and thus reduce the sprawl needs of the subsistence sector. Moreover, salaries may be too low

Table 4 Employment in relation to population aged 15–49, Ngamiland, 1981, 1991, 2001

Ngamiland	2001	1991	1981
Total employment	22,481	21,843	21,191 ^a
Total population 15–49	60,954	38,687	25,899
Ratio: people per job	2.7	1.8	1.2

Source: CSO (1982), CSO (1991), CSO (2002)

^aIn 1981 the definition of employment was more liberal in including persons engaged in traditional agriculture than in later years

to allow households to make the full transition to the cash economy. Additional workforce training as well as diversification, both in terms of the overall economy and tourism itself, are therefore as much necessities as they are challenges.

Problems with Community Based Projects

Additional options such as involving more residents in the running of the tourism industry and involving more local people through community based initiatives are being pioneered. Currently in Ngamiland many concessions are operated under joint-venture arrangements that are more or less imposed by authorities upon communities and companies alike (Arntzen et al., 2003). For the private sector, working with communities complicates management, while communities often feel short-changed because not everyone acquires a job. Thus, in some cases conflicts arise that result in companies withdrawing from partnerships as happened at Jedibe and Mokoena lodges in concession area NG24 (Jan Drotzky, tourism operator, personal communication, January 14, 2006).

In such cases the government may have a role to play as mediator but also by providing a framework for benefit sharing between company and community. Further, tax benefits could be extended to companies in relation to community benefits provided. Government could also sponsor community–private partnerships in other ways, for example by subsidising trainee positions or by assisting toward specific training programmes for local people who are poorly trained and equipped for the industry. Through this the government would show responsibility for land-use changes that have affected local people, while promoting increased benefits from community tourism, which have been demonstrated elsewhere as being achievable (Scheyvens, 2002).

Compensation

Thus, wildlife-based tourism has built-in tendencies for rural sprawl on account of the required infrastructure of camps, lodges, airstrips and access roads, although the industry has a vested interest in limiting effects on the ecology upon which it is ultimately based. Such sprawl is relatively easily managed as operators are known companies with licences that have conditions attached to them, while areas of operation are well defined and clear rules and regulations exist; it is thus a matter of implementation (TLB, 2006).

Because of existing land-use arrangements the sector is in direct conflict with the subsistence sector concerning access to land and subsistence resources and in terms of jobs and (through joint-ventures) community based initiatives. The tourism industry can play an important role in reducing future rural subsistence sprawl by improving options for integration of local communities and contributing to compensation for lost community resources. This implies increased job-creation, higher salaries, more mutually beneficial relations with CBNRM initiatives and more attention to training of local populations. But, since the industry is profit motivated, such responsibilities need to be stimulated by appropriate government policies that may need to include rewards such as tax benefits.

Discussion and Conclusion

Until recently, large wilderness areas remained in Africa, although only ecologically inadequate portions were proclaimed protected. Today, informal buffers of protected areas,

needed for the ecological survival of Africa's unique mammal herds, experience pressure from human sprawl related to both a growing subsistence sector and expansion of commercial activities such as tourism. While sprawl is an outcome of Africa's demographic and economic transformation, it potentially conflicts with the conservation of African savannah wilderness areas considered increasingly valuable in terms of global biodiversity protection (Chape, Blyth, Fish, Fox, & Spalding, 2003) and infringes upon potential future benefits from international wildlife-tourism in which Africa has a global comparative advantage (Western, 2003).

The subsistence pathway to rural sprawl comprises of a growing rural population occupying additional communal land for subsistence cultivation, livestock husbandry and bush-product harvesting. This expansion can be expected to continue while the growth of alternative options (e.g. agricultural intensification or salaried jobs) remains at a level below the annual increase of the rural population, currently at over 2% in Ngamiland and across most of Africa (PRB, 2005).

The wildlife-based tourism pathway has built-in momentum for rural sprawl due to profit and growth needs and associated infrastructure requirements. Sprawl related conflicts tend to concentrate along the interface between communal land and protected areas, i.e. the Buffalo fence in Ngamiland's case. The wildlife-tourism sector clashes with the subsistence sector by infringing upon people's historical rights of fishing, hunting and bush-product gathering. Compensation for the loss of these resources is usually inadequate or incomplete. This is a significant root cause of conservation-sprawl conflicts.

The wildlife-tourism sector has economic strength because it is based on commercial profits and contemporary land-use principles. The subsistence sector is economically weak but, because people are compelled by poverty to ignore laws, potentially damaging to conservation. Without solution for both sprawl pathways, conservation will suffer and rural poverty increase.

Addressing wildlife-tourism related sprawl is mostly a matter of enforcing existing regulations. What is missing in buffer zones is an overall plan for tourism infrastructure to mitigate habitat fragmentation. In Ngamiland it is anticipated that such plan may be an outcome of the Okavango Delta Management Plan (TLB, 2006).

Addressing subsistence related sprawl is more difficult, because fundamentally it implies addressing rural poverty, which has been an illusive objective in most African countries (UNEP, 2006). Botswana, in spite of favourable economic growth, has also not conquered rural poverty (Kgathi et al., 2004). In remote rural areas such as Ngamiland it has proven difficult to uplift the livelihoods of unskilled, even illiterate, rural villagers through standard government programmes, private sector employment or (joint-venture) CBNRM activities (Arntzen et al., 2003).

However, existing strategies can be strengthened to provide substitutes or alternatives to contribute to more adequate compensation for subsistence resource losses. Substitution may, for example, consist of donations of livestock to compensate for reduced access to meat following loss of hunting rights as has happened in some resettlement villages in northern Ngamiland. In Botswana, also, subsidies exist for subsistence cultivation and animal husbandry to support emerging subsistence peasants (Kgathi et al., 2004). Unfortunately, impoverished rural dwellers also frequently qualify for destitute allowances (Cassidy et al., 2001). The contribution of such "options" toward solving conservation-development contradictions can, generally, be regarded as rather limited.

Contemporary realistic alternatives include private sector jobs and CBNRM activities, which, if adequately remunerative, may play an important role in weaning people from subsistence resource exploitation and, thus, reduce the need for subsistence sprawl.

For conservation purposes, it is necessary to halt the increase of the population relying on subsistence resources by reduced population growth (a long-term issue) and by accelerating employment creation in local private and community-based initiatives. This may require stimulation of local private investments in tourism as opposed to investments by outsiders who now often dominate the tourism industry (Mbaiwa, 2005).

The literature agrees that, in spite of problems, more support must be given to various forms of CBNRM. Prospects for fruitful partnerships between communities (in need of livelihood improvements) and private companies (equipped with skills and experience) may be enhanced by appropriate tax incentives. Government can assist further by providing more direct assistance toward special training for poorly educated community members and (directly or through relevant NGO's) toward community project management, something that has proven challenging for communities (Arntzen et al., 2003).

The creation of a sufficient quantity and quality of income opportunities for local residents in buffer areas in Africa should not remain an elusive objective; wildlife-tourism's considerable revenue needs to translate into more and better-paid jobs. Additional (inter)national investment in private and community activities is required. CBNRM initiatives may benefit from enhanced political will at local and central government levels accompanied by increased (government or donor) financial support directly to local CBNRM projects or to NGO's assisting communities. Currently, such NGO's attract donor-funds mostly from international sources and not enough from national sources (Roe et al., 2000). Providing tax incentives for private companies working in partnership with communities may be worthy of consideration, while more attention is also required for consumptive forms of sustainable resource utilisation by communities.

In many parts of Africa, people have been excluded by erecting fences around protected areas, a traditional conservation solution that has been found wanting in terms of achieving long-term herbivore habitat conservation (Sherbinin, 1998), partly because it creates animosity. Globally, there is now growing consensus that people cannot be excluded from protected areas and that local populations must benefit from local environmental resources, including wildlife. This consensus needs to be transformed into support for CBNRM and combined private-CBNRM initiatives.

If, through a combination of population growth and limited alternatives, many people in a region remain compelled to directly "live from the bush", chances for future wilderness conservation in Africa are small. Instead, subsistence sprawl can and must be mitigated by full-fledged efforts, backed by political will, to provide sufficient alternatives to rural dwellers for the loss of subsistence resources.

The material presented above, shows that disaggregation of rural sprawl contributes to improved understanding of its root causes and possible alternatives. Mitigating conservation unfriendly rural sprawl in African buffer areas of conservation significance means addressing both pathways of sprawl and their root causes. It is important for long-term conservation of Africa's wildlife heritage that subsistence living becomes compatible with wildlife-tourism and that wildlife habitat becomes a resource upon which local people can build a prosperous life to the extent that they consider conservation in their own self-interest. Ultimately, it would be a disgrace if the land and wildlife that was taken away from the poor to be enjoyed by the rich, would yield only long-term poverty and degradation to Africa's rural dwellers.

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