

## Animal Health and Biodiversity – Preparing for the Future

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## **The value of wildlife tourism: perspectives from sub-Saharan Africa**

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### *Summary*

*Various authors have used different categories to estimate the value of wildlife, e.g. direct and indirect use values, option values, ethical values, etc. In this paper, the authors address the value of wildlife-based tourism. With the development of the world tourism industry, the value of nature-oriented tourism is increasing on all continents, and especially in sub-Saharan Africa. The value of such tourism is often understood as the direct economic benefits that come from ‘the tourist dollar’ and contribute to the generation of income for the country and its inhabitants. However, there are other ways to value wildlife which are not sufficiently taken into account, i.e. the diverse benefits provided by ecosystem services, such as the ecological value of species to a healthy ecosystem, their nutritional value and cultural value, etc. Wildlife tourism in sub-Saharan Africa is largely supported by Protected Areas (PAs), with their broad range of different categories, which are clearly the backbone of the industry.*

*One leg of wildlife tourism is the wildlife-viewing tourism in natural habitats. In sub-Saharan Africa, this type of tourism mainly occurs in PAs of the public domain, principally national parks (NPs). It also occurs at a few other locations, such as game ranches which are privately owned, or communal conservancies which are community-based, both found mainly in Southern Africa. With a few notable exceptions, a majority of NPs are struggling to fulfil their conservation mandate, due to a lack of financial and human resources for their management: very few of them attract enough tourists to cover their management costs. At present, most NPs require external funding to support their day-to-day running and achieve their conservation aims. This is nothing new. Protected areas cannot be justified solely by their direct economic outputs; the entire range of benefits that they provide must be considered.*

*The other leg of wildlife tourism is hunting tourism. This type of tourism mainly occurs in publicly owned PAs, which are officially gazetted and earmarked as hunting areas (HAs) under various names (e.g. game reserves, hunting blocks, Coutadas, Zones de Chasse, Domaines de Chasse, etc.). In a few Southern African countries, hunting tourism is also carried out on private and communal land. These HAs, overall much bigger than NPs, often act as buffer zones around and ecological corridors between NPs. They are usually privately managed and financed and thus their contribution helps to reduce the financial burden on the government, of conserving and managing its biodiversity assets in these areas. Government budgets for conservation are often under-resourced, being low on the list of*

*national development priorities. Thus, improved professionalism and efficiency in the hunting tourism industry could substantially increase the ability to conserve huge tracts of natural habitat, with all of their biodiversity and ecosystems services, while increasing economic benefits to the local people and Government.*

*However, most PAs are under threat from humans, caused by growing populations and their increasing need for land and natural resources. In developing countries, concerned with food security and poverty alleviation, poaching is a widespread threat to PAs. The often massive quantity of bushmeat taken from both inside and outside PAs represents a kind of 'hidden' value, since it is largely unknown, overlooked and often illegal. When this direct consumption of game for food becomes unsustainable, due to over-harvesting the resource, its value becomes negative and counter-productive to wildlife tourism. Agriculture encroachment is a severe threat to PAs because it is converting natural habitats, destroying biodiversity and compromising ecosystem services. Pastoral encroachment is a relatively new threat to NPs and HAs, and this issue is often neglected in management schemes although it is happening more frequently. The two different types of PAs, NPs and HAs, complement each other very well in their common function of resisting the biological collapse affecting vast areas of sub-Saharan Africa.*

### **Keywords**

Economic value – Ecosystem services – Hunting tourism – National Parks – Protected areas – Rural development – Sub-Saharan Africa – Tourism hunting – Wildlife – Wildlife-based tourism – Wildlife conservation – Wildlife-viewing tourism.

## *Introduction*

Various authors have used very different categories to try to estimate the value of wildlife, e.g. direct values comprising consumptive use value and production use value and indirect values comprising non-consumptive use value, option value and ethical value (24). The focus of this paper will be on sub-Saharan Africa and different perspectives on the value of (i) wildlife-based tourism, (ii) protected areas and (iii) wildlife itself.

## *The growing development of tourism*

### **Tourism throughout the world**

Tourism is one of the world's leading industries, accounting for 5% of the world's gross domestic product (GDP) and 30% of the world's export of commercial services. Furthermore, the industry is growing: the value of travel and tourism is expected to rise from 7.9 billion United States dollars (US\$) in 2008 to US\$ 14.8 billion by 2018. The contribution of the travel and tourism economy to global employment is expected to rise from 238 million jobs in 2008 to 296 million jobs (1 in every 11 jobs) by 2018 (38). The number of international arrivals has grown from a mere 25 million international arrivals in 1950 to an estimated 806 million in 2005, corresponding to an average annual growth rate of 6.5% (43). The UNWTO Tourism 2020 Vision forecasts that international arrivals will reach nearly 1.6 billion by the year 2020. In terms of total tourist arrivals, the top three receiving regions in 2020 will be Europe (717 million tourists), East Asia and the Pacific (397 million) and the Americas (282 million), followed by Africa, the Middle East and South Asia. With such impressive growth, the tourism industry appears to be one of the most remarkable economic and social phenomena of the beginning of this century. With the development of the world tourism industry, the value of nature-oriented tourism is rising on all continents: already, in 1999, 7% of all international travel expenditure was related to

nature tourism, which was also one of the fastest-growing segments within the international tourism market (9).

## Tourism in Africa

The African region boasts a number of major assets (e.g. nearly one-third of the world's terrestrial biodiversity, more than one-fifth of the world's terrestrial surface area and 15% of the world's population). However, its share of the world's tourism is still tiny, with only 4% of international arrivals. Nevertheless, tourism in Africa is showing steady growth, higher than the world's average. While tourist arrivals declined globally in 2009 because of the financial crisis, Africa was the only region that showed the opposite trend, with a 5% increase (38).

The tourism industry in Africa is unevenly distributed, ranging from virtually none in some unstable and/or poor countries to a very important activity in some emerging economies. North Africa (mainly beach tourism) and southern Africa are, by far, the two leading sub-regions of the continent. In sub-Saharan Africa, southern Africa dominates the industry, followed by East Africa and, quite far behind, by Central and West Africa (38) (Fig. 1).

Sub-Saharan Africa is now emerging as a popular destination for visitors and a promising source of development. According to the World Travel and Tourism Council, travel and tourism are expected to contribute over 9% to the African region's GDP over the next decade.

Besides beach tourism, nature-based tourism is a major component of the tourism industry in sub-Saharan Africa. Wildlife-based tourism offers a very wide and diverse range of products, e.g. nature-based tourism with a wildlife component, visits to locations with good wildlife presence, visits to artificial attractions based on wildlife, habitat-specific tours, animal watching, thrill-offering tours, hunting/fishing tours, ecotourism (31).

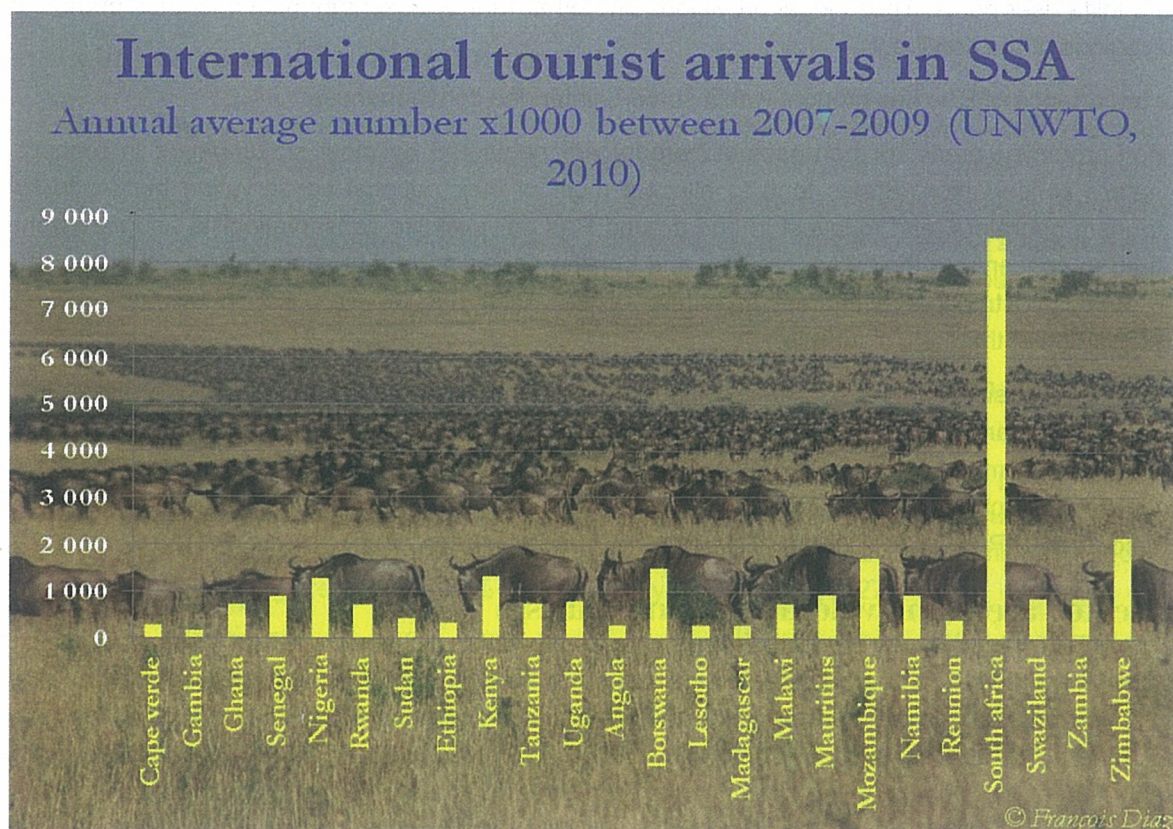


Fig. 1

International tourist arrivals in sub-Saharan Africa. Adapted from (38)

Available at: [www.unwto.org/](http://www.unwto.org/)

## *Protected areas and wildlife-based tourism in sub-Saharan Africa*

### **Protected areas as the backbone of wildlife-based tourism**

Wildlife-based tourism and protected areas (PAs) are closely interrelated in sub-Saharan Africa: wildlife-based tourism would not exist without PAs, which are really the backbone of the industry. In return, PAs need wildlife-based tourism, which is their main income-generating activity. Beyond the well-known I to VI categories of the International Union for Conservation of Nature (IUCN), PAs cover a wide range of parks and other bodies featuring different patterns of wildlife-based tourism ([www.iucn.org/about/work/programmes/pa/pa\\_products/wcpa\\_categories/](http://www.iucn.org/about/work/programmes/pa/pa_products/wcpa_categories/) accessed on January 2012), e.g.:

- PAs support various forms of wildlife-based tourism:
  - i) wildlife-viewing tourism, a non-consumptive form of wildlife-based tourism, occurs in all types of PAs with particular emphasis on national parks
  - ii) hunting tourism, a consumptive form of wildlife-based tourism, occurs in many types of PAs (hunting areas, conservancies, game ranches), but not in most national parks
- PAs have differing forms of legal status:
  - i) public PAs, e.g. national parks and hunting areas
  - ii) communal PAs, e.g. communal conservancies
  - iii) private PAs, e.g. private wildlife ranches.

It is worth noting that the last two types (communal and private PAs) occur mainly in the southern African sub-region, where communal conservancies, commercial conservancies and private wildlife ranches are made possible by specific legal provisions, in terms of land tenure, ownership rights and wildlife user rights. These legal provisions are either rare or absent in most countries of the other sub-regions of the continent.

The importance of PAs has brought with it some unintended consequences:

- non-protected areas (or non-gazetted areas) are neglected by most stakeholders in respect to nature conservation. States tend to allocate most of their national conservation budget to PAs; tourism operators tend to invest in and around PAs only; wildlife conservationists and researchers tend to concentrate their work on PAs, and funding agencies tend to support PAs. All these efforts reduce investment and interest in nature conservation outside PAs, i.e. in by far the largest proportion of the earth's surface;
- PAs are considered by most stakeholders as very important or the most important areas in the remote and landlocked regions where they are often located; as a consequence, too much is often expected from PAs. These expectations are not limited to achievements in conservation but frequently include rural development results, which are often beyond the competence and resources of PAs.

### **Protected areas and wildlife-viewing tourism**

In sub-Saharan Africa today, wildlife-viewing tourism is a major contributor to the national economy in only a limited number of countries. Nature-based tourism generated US\$ 3.2 billion in ten out of 14 Southern African Development Community (SADC) countries in 2000/2001 (3). In Kenya, the direct contribution of the global tourism sector (more than three-quarters of tourists to Kenya visit parks and reserves) to the GDP was US\$ 1.4 billion (3.2%) in 2007 (21). As a leading country in African tourism, South Africa is achieving impressive performances. During the 2009–2010 financial year, the total number of guests visiting parks surpassed 4.5 million people through the South African National Parks' (SANParks) gates, an increase of 3.8% from the previous year. For the famous Kruger National

Park only, the number exceeded 1.4 million visitors, an increase of 7.8% on the previous year. Outstandingly, national citizens (South Africans themselves) accounted for 77.6% of all guests to parks (36), which is very unusual in all other African countries. Another peculiarity of South Africa is the important role played by the private sector in the tourism industry, with the unique development of (i) a large and growing number of private wildlife ranches and (ii) private concessions within public PAs.

With a few notable exceptions, such as in South Africa, most national parks struggle to fulfil their conservation mandate because of the lack of sufficient financial and human resources for their management (15, 20). Very few of them attract enough tourists to cover their management costs: in West Africa, for instance, national parks very seldom attract more than 6,000 visitors a year (19), which is far from enough to cover their investment, and management costs. In Gabon, out of the 15,000 foreign visitors to the country each year since 2007, only 1,000 to 1,500 people specifically come to visit the national parks (10). Apart from some specific, privately owned and/or managed enterprises, wildlife-viewing tourism is profitable in very few national parks. Moreover, these parks require a high level of security, easy access, an efficient infrastructure, professional services and at least one outstanding feature, such as a spectacular landscape and/or popular species.

In some cases, too much mass wildlife-viewing tourism may lead to significant environmental and socio-cultural impacts. In Kenya, for example, after a period of unplanned expansion, tourism began to decline in the early 1990s, with the breakdown of the physical infrastructure, environmental deterioration, wildlife-human conflicts, socio-cultural problems and an uneven distribution of benefits (35).

There is nothing new here: most PAs cannot be justified solely by their direct economic contribution. Their whole range of values should be considered, especially their ecosystem services. At present, external funding is needed in most cases to support public PAs and maintain their values.

## **Protected areas and hunting tourism**

Consumptive tourism principally occurs in PAs – mainly in the public domain – that are officially gazetted and specifically earmarked as hunting areas under various names: *Coutadas* in Portuguese-speaking nations, *Zones de Chasse* and *Secteurs de Chasse* in former French colonies, *Domaines de Chasse* in former Belgian colonies, hunting blocks, game reserves, game controlled areas and wildlife management areas in English-speaking nations. Hunting tourism is also carried out on private and communal land in a few countries, mainly in southern Africa.

While national parks are well documented and publicised, hunting areas are often overlooked as a support to (i) nature conservation and (ii) wildlife-based tourism, despite:

- covering very extensive surface areas, currently much larger than national parks: 1.2 times larger in sub-Saharan Africa and 1.7 times larger in countries where hunting tourism is practised (23, 33). For instance, in Tanzania, national parks cover about 7% of the country (57,840 km<sup>2</sup>), while the total hunting area covers 33% of the country (295,660 km<sup>2</sup>) (27);
- often acting as buffer zones for national parks and ecological corridors between them, thus facilitating the functioning of national parks. These two different types of PAs complement each other very well in their common function of resisting the human pressures that affect most of sub-Saharan Africa;
- acting as transition zones between national parks and non-gazetted areas because of their more tolerant management systems: while national parks are generally strictly exclusive and repressive towards human activities within their borders, hunting areas are more community-friendly, with a spectrum of traditional activities permitted inside;

- reducing the government's financial burden of conserving and managing its biodiversity assets in hunting areas, a budget that is often under-resourced and frequently comes last in the list of national development priorities. In most cases, the management of hunting areas is privately financed.

Hunting tourism occurs in nearly half of all African countries, fluctuating from one year to another, in between 22 and 25 countries. The hunting tourism industry is unevenly distributed, being mainly concentrated in SADC countries. Out of a minimum of 18,500 tourists a year, throughout the sub-Saharan region, nearly half of these tourists travel to South Africa (45.6%), nearly one-third to Namibia (29.0%), then to Zimbabwe (10.0%) and Tanzania (7.3%), etc. South Africa and Tanzania currently dominate the industry, earning 36% and 29%, respectively, of the gross income generated (3). The hunting tourism industry generates gross revenues of more than US\$ 200 million per year in sub-Saharan Africa and is expanding. In Tanzania, direct and indirect tax flow to the government is approximately 44% of the gross income of the industry, i.e. US\$ 24 million. In Botswana, 75% of the gross income generated by hunting tourism remains in the country and about half of it stays at the district level, equating to an income of US\$ 48.5 *per capita* in the main hunting districts (3).

Hunting tourism is of major importance to nature conservation in sub-Saharan Africa since it justifies the conservation of vast areas, many of which are unsuitable for alternative wildlife-based land uses, such as photographic ecotourism, because of the lack of access, infrastructure, attractive scenery and/or high densities of viewable wildlife (23). Hunting tourism presents strong comparative advantages:

- compared with wildlife-viewing tourism, hunting tourism is effective in a broader range of situations and has a lower level of requirements
- it generates high revenues from low volumes of tourists in areas unsuitable for wildlife-viewing tourism
- it is generally more resilient to political instability
- it does not preclude some other forms of resource use
- it can help to control problem animals even if this control is not sufficient by itself
- it reduces poaching through private support to public efforts (23).

These advantages are not always fully achieved because of a lack of professionalism among some of the hunting operators. By adopting best practice in every aspect of the profession, the hunting tourism industry could increase its efficiency and more effectively conserve large natural habitats with their biodiversity, while increasing benefits to local people and governments.

Just like national parks, the value of hunting areas is not only economic. This is fortunate because the revenue they bring in per surface unit is far lower than potential alternative revenues from, for example, agriculture and livestock-rearing (18). However, the latter are either destructive to the environment (through the conversion of the natural landscape by agriculture) or degrading (transformation of the natural landscape by pastoralism). As with PAs, and like national parks, hunting areas provide ecosystem services at the global and at the local scale: the huge size of hunting areas makes them massive carbon sinks and enormous reservoirs of biodiversity. The ecosystem services provided by hunting areas to society's development and the planet's conservation may represent much larger benefits than the direct economic income they produce.

## *The value of wildlife and protected areas*

### **Different perceptions**

Wildlife is a renewable natural resource with multifaceted values (4). Every single person has his or her own perception of the wildlife resource. These perceptions vary greatly, especially across cultures, to the point that a given value may be considered positive by one and negative by another. In Barth's theory of value systems, seven distinct spheres of values can be identified in the domain of wildlife exploitation (32):

- a) symbolic values
- b) traditional subsistence values
- c) hostile values
- d) economic enterprising values
- e) farming values
- f) pragmatic conservation values
- g) idealistic values.

There are clearly large differences between traditional values, such as (a) and (b); enterprising values, such as (d) and (e); and modern conservation values, such as (f) and (g). While local rural Africans tend to hold values mainly in spheres (a), (b), (c) and a part of (d), westerners tend to predominantly adopt conservation values. According to Rosa and Joubert (32), 'there is considerable asymmetry in opportunity awareness, know how and capital between western-driven forms of wildlife exploitation, and those of indigenous Africans'.

### **Economic values**

Through a strictly economic prism, wildlife may be regarded as biological capital from which all types of values can be derived, e.g. spiritual, cultural, subsistence and existential; the combination of values assigned to wildlife will tend to determine management objectives to protect and regulate its use (21).

A classic way of categorising the economic values of wildlife is to divide them into consumptive and non-consumptive uses of the wildlife resource (29):

- consumptive use: hunting, live sales, meat, skins, hides, horns, ivory and other products, including trophies and talismans, etc.
- non-consumptive use: all aspects of ecotourism, game viewing, photographic safaris and other activities, such as catch-and-release sport fishing.

Both classes of tourism (consumptive and non-consumptive) generate taxes for the State, profit for private operators, and shared benefits and advantages for local communities. The global value of wildlife-based tourism is often perceived as restricted to its tangible economic value, i.e. using wildlife to directly generate income. However, a very limited number of PAs present positive economic balances while many more do not. Thus, relying solely on their economic value to justify the continued existence of PAs appears to be a risky approach.

According to Kojwang (21), nature-based tourism is still not directly reflected in national accounts and is hardly recognised as an industry through budgetary allocations and supportive policies: it does not fit into the classification system and is hidden within different industries.



Nature-based tourism is often considered by decision-makers and local communities as the main justification for the existence of PAs. However, very few public PAs are economically balanced, i.e. managing to cover both their investment costs and running costs from tourism revenues, and that is before profitability is even mentioned. A large proportion of PAs are actually a burden on government budgets. Moreover, even when economic benefits do exist, few are shared with local communities. As a consequence, PAs often generate frustration, dissatisfaction and even resentment among local stakeholders, who doubt their relevance. In Kenya, Norton-Griffiths and Said (28) demonstrated that the clear differentials between the returns to agricultural production, livestock production and wildlife production are so great that the benefits from agricultural and pastoral production overwhelm those from wildlife, even in the areas most visited by wildlife tourists. The most lucrative wildlife uses, from the conservation viewpoint, are the concession and access fees paid to landholders by the tourism cartels – potentially between US\$ 20 million to US\$ 100 million a year, vastly less than the rents from either livestock or agricultural production.

One outstanding exception is the success story of the communal conservancies in Namibia. As explained by Weaver *et al.* (39), the passage of the 1996 communal area conservancy legislation has provided both incentives and motivation for communal area residents across Namibia to conserve wildlife resources. Communities who form conservancies are now managing and making use of their wildlife through a number of means (photographic tourism, trophy hunting, various forms of meat-harvesting, live game sales). The resulting cash and in-kind benefits have fostered a deeper appreciation of the value of wildlife and stimulated communities to incorporate wildlife conservation practices into their daily livelihood strategies. Consequently, unprecedented recoveries of wildlife are occurring across Namibia's communal areas, while economic and financial benefits to communities are continuously increasing.

Overall, however, the value of PAs in sub-Saharan Africa, when estimated only on financial revenues, appears insufficient to justify these areas. Nonetheless, PAs have many other values that are essential, despite being too often overlooked, i.e. the important and diverse values of all ecosystem services, including ecological value, nutritional value, cultural value, etc.

## **The values of ecosystem services**

The economic function of wildlife tourism is no doubt crucial, although its conservation function to help justify PAs is also of great importance for biodiversity conservation and climate regulation.

With or without nature-based tourism, whether wildlife-based tourism is profitable or not, whether it is consumptive or non-consumptive, every single PA performs the function of setting aside large tracts of land for nature conservation. Since the creation of PAs, this function has been acknowledged as being instrumental for conserving biodiversity as a whole: PAs are widely recognised as the most efficient conservation tool that exists today.

More recently, this function has been recognised as crucial for delivering ecosystem services. Ecosystem services delivered by PAs are both global in their range (e.g. adaptation to climate change through maintenance of carbon sinks, preservation of genetic richness through conservation of biodiversity) and local in their range (e.g. watershed management, regulation of local climate, support to livelihoods, contribution to food security).

The value of these ecosystem services has not been readily recognised by previous studies of PAs, maybe because it is not considered as an economic value in the strict sense, of producing direct income-generating revenues. However, recent studies provide evidence that the benefits from ecosystem services in PAs to local communities are often greater than those from tourism revenue-sharing, e.g. whether legal or not, gathering wild plants and harvesting fish and game in and around

PAs bring in more benefits than tourism (19). In these cases, traditional and informal benefits overtake conventional formal benefits.

The production of meat from wild animals (bushmeat) may be considered one of the services provided by ecosystems, including PAs. When its legal and illegal components are added together, the global production of bushmeat makes it a very important industry in sub-Saharan Africa, with consumption of about 1.2 million tons a year in the Congo Basin (41) and approaching 2 million tons a year over all. Bushmeat substantially contributes to food security and traditional livelihoods, more so in forest ecosystems than in savannah ecosystems, where livestock are more accessible. In some countries, this industry is increasing with the growth in population and urbanisation, raising the growing concern of sustainability. When poaching wild meat threatens the wildlife resource, which is often the case, the bushmeat industry enters into direct competition with wildlife-based tourism, either consumptive or non-consumptive. Indirect competition occurs when taking bushmeat competes with large carnivores targeting the same animals as prey. In Ghana alone, the annual bushmeat market is estimated at US\$ 250 million, higher than the value of the entire hunting tourism sector in sub-Saharan Africa (3). Paradoxically, the bushmeat industry represents a real ecosystem service while nonetheless being an informal and illegal economy. Rosa and Joubert (32) develop the concept of a dual wildlife economy: one informal, dominated by poaching, the other formal and based on non-consumptive exploitation, founded on tourism.

As stated above, the insufficient benefit-sharing from tourism in many PAs is a source of resentment among neighbouring communities. This resentment is stronger in situations where access to land and natural resources is restricted and even worse when it is denied. For this reason, payment for environmental services (PES) is a new and very important tool for conserving natural ecosystems, especially in PAs with no or limited tourism income. The relatively new concept of PES aims to achieve conservation outcomes in a similar way to the more common integrated conservation and development projects, although PES is more direct, more cost-effective and less complex institutionally (14). For instance, the well-known Zimbabwe Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) generated, during 1989 to 2001, over US\$ 20 million of transfers to the participating communities, 89% of which came from hunting tourism. Twelve of the 37 districts with authority to market wildlife produced 97% of all CAMPFIRE revenues, reflecting the variability in wildlife resources and local institutional arrangements (14). CAMPFIRE paved the way to a wide range of similar programmes over the whole continent.

## *Threats to wildlife, protected areas and wildlife-based tourism*

### **Impact of threats**

Threats to wildlife are also threats to PAs as wildlife is a vital constituent of their ecosystems. Threats to PAs are threats to wildlife-based tourism, which very much relies on the integrity of PAs. The intention in this section is not to exhaustively cover the whole spectrum of threats to wildlife, but simply to raise awareness by presenting some of the most prominent. Threats to wildlife may be simply described as:

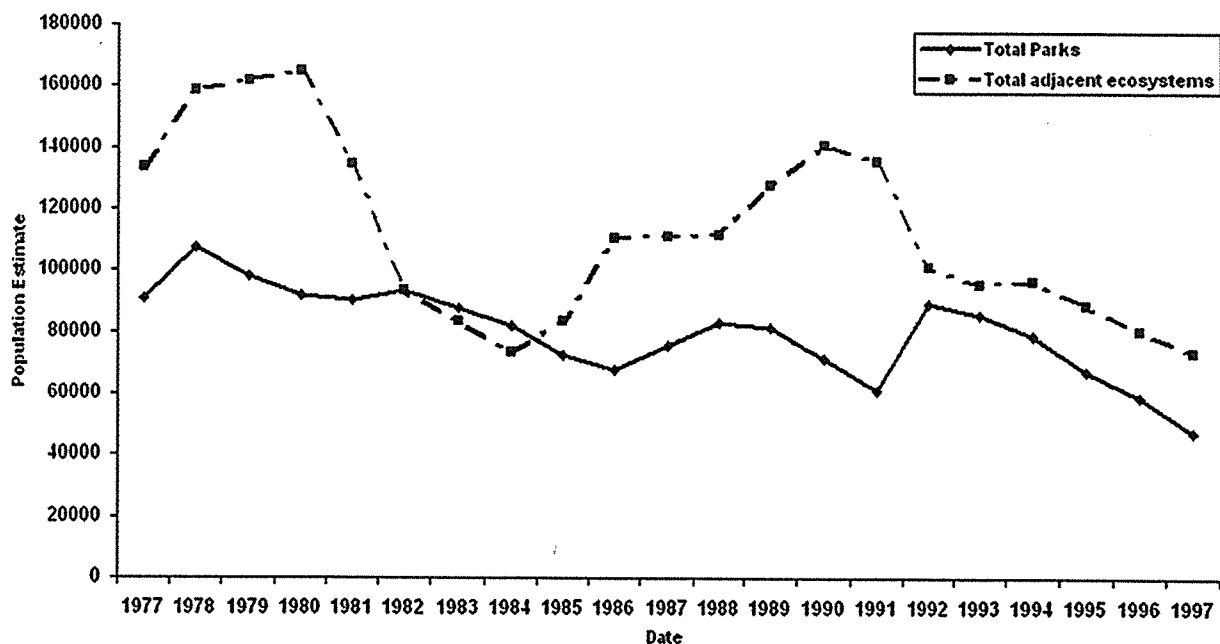
- direct threats responsible for the physical destruction of the wildlife itself, e.g.
  - i) poaching, e.g. game harvesting when that is illegal
  - ii) disease, e.g. often caused by domestic animals contaminating wild ones, as a result of increased livestock/wildlife interaction.
- indirect threats due to either degrading or destroying wildlife habitats:
  - i) habitat degradation, e.g. by pastoral encroachment
  - ii) habitat conversion, e.g. by agricultural encroachment.

## Impact on wildlife

Declines in large mammal populations in Africa's PAs have been described by Craigie *et al.* (8). By using a database of 583 population abundance time series for 69 species of large mammals in 78 PAs, a multi-species index of overall changes in population abundance was developed, revealing an average decline of 59% in wildlife population abundance between 1970 and 2005. However, large regional differences exist, with southern African PAs typically maintaining their populations and western African PAs suffering the most severe declines. According to the same authors, these results indicate that African PAs have generally failed to mitigate human-induced threats to African large mammal populations, even though they also show some successes.

Following the authors above, Scholte (34) further documented the large-mammal population decline in Africa's PAs in two particular sub-regions of the continent that are usually under-documented, West Africa and Central Africa. He notably describes the underlying drivers of the difference between sub-regions, especially the prolonged decline in rainfall coinciding with increased human pressure in West and Central Africa.

At the country level, a telling example of the decline in wildlife has been given by Western *et al.* (40) in Kenya. Estimates show a nationwide decline of 38% in wildlife numbers between 1977 and 1997, and a loss of 41% of wildlife populations in the combined national parks over the same period (Fig. 2). Interestingly, the losses in national parks reflect, in part, the poor coverage of seasonal ungulate migrations and, for the largest parks, the effect of climate change and the difficulty of protecting large remote parks. As evidence, wildlife declines appear similar both inside and outside national parks, so that '... parks and reserves have not insulated wildlife from the steep country-wide declines of the last 30 years' (40).



**Fig. 2**  
**The evolution in Kenya of total wildlife populations in national parks over three decades, between 1977 and 1997, with matching external ecosystem counts**

These parks include Tsavo East, Tsavo West, Amboseli and Nairobi but exclude Meru and Nakuru. Doi:10.1371/journal.pone.0006140.g002 (40).

## Impact on people

Most PAs are exposed to tremendous pressure from growing human populations and their need for development. In developing countries, concerned with food security and poverty alleviation, land and natural resources are even more sought after than in developed countries, at least at the individual and household levels.

Since one of the main mandates of PAs is to preserve land and natural resources from human exploitation, PAs are often regarded by many stakeholders as obstacles to development. In developing countries, PAs are often perceived by local communities as constraints to their traditional lifestyle and subsistence livelihoods. In these countries, the management of PAs becomes extremely tricky, due to the huge challenge of tackling the over-harvesting of their resources while, at the same time, maintaining good relationships with neighbouring communities.

The common 'tough approach' adopted by many PAs, based on exclusion, coercion and repression, tends to partition the world into, on the one hand, impenetrable sanctuaries within PAs and, on the other, areas characterised by carelessness and lack of restraint outside PAs. Such a 'sanctuary' approach tends to create 'enemies of conservation' (11).

In Barth's theory of spheres of values, the contradictions between the values of indigenous Africans and those of westerners are responsible for a conflict of interest between the consumptive commodification of wildlife by the communities that neighbour PAs and the non-consumptive uses of wildlife by PAs themselves (32). A dual economy results; one dominated by poaching, the other by tourism, and this dual economy increases with human demography. As a consequence, 'wildlife numbers are plummeting faster than ever at a time when the growth of PAs has never been greater' (32).

## Poaching

Poaching, the illegal harvesting of wildlife, encompasses various realities that may feel very different to the people concerned. Poaching targets large mammals, which are the cornerstone of wildlife-viewing tourism, as well as of hunting tourism. Poaching also targets small game, such as mega-rodents (e.g. the crested porcupine, cane rat or grasscutter, giant Gambian rat) or duikers (e.g. blue duiker), all of them (i) with a higher resilience to hunting pressure, (ii) with little appeal for tourists, and (iii) often regarded as agricultural pests. Poaching ranges from large commercial poaching to local traditional hunting. Traditional hunting is conducted for either subsistence or commercial purposes or both. The trade component of poaching is rising with human demography and urbanisation. In general, with a few exceptions, poaching activity is escalating.

Most of the time, when a PA is officially declared and gazetted in a given area, any hunting and fishing practised by local communities in that particular area – usually for centuries – becomes poaching, i.e. a crime. Not surprisingly, many neighbouring communities – often displaced from the area – keep hunting and fishing the land they used to exploit, especially:

- when they have few alternative livelihood choices, and
- when hunting and fishing are deeply rooted in their traditional culture.

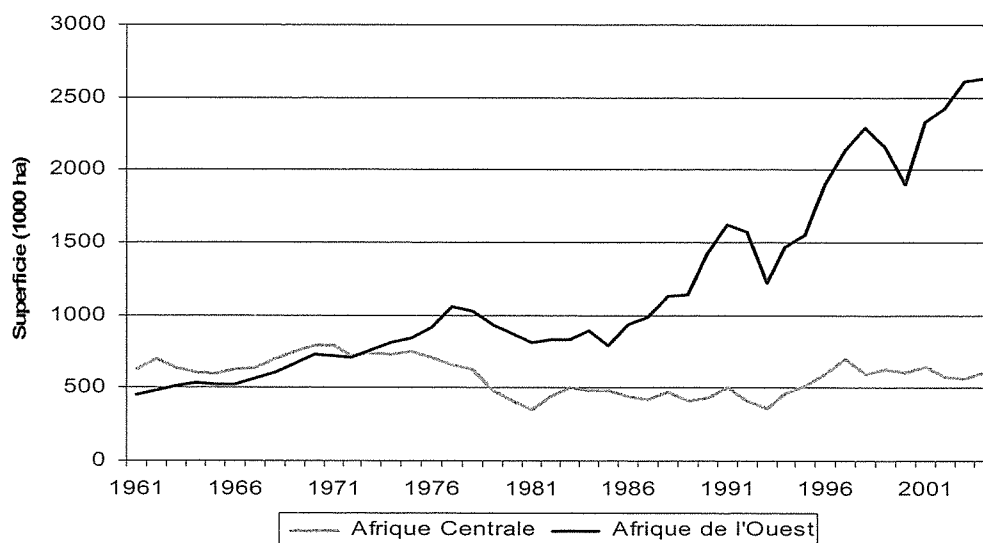
The often massive quantity of bushmeat taken from both inside and outside PAs represents a sort of hidden value, as the amount is largely either unknown or overlooked. Where and when the consumptive use of game for food becomes unsustainable because of over-harvesting, its value becomes negative and counterproductive to wildlife tourism. In addition to decreasing wildlife abundance and diversity, poaching tends to increase the fleeing distance of large mammals, thus reducing the attractiveness of the area to ecotourists.

## Agricultural encroachment

Agricultural development transforms wild landscapes into domesticated landscapes. Because of the brutal nature of the transformation, the ecosystem is subject to a destructive conversion, a process that is more severe than ecological degradation alone. As agricultural development is unquestioned and growing, this problem poses a serious challenge for decision-makers and stakeholders.

For instance, in a 30-km radius around the W-Arly-Pendjari (WAP) complex in Benin, Burkina Faso and Niger, more than 14.5% (3,514.4 km<sup>2</sup>) of natural savannah has been lost in the 18 years between 1984 and 2002 (6, 7). In the Benin part of the WAP complex, the loss of natural vegetation reached 17.3% during the same period.

In West and Central Africa, most savannah PAs are situated in the Sahelo-Sudanian eco-region, where cotton is grown. In several West African countries, cotton is one of the main cash crops and sources of foreign currency, and production has been steadily growing (Fig. 3). Since growing cotton requires large amounts of land, it is destroying vast areas of natural habitat. As an example, Banikoara, located at the southern border of the W Biosphere Reserve, is the first cotton-producing commune in Benin. The land area devoted to cotton has multiplied there by 1.6 and cotton production has increased 2.7-fold in the ten-year period between 1998 and 2008. In the same commune, the human population increased by 4.6% a year between 1992 and 2002 and doubled in the area closest to the Reserve during the same period (1).



**Fig. 3**

**Evolution of cotton production in West and Central Africa over four decades, between 1961 and 2001 (13). Available at: [www.fao.org/](http://www.fao.org/)**

Similarly, in Zimbabwe's Mid-Zambesi Valley, rapid changes in land use over the past 30 years have substantially decreased wildlife habitat, with adverse consequences for elephant and buffalo numbers. Farmland there has expanded faster than the human population. Baudron *et al.* (2) demonstrated that the paramount driver of such a change is the expansion in cotton growing, rather than an increase in cattle production following tsetse-control operations.

Furthermore, cotton farming is a major source of ecosystem pollution, degrading water quality and affecting flora, fish and wild large herbivores, as demonstrated by Issa (2004) in the Pendjari and W Biosphere Reserves in Benin. Wild large carnivores, at the tip of the trophic chain, are expected to be even more exposed.

According to Norton-Griffiths and Said (28), a simple elasticity analysis suggests that, for every 1% increase in land supporting cultivation in Kenya, a corresponding decrease of 0.85% occurs in

wildlife density. In Kenya's rangelands that receive more than 800 mm of annual rainfall, given the huge discrepancies between the returns from agricultural and livestock production *versus* those from wildlife production, wildlife must be considered to be at a very high risk of elimination.

The expansion of cultivation into wild lands exacerbates the occurrence of human/wildlife conflicts and increases their magnitude. A wide variety of wildlife species conflict with farming activities (22). Beyond the economic losses affecting rural farmers' subsistence and livelihoods, human/wildlife conflicts also have a social dimension, which is complex, intangible and difficult to quantify, although it is substantial (12). Thus, human/wildlife conflicts play a major role in the perceptions and tolerance of local communities nearby PAs and, ultimately, in the success of conservation strategies.

In fact, human/wildlife conflicts are often considered to be growing threats to PAs and wildlife. For communities living next to PAs, interactions with wildlife have inevitably led to sources of conflict, for as long as humans and wild animals have shared landscapes and resources. Human/wildlife conflicts result in adverse effects on:

- human life, in many economic, social and cultural aspects
- wildlife conservation
- the environment.

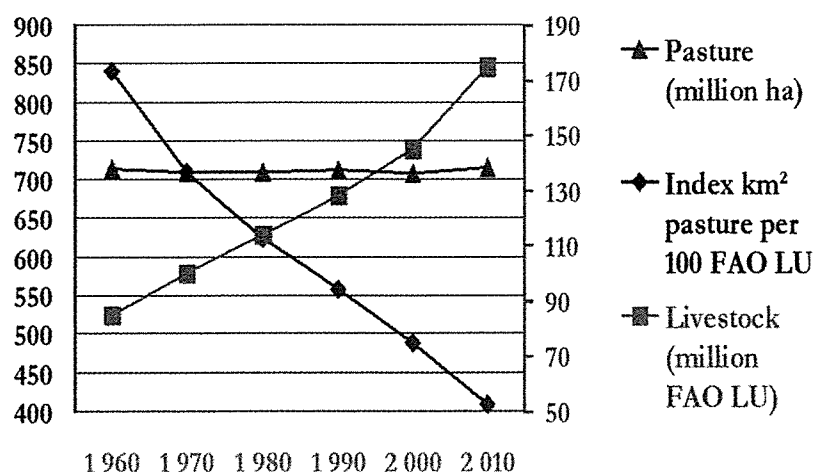
According to Baudron *et al.* (2), conserving biodiversity without jeopardising agricultural production will require an integrated approach, including technical and institutional innovation and the development and enforcement of policies and regulations to promote sustainable intensification and constrain further clearance of land for agriculture in order to 'spare' land for wildlife.

## Pastoral encroachment

Pastoral encroachment is a growing threat to national parks and hunting areas that is often neglected in management schemes, although it is on the increase. The antagonism arises from:

- direct negative interactions between wild and domestic animals, including disease transmission
- competition over feed and water resources (13).

The current rapid increase in livestock numbers in sub-Saharan Africa (faostat.fao.org/) (Fig. 4) is the



result of about 50 years of relatively successful livestock development programmes, the modernisation of veterinary science and the attractiveness of cattle ownership for urban and rural dwellers, etc. In particular, the recent eradication of rinderpest (17, 42) has removed one of the main constraints to cattle demography since the end of the 19th Century.

Fig. 4

### Evolution in sub-Saharan Africa of:

- i) the surface area of grazing rangeland (pasture in millions of hectares)
- ii) the global livestock herd (in millions of FAO livestock units [LU])
- iii) an index of pastures used by livestock (in km² pasture per 100 FAO livestock units). Available at: [www.faostat.fao.org/](http://www.faostat.fao.org/)

In the meantime, the amount of land supporting cattle grazing has remained remarkably stable worldwide ([www.fao.org/](http://www.fao.org/)). Traditional pastoral rangelands have been reduced by the expansion of cultivation and the multiplication of PAs; in West and Central Africa, pastoralists are progressively being squeezed between desertification in the north and the agricultural pioneer frontier in the south; and little new ground is available because of ecological constraints, such as unsuitable forested landscape. As a consequence, the ratio of pasture surface area per head of cattle is steadily dropping, resulting in increased grazing pressure per surface unit, ecological degradation of rangeland, impoverishment of the average livestock herder and rising conflicts between pastoralists and other stakeholders. The real development of cooperation schemes between agriculturalists and pastoralists, notable for a more efficient use of agricultural by-products, does not fully compensate for the shortage of natural pasture.

In their often desperate search for grazing areas, cattle-herders are being driven to illegally enter into PAs, a rising phenomenon that has become a sort of invasion in some areas of West and Central Africa. This has largely been facilitated by the progress in controlling trypanosomiasis, which used to prevent cattle penetrating into PAs often established in marginal tsetse-infested landscape. Domestic cattle have a negative impact on wild herbivores through:

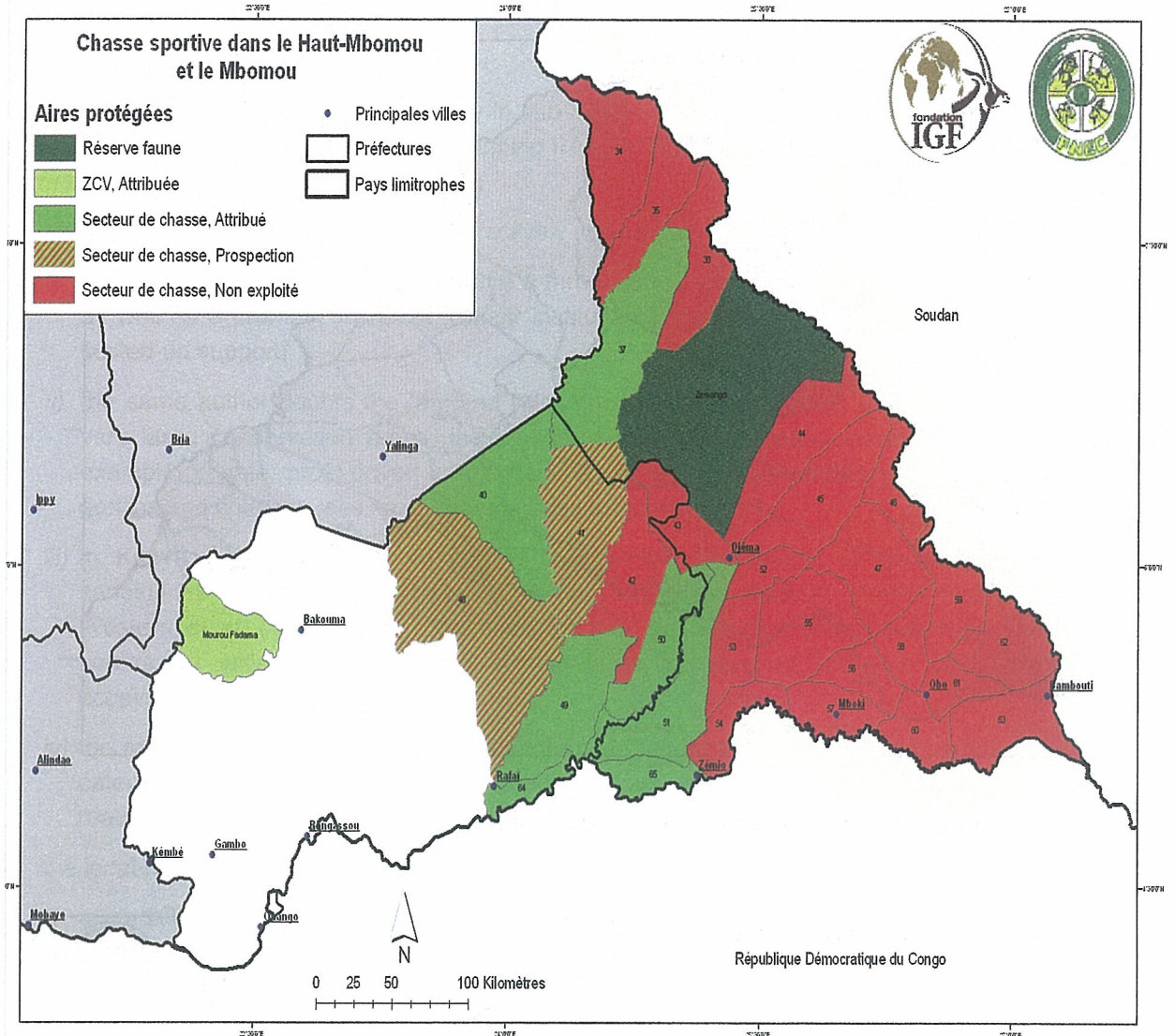
- food competition, especially for species with a predominantly grazing diet, such as the African buffalo
- spatial avoidance, especially for elephants (with exceptions, such as the Gourma's elephants in Mali), because of the association with overall human disturbance (16).

Pastoral development is responsible for the transformation of natural ecosystems into modified ecosystems, with eroded biodiversity. Herds cause wide-scale land degradation through overgrazing, compaction and erosion, with particular problems in the dry lands (13). Furthermore, as pastoralists are gaining access to wild lands and PAs where lions live, and villagers are farming right up to the edge of national parks, the potential for an increase in lion attacks on livestock and people is obvious. With such an increased interface between people and lions, the human/lion conflict is increasing, even in areas where the lion population is not thriving (5).

In Kenya, according to Norton-Griffiths and Said (28), wildlife has had pernicious effects on livestock production. While wildlife adds perhaps only 6% to the total operating costs of a livestock operation, this can represent anywhere up to 50% of the net operating profits; in other words, eliminating wildlife can effectively double the operating profits of livestock production.

The far eastern region of the Central African Republic provides a telling example of this (26) (Figs 5a, 5b & 5c):

- no cattle were present in the region before the last few decades. Recently, mobile pastoralists have expanded their transhumance into the region inhabited by sedentary agro-hunters, and settled and developed their activities;
- the natural landscape, made up of a forest/savannah mosaic, is being progressively transformed, with a slightly progressive expansion of the savannah, caused by the intensive use of fire by herders;
- the PAs (one wildlife reserve, one community-based hunting area and a dozen hunting blocks) are being encroached upon by pastoralists;
- wild herbivores are being poached by cattle-herders as bushmeat, to complement their diet and to spare their livestock;



**Fig. 5**  
**Recent human encroachment onto protected areas of the Mbomou and Haut-Mbomou Préfectures, South-Eastern Central African Republic (25)**

**Fig. 5a**  
 Protected areas gazetted as wildlife reserves (*Réserves de faune*), community-based hunting areas (*Zones cynégétiques villageoises*) and hunting blocks (*Secteurs de chasse*)

- wild predators are being harassed and persecuted by cattle-herders: shot, snared, poisoned, netted and speared.

The long-term sustainability of biodiversity conservation in PAs invaded by livestock is dependent on:

- applying protective rules and legislation
- the largely shared perception that PAs are legitimate, and
- a consensual vision of land management with negotiation mechanisms established at both local and regional levels, which take into account wildlife conservation and the seasonal migrations of wildlife and livestock (37).



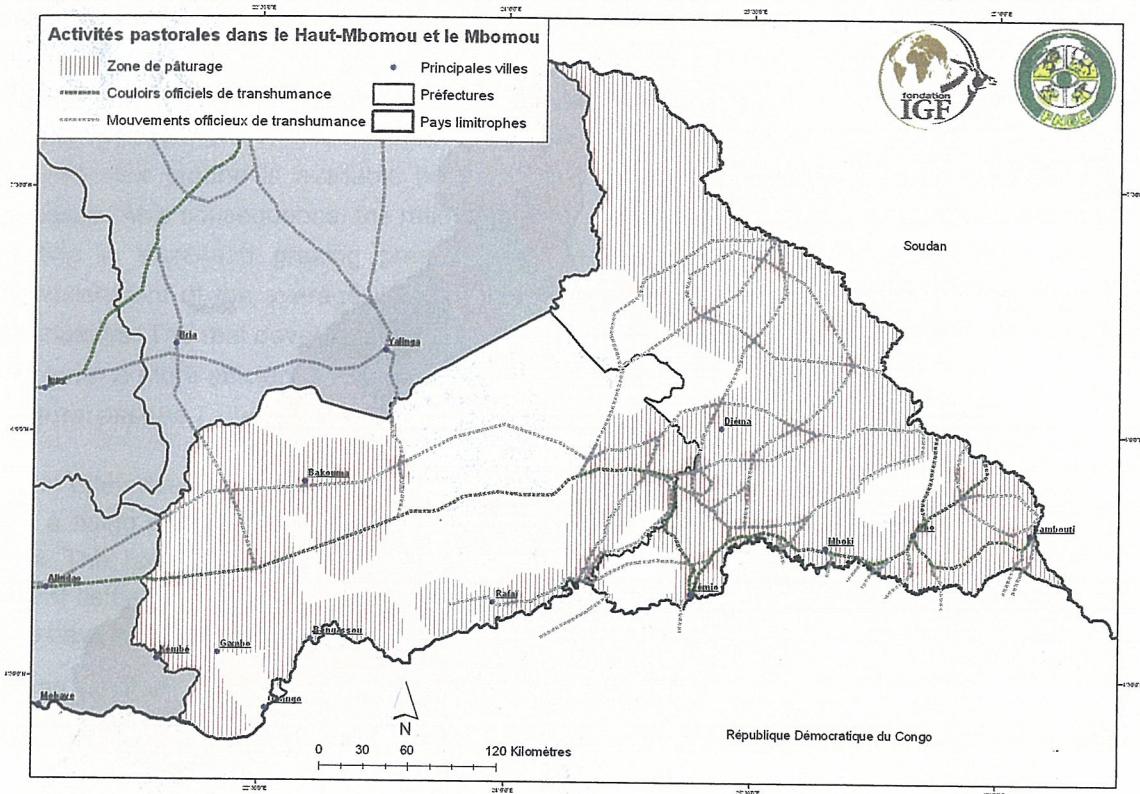


Fig. 5b  
Development of pastoral herding: grazing rangeland and official and informal transhumance corridors

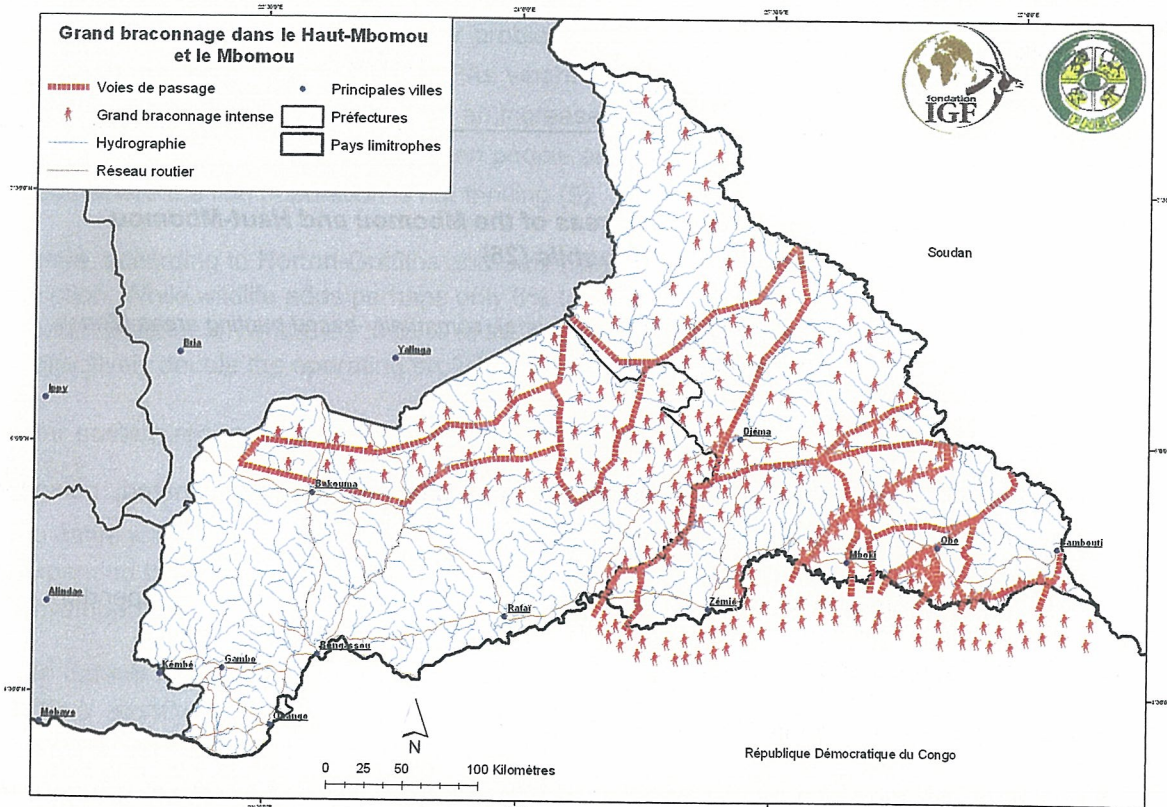


Fig. 5c  
Development of commercial poaching: main poaching grounds and main poachers' paths

## *Prospects*

The steady growth of the tourism industry in sub-Saharan Africa, especially of nature-based tourism, offers an outstanding opportunity for developing PAs and improving the conservation status of wildlife. However, two conditions must be fulfilled:

- the wildlife resource still needs to be effectively conserved:
  - i) according to Scholte (34), PAs require a three- to ten-fold increase in their operational budget, as well as a dramatic increase in their institutional, human and local capacity to handle such scaled-up support;
  - ii) the same author doubts the 'myth of wild Africa' today: he predicts that, outside a handful of very large conservation areas, indigenous wildlife will ultimately remain in the form of, for example, private, profit-driven wildlife ranches or well controlled PAs where species such as gorillas and chimpanzees have become used to humans;
  - iii) in Kenya, Mutu (2005, in 40) shows that wildlife populations in private and community sanctuaries are stable or increasing, in contrast to the declines in PAs and country-wide. Western *et al.* (40) point to: 'the need for new policies that combine national, private and community initiatives in order to sustain large free-ranging herbivore populations at an ecosystem and landscape scale';
  - iv) the maintenance of a partitioned and segregated landscape in distinct compartments (different categories of PAs and non-PAs) needs serious improvement in land-use planning and practices.
- the local rural societies need to be part of the scheme:
  - i) according to Rosa and Joubert (32), 'entrepreneurs [should be] able to exploit synergies between traditional value systems, that see wildlife as a resource to be harvested for subsistence and local profit, and new forces of commercial entrepreneurialism in Africa where the need for self-advancement and economic development is highly valued';
  - ii) as a possible response to this recommendation, Novelli *et al.* (29) propose an approach where: 'ecotourism embraces forms of consumptive tourism, which can prove to be beneficial to the economy, the environment and local communities'. If such an approach is adopted, local communities and entrepreneurs should engage in more sustainable forms of wildlife exploitation.

To be strategic, wildlife-based tourism must be beneficial to the economy, to the environment and to local communities. However, for such a strategy to succeed, it is now extremely urgent to improve existing practices and introduce innovative ways to truly involve local rural societies in the global economic world and to overcome the biological collapse.

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