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Wildlife & Countryside Directorate

Assessment of the Solution-orientated research needed to promote a more sustainable Bushmeat Trade in Central and West Africa

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DEFRA

EXECUTIVE SUMMARY

The 'bushmeat trade' is a highly complex issue with few, if any, general solutions. The general characteristics of the situation have been well researched, and because of the growing urgency of the issue it is now time to concentrate on the specifics from an action-oriented perspective.

The bushmeat issue is not easily compartmentalised and, although this report uses a format fitting with the respective authors' expertise and examines the issue in terms of institutions and policy, biodiversity, and livelihood perspectives, many of the key questions remaining to be solved are crosscutting. Our approach was, therefore, to identify questions that need to be answered and prioritise these within the context of the reality of the situation in West and Central Africa. This region is probably the geographical area on which most has been written in recent years with regards the hunting of wild game. However, it should be recognised that the bushmeat problem is global, and that hunting in the Asian and American tropics shares many of the characteristics noted below, and warrants the same kind of attention. This analysis of characteristics was based on a literature review, which is attached as Appendix 1.

In West and Central Africa the bushmeat trade exhibits the following **general characteristics**:

- It is a large, but often invisible, contributor to the economies of West and Central Africa.
- It is highly complex and displays significant geographic variation.
- It is already unsustainable at various local levels and appears to be increasing.

The trade exhibits specific **livelihood and trade characteristics**:

- Bushmeat has significant impacts on the livelihoods of the rural poor, providing both an affordable source of animal protein and a livelihood opportunity for men as hunters and women as traders.
- Hunting tends to be opportunistic.
- Bushmeat is a favoured food item and is part of a complex commodity chain, linking rural hunters to urban and rural consumers.
- Smoked bushmeat is often the only method of maintaining a store of protein for rural communities.
- The logging industry is an important stakeholder sector that often facilitates the trade.

From an **ecological perspective** there is also complexity in that:

- Tropical forests, the source of much of this bushmeat, have intrinsically low rates of production of wild animals in comparison to other ecosystems.
- Some bushmeat species thrive in secondary forest and may be able to sustain relatively high levels of hunting, others may be pest species, and some species are genuinely threatened by over-hunting.

- The current trade is having a negative impact on populations of vulnerable species, resulting in local extinctions that could ultimately lead to global extinctions.

- Although large-bodied species such as elephant and gorilla are a small percentage of the total trade, this level of off-take is a real problem.

In addition, the instruments of **institutions, laws and policy** exhibit characteristics that are, at present, not conducive to encouraging greater sustainability for this trade:

- Legislation and policy have typically given few tenurial rights to forest-dwelling and dependent human populations.

- Forest areas may be immigration zones for the national population.

- Non-traditional protected area management schemes have typically been overlooked.

We, therefore, identified various principles that need to be borne in mind when looking for potential ways to promote sustainability within this complex scenario. These were aimed at all decision-makers from project managers to governmental ministers, in the countries in question and donor nations. Without consideration of these principles, constructive and effective action to tackle the current unsustainability of the bushmeat trade will be difficult. Thus, if further conservation and livelihood problems are to be prevented these principles need to be addressed.

Box 1: Principles for moving forwards with regards the bushmeat trade.

1. Ensure future research is action and solution-oriented, rather than being geared towards abstract or academic questions.
2. Mitigate against the potential for tensions between livelihood and conservation objectives.
3. Analyse the livelihood implications of any given intervention on all stakeholder groups.
4. Look for alternative models from other sectors.
5. Identify the most appropriate entry points.
6. Employ multi-pronged approaches to a complex problem.
7. Facilitate a more positive policy environment for wildlife management in tropical Africa.
8. Recognise the relative significance of the international dimensions of the bushmeat trade.

Having characterised the trade using the existing body of knowledge available, we then identified the current gaps in knowledge that were acting as constraints to progress in tackling over-hunting within the region. We classified these as either general, livelihood, ecological or policy and institutional themes, and attempted to elaborate them in light of the principles for moving forwards, as shown below.

Researchable constraints – general themes

- Encourage range-state recognition of importance of the bushmeat trade and implications therein

- Address the need for a multi-disciplinary approach to the bushmeat issue that reflects and effectively deals with the complexity of the issue

- Address the highly variable nature of the bushmeat problem

- Change the approach from abstract research to practically-oriented research based upon an intervention framework

Researchable constraints – livelihood themes

- Work with hunters as a critical entry point for improving the sustainability of the trade

- Engage urban consumers as a critical entry point for managing the bushmeat trade

- Improve management of the bushmeat commodity chain as an entry point to increase the sustainability of the overall trade

- Increase the positive management role that the logging industry should be playing with regards the bushmeat trade

- Increase community involvement in wildlife management whilst ensuring sustainability as a common objective

- Carry out a realistic assessment of the practical alternatives to hunting as a source of income and food

- Clarify the health issues surrounding bushmeat as a crucial protein source for the rural poor

Researchable constraints – ecological themes

- Assess the most appropriate mechanisms for the direct protection of vulnerable wildlife populations, and their current conservation status.

- Find transferable data sets, models and control methods that have been shown to work and could be used as replicable models to improve bushmeat management.

- Meet the ecological information needs that still exist with regards the bushmeat trade.

Researchable constraints – policy and institutional themes

- Improve the regulation of the bushmeat trade at national and regional levels in Central and West Africa.

- Assess the significance of the inter-continental trade and improve its monitoring and regulation.

These themes were broken down into constituent research frameworks and questions, and then following the original DEFRA remit these themes, frameworks and questions were prioritised according to some simple criteria shown in Box 2.

Box 2: Criteria used for prioritising researchable constraints for DEFRA

- General rationale
- Existing DEFRA activities
- Potential efficiency of investment
- Biodiversity value
- Livelihood gain within a sustainable development framework

The result was a prioritised list of the key researchable constraints that DEFRA (and other UK governmental departments with remits that include bushmeat, e.g. DfID) should concentrate upon. A synopsis is shown in Box 3 and further details are presented in Section 5.

Box 3: Prioritised Researchable Constraints for DEFRA

Livelihoods

- Increase the positive management role that the logging industry should be playing with regards the bushmeat trade
- Engage urban consumers as a critical entry point for managing the bushmeat trade
- Increase community involvement in wildlife management whilst ensuring sustainability as a common objective
- Work with hunters as a critical entry point for improving the sustainability of the trade

Ecological

- Assess the most appropriate mechanisms for the direct protection of vulnerable wildlife populations, and their current conservation status.
- Meet the ecological information needs that still exist with regards the bushmeat trade

Policy and Institutional

- Assess the significance of the inter-continental trade and improving its monitoring and regulation.
- Improve the regulation of the bushmeat trade at national and regional levels in Central and West Africa.
  - What legislative models exist for the management of community-based hunting, and how can these be adapted to the realities of commercial as well as subsistence activities?
  - How much influence does formal law enforcement have on the bushmeat trade?

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1. INTRODUCTION

1.1. Background to the DETR/DEFRA Bushmeat Project

The purpose of this project is to identify appropriate, specific, and feasible interventions necessary to achieve a sustainable bushmeat trade in West and Central Africa. In particular the project:

1. Identifies the key unanswered problems and data requirements through an analysis of the long-term and short-term factors (pressures and shocks) that are causing the trade in bushmeat to become increasingly unsustainable

2. Proposes activities and methodologies that need to be developed to identify and implement solutions to the unsolved research issues

3. Engages with and provides practical inputs into the on-going international efforts to solve the bushmeat crisis.

The project comprises four outputs. The first three outputs address the specific concerns of the project. The fourth output is additional to the original terms of reference of the project.

- *Output 1*: Consolidated overview of the bushmeat trade
- *Output 2*: Developed research approach and recommendations to address key problems and issues
- *Output 3*: Feasibility and prioritisation of the current and further-required research and activities and potential solutions
- *Output 4*: Funding has not as yet been forthcoming for in-country testing, so the project team intends to circulate the draft report from Output 3 among the CITES Working Group on bushmeat.

1.2. Explanation of project process

This project was undertaken in three stages, the combined output of which is presented here. During each stage of the project, contributions and feedback were sought from key experts and practitioners involved in protecting endangered wildlife species and improving the management of the bushmeat trade.

The first output reviewed the literature, assessing the current state of knowledge about the bushmeat trade, identifying the key summary publications and syntheses, the lessons learned, and the way to move forward towards action and impact-oriented research. The review of the literature, including a comprehensive list of references, can be found in this document in Appendix 1.

Output 2 listed the key research questions that need to be addressed to improve the management of the bushmeat trade. These questions were arranged according to themes: "entry points" for addressing the trade, such as hunters, consumers or traders; and "cross-cutting" themes such as community management, and policies and institutions.

The third output of the project, incorporated in this document in Section 5, is the prioritisation of the research questions for DEFRA according to their relevance, feasibility, and likelihood of leading to successful improvements in the trade. Research approaches are proposed, appropriate countries for undertaking research identified, and target institutions, policy makers and other stakeholder groups are given. This information provides a set of recommendations for solution-oriented researchable questions.

2. KEY CHARACTERISTICS OF THE BUSHMEAT TRADE

Table 1 summarises the key characteristics of the bushmeat trade in West and Central Africa that the authors extracted from the current body of knowledge available. The table has been split into the general, livelihood, ecological, and policy characteristics and their perceived implications.[1]

Table 1: Summary of characteristics of the bushmeat trade

General characteristics	Implications
Bushmeat is a large, but largely invisible, contributor to the economies of West and Central African countries. Although it rarely figures in national economic statistics or nutritional estimates, estimates of the national worth of the trade suggest that it is often amongst the most economically significant trade sectors in the countries involved.	The importance of bushmeat most likely has been over-looked and hence marginalised in national and international circles.
The trade is highly complex, influenced by the social, ecological, and political characteristics of the specific location.	It is difficult to split an analysis of the trade into different components because these characteristics are often dependent on one another. Hence a multi-disciplinary approach towards the identification of appropriate interventions is required.
The trade displays significant geographic variation.	There are few general solutions, and each area probably needs to be taken on a case-by-case basis. This means the collection of good baseline social and biological data during the planning process for potential interventions. Neither can success be assumed because

[1] The literature review on which this diagnosis is based can be found in Appendix 1

	interventions have worked elsewhere. Social and ecological monitoring procedures should be an integral project element.
The trade in bushmeat is already unsustainable at various local levels and appears to be increasing. In tropical regions such as West and Central Africa, many areas are already threatened with habitat alteration (including non-selective logging, clearance of forest for oil palm, mineral extraction, etc.), causing population declines and species loss.	Action needs to be taken now to avert increased ecological and livelihood problems. Thus, action oriented research needs to be the priority, and not further studies that do not contribute to actual ways of improving the current situation.

Livelihood and trade characteristics	**Implications**
Hunting is a livelihood opportunity that has low entry costs and can be undertaken flexibly throughout the year.	Alternative livelihood options for rural people are unlikely alone to reduce hunting pressure unless they offer superior benefits, and compete for labour time.
Hunting tends to be opportunistic. If the market dictates certain preferences, hunters tend to consume the less-marketable species if caught rather than avoid hunting them.	Species-specific hunting controls will be hard to enforce without strong local as well as central control mechanisms.
Bushmeat has significant impacts on the livelihoods of the rural poor, providing both an affordable source of animal protein, where alternatives are not available or expensive, and a livelihood opportunity for men as hunters and women as traders. The livelihood opportunities of hunting are particularly important for people with few assets because entry costs are low (i.e. the price of a snare) and people can hunt when and where it is convenient. Hunting also provides a source of emergency income. Although some people have migrated to rural areas to take advantage of the trade, the opportunity to hunt may also encourage men to remain in a village rather than migrate to urban areas for employment.	Attempts to impose blanket restrictions on consumption and trade most likely have important and negative livelihood effects and engender resistance and hostility. Most such attempts have so far been unsuccessful and past experience suggests that attempts to apply blanket controls to highly lucrative trade flows are rarely successful without significant local support. Thus, community wildlife management models have to be investigated as one of the key mechanisms to engender support for attempts to make the trade more sustainable.
Bushmeat is a favoured food item in many countries and an important item of trade. Where bushmeat is widely harvested the price tends to be competitive with farmed meat. When bushmeat becomes scarce, or where demand is high, such as in urban settings, it often becomes a luxury item.	Where bushmeat is preferred and consumers are willing to pay a premium, the provision of alternative sources of animal protein is unlikely, on its own, to reduce demand for or supply of bushmeat.
Bushmeat is part of a complex commodity chain linking rural hunters to urban and rural consumers, in which men and women typically	Interventions that ignore social and gender dimensions to the control of the trade are unlikely to work in the long-term.

have differentiated roles (men as hunters, women as traders).	Additionally, the drivers of the trade must be understood before one can predict how interventions will or will not alter behaviour.
Smoked bushmeat is often the only method of maintaining a store of protein for rural communities.	Negative aspects of bushmeat, including health concerns, tend to be emphasised. However, the positive health benefits of bushmeat should not be overlooked.
The logging industry is an important stakeholder sector, influencing supply of, demand for, and access to bushmeat.	The industry must be included in efforts to improve the sustainability of the trade

Ecological characteristics	**Implications**
West and Central African tropical forests have different physical characteristics to East and Southern Africa. In particular, the **tropical forests have intrinsically low rates of production of wild animals,** and generally lower visible abundance of species that traditionally attract mainstream tourists	Wildlife management options that have proven successful in the savannahs of East and Southern Africa may not be applicable. Thus, although touted as a potential income generator from live animals, ecotourism in the Central/West African context is a different entity to that functioning in East Africa. Options may be more limited and innovative approaches may be required.
Some bushmeat species thrive in secondary forest and may be pest species; others are genuinely threatened with local and global extinction by both forest habitat loss and hunting pressure.	Relatively sophisticated management approaches are required that protect more vulnerable species from indiscriminate hunting, particularly those with wider, and often insufficiently understood, ecological functions, whilst allowing hunting of species not at risk.
The current trade is having a negative impact on populations of species vulnerable to hunting, resulting in local extinctions that could lead to global extinctions.	More information on distribution of vulnerable species, responses to hunting, and current and potential direct protection mechanisms is required
Large-bodied charismatic species (e.g. elephant and gorilla) are a small, but emotive, percentage of total trade. However, even low-levels of off-take may cause loss of populations, hence even 'by-catch' is a problem.	Careful separation of conservation and cultural dimensions is required. Specific action to protect key populations will be needed because they have a very low tolerance of hunting pressure. Thus, some strict enforcement is likely to be necessary, as back-up if nothing else. This will apply where critical populations would be vulnerable to the breakdown of other models, e.g. community wildlife management.

Institutions, laws, and policy characteristics	Implications
Legislation and policy have typically given few tenurial rights to forest-dwelling and dependent populations.	Local populations have little incentive to manage wildlife sustainably. Populations are more likely to engage in managing wildlife sustainably if they have a guaranteed long-term stake in the land and wildlife
Forest areas may be immigration zones for the national population, and governments are often reluctant to restrict the movement of peoples.	Forest-dwelling populations may lack the capacity to control access to the resource, reducing the potential for effective management and the incentive for sustainable management. Where land is allocated as concessions, there may be other mechanisms for control.
Non-traditional protected areas have typically been overlooked.	Mechanisms to limit supply from non-traditional protected areas need to be developed to maintain stocks at national levels for both conservation and livelihoods.

3. PRINCIPLES FOR MOVING FORWARD

3.1. Rationale for identification of principles

The literature review (Appendix 1) demonstrates the considerable amount of research that has been undertaken on the bushmeat trade from an ecological, livelihoods, and policy perspective. Despite this considerable body of work, the bushmeat trade continues to become more unsustainable, and few examples of successful interventions or initiatives to improve the sustainability of the trade can be found.

Part of the reason for the lack of practical success in improving the sustainability of the bushmeat trade whilst protecting at-risk wildlife species is the complexity of the problem.

- Bushmeat is critical to the livelihoods of rural and urban people – livelihoods issues.
- Hunting can and does drive populations of some species to unsustainable levels leading to local and regional extinctions – biological and conservation issues.
- Efforts to protect both the trade and at-risk species must confront the practicality of whether initiatives can be enforced and maintained – policy and institutional issues.

Based on the key characteristics of the bushmeat trade, the implications of these characteristics, and consultations with a range of experts, the authors have identified a number of principles to guide policy makers and researchers in identifying and undertaking the key research questions for the bushmeat trade. These principles are

used as the premise for the discussions in Section 4, where the different themes for researchable questions are identified.

3.2. The principles

1. *Ensure future research is action and solution-oriented, emphasising a direct impact on the volume and composition of the trade rather than abstract or academic questions*

Although considerable knowledge and expertise on wildlife and the bushmeat trade exists, insufficient effort has been made to link research to practical sustainable solutions that protect wildlife and livelihoods.

2. *Mitigate against the potential for tensions between livelihood and conservation objectives*

Historically a tension has existed between those who focus on wildlife and conservation issues, in particular potential extinction and loss of biodiversity, and those who focus on people's dependence on bushmeat as a source of protein and income. Although these two views need not imply contradictory management approaches, conflict between the two has often been detrimental to both the wildlife and the people who depend on it.

There is a need to explicitly recognise the potential problems that can be caused by this tension and deal with them accordingly. Thus, the motivation behind different interventions and management models and the anticipation of their impact on different stakeholder groups is key.

3. *Analyse the livelihood implications of any given intervention on all stakeholder groups*

Interventions are most likely to work if the livelihood implications for each of the different stakeholder groups are better understood. Interventions will have a greater chance of success if:

- Motivations for involvement of each different stakeholder group in the bushmeat trade is understood;
- Proposed solutions that require local support recognise the economic and cultural significance of bushmeat;
- Winners and losers from proposed interventions are identified;
- Specific conflicts between different stakeholder groups are predicted and managed before an intervention;
- Solutions are negotiated with all affected stakeholders;
- Alternative opportunities are considered for any 'losers', even if those who lose were involved illegally in the trade.

1. Look for alternative models from other sectors

There are very few instances of tailor-made models for the successful management of bushmeat, thus there may be value in looking at other animal and natural resource sectors for possible ways forward, such as the literature on common property management. In particular, lessons that can be learnt from the fisheries sector (see Appendix 2 for a fuller discussion), and the impossibility of reversing extinction, dictate that a sensible premise with which to work on solutions that balance livelihoods and conservation concerns is the precautionary principle.

2. Identify the most appropriate entry points

Traditional entry points for interventions (for example, total bans on hunting) may not be the most appropriate, and other potential approaches should be explored. For example, where logging companies influence supply of and demand for bushmeat, and hence are an important stakeholder group, they should be an integral part of management interventions. The logging industry is also a sector that can be influenced by the West and is therefore potentially a key entry point from a European perspective.

More traditional entry points should not be dismissed, even if they have resulted in few successes, but should be better targeted and the feasibility of these alternatives addressed more rigorously. For example, alternative protein sources must themselves be sustainable, accepted by consumers, and be complemented with mechanisms to ensure that hunters reduce the volumes they hunt and the mix of species caught.

3. Employ multi-pronged approaches to a complex problem

In a hypothetical area, it is likely that the correct combination of well thought-out interventions that integrate good protected area management (to act as a source for local hunting reserves) with reduction of off-take in logging concessions and better information about threatened species, could push hunting towards ecological and economic sustainability, whilst protecting key species. However, such interventions will require a more holistic and long-term approach from implementing agencies and donors alike. Thus, it is important to create frameworks that can identify areas where selected interventions may have the best chance of success. This increases the potential for future replication over wider areas based upon demonstrable sustainability rather than the current rather vague concept of sustainability.

4. Work towards improving the policy environment

A more positive policy environment for wildlife management in tropical Africa is urgently required. One of the major problems in advancing the bushmeat agenda, both within the range states and internationally, is the stigma of illegitimacy that pervades wildlife use and the treatment of this use in the environmental literature. The Western environmental press tends to treat the bushmeat issue in an emotional way, with few concessions to local interests and little recognition of cultural sovereignty or the notion of cultural relativity. Such a stigma makes moving towards management systems that offer any real prospect of sustainability more difficult. There is therefore a pressing need to change the tone of the dialogue, so that the international community

can engage more constructively with the range states and their peoples. Although urgent, such a change in policy environment presents a major challenge. Wildlife is only one component of a range of natural resources, some of which, such as minerals and timber, are of immense value and political importance. The present policy debate over bushmeat is being driven almost exclusively by international environmental campaign groups, which is leading to over-reactive policy formulation (usually in the form of blanket interdictions). The treatment of the issue in the Western media (including the British media) is often insensitive, and is generating a sense of grievance in the producer societies (and their members resident in the West) that their cultural norms are being stigmatised and denigrated in the name of biodiversity conservation.

5. *Recognise the relative significance of the international dimensions of the bushmeat trade*

The international dimensions of the bushmeat trade are of growing importance, and there are some potential health hazards (this has been alighted on in the British press). Much of the importation of bushmeat into the UK is commercial, organised and clandestine. While the conservation implications are often uncertain (because of the difficulty of identifying meat), CITES rules are being flouted with some regularity.[2] However, whatever the trade implications, it is most unlikely that the international trade will ever represent a greater threat to conservation than hunting for local consumption and habitat loss.

4. IDENTIFICATION OF KEY ISSUES

From this synopsis of the characteristics of the bushmeat trade a list of key researchable questions has been generated that can be tackled through baseline research and appropriate monitoring and evaluation within an intervention framework. Such an approach should contribute to the identification of the best potential interventions and the determination of likely successes, so that pragmatic adaptive management can be employed.

The list of researchable questions is arranged thematically according to the earlier characterisation of the trade. A general discussion of each of these themes, with regards to the aspects of the trade they relate to, is provided and linked to appropriate research frameworks. Where appropriate, these frameworks are broken down further into specific questions. This list covers questions that may have been partially addressed, and for which data may exist but has not been applied to the specific question. This section does not, however, aim to prioritise these questions. This is dealt with later in this document.

In addition to specific research questions arranged according to livelihood, environmental, ecological, and institutional themes, there are a number of general

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[2] 200 seizures were made at Heathrow airport in one five-week period earlier this year, and 1.4 metric tonnes were seized from a single flight.

themes that cannot be ignored but that do not lead to a set of actionable research questions relevant to DEFRA. These themes are therefore presented first, spanning the livelihood, ecological and institutional categories, and following on from the proposed principles for moving forward.

4.1. General research themes

4.1.1 Theme: Encourage range-state recognition of importance of the bushmeat trade and implications therein

Research objective

Acknowledge bushmeat consumption in national economic statistics, and determine the steps that need to be taken to better acknowledge the role of bushmeat in the economies of producer nations.

4.1.2 Theme: Address the need for a multi-disciplinary approach to the bushmeat issue that reflects and effectively deals with the complexity of the issue

Research objective

Determine how different departments in West and Central African governments, as well as international donor organisations, can be encouraged to take the bushmeat issue into account when making planning decisions regarding food security, forestry, infrastructure provision, etc. In essence determine how the 'bushmeat problem' can be mainstreamed.

4.1.3 Theme: Address the highly variable nature of the bushmeat problem

Research objective

Determine how governmental, donor, and implementing agencies can be encouraged to act upon good baseline data, as part of adaptive management practices, and be encouraged to share this collective experience (see 4.4.3 in the Policy & Institutions section).

Research objective

Determine which findings are 'universal' to the bushmeat issue and which can be clustered for specific ecological, livelihood, or institutional situations.

4.1.4 Theme: Change the approach from abstract research to practically-oriented research based upon an intervention framework

Research objective

Encourage implementing agencies to recognise the need for experimentally-oriented interventions that allow targeted research rather than research for it own sake.

4.2. Livelihood themes

The key areas clustered under 'livelihoods' that arose in the categorisation of the bushmeat trade (Section 2) are discussed below, with reference to key literature and bearing in mind the principles for moving forwards (identified in Section 3).[3] The livelihood themes are clustered as to whether they focus primarily on "entry point" stakeholder groups for interventions, or on cross-cutting themes that relate to people's livelihoods.

4.2.1 Hunters as a critical entry point

It is hunters who are the direct link with wildlife that is killed for bushmeat. Hence a key entry point for influencing the bushmeat trade (in terms of the quantity and mix of species caught) must be the hunters themselves. However, hunters are not a homogeneous group. They may be locals or migrants, and they may be hunting for home consumption or the occasional sale, or be professionals for whom the sale of bushmeat is the household's major livelihood opportunity. Moreover, whereas some hunters supply their own snares and traps, other hunters are influenced strongly by the individuals who provide credit, guns, and ammunition and hence who have more control over hunting than the hunters themselves.

Hunting tends to be non-discriminatory, either because the technology itself does not allow discrimination (e.g. when snares and traps are used or when night hunting occurs) or because the hunter chooses not to discriminate when hunting with guns. The viability of different management regimes for different species will depend in part on the technologies used by hunters. Typically, poorer people always use snares, which are not selective. Snares tend not to catch certain species, such as primates, although there is limited secondary mortality and severe injury to certain endangered species including the great apes and elephants. The factors that make snares an attractive technology from a pro-poor perspective (e.g. low cost and low barriers to entry, their importance in crop protection) also create a potential for over-use and abuse.

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[3] A full review of the current information available on these themes is given as part of the literature review in Appendix 1.

4.2.2 Consumers as a critical entry point

If there were no demand for bushmeat, then there would be no incentive for people to hunt wildlife to sell. Hence consumers are another important entry point to consider. Consumers can be crudely classified into two groups, those who eat bushmeat out of preference and therefore have strong preferences for 'choice' species, and those who have no (viable) alternative, specifically those in remote rural areas, who are likely to be less choosy (Ntiamoa-Baidu, 1998).

There is an emerging debate in the literature as to whether the fundamental drivers of the bushmeat trade are economic or cultural. With regards to the former view, the public preference for bushmeat is based on its competitive price, so that an appropriate conservation strategy would be to flood the market with low-cost domestic animal protein (this proposition is currently being researched by Wilkie, 2000). There is some evidence to support this view but there is also evidence of a cultural preference for bushmeat leading to willingness to pay a price premium (Asibey and Childs, 1991). These two propositions may be reconcilable to the extent that there is a likely change in consumption preferences as bushmeat increases in scarcity; as the price rises, the market switches from basic nutrition for the urban population to a luxury food item. Attempts to substitute farmed domestic species have not met with success (see Output 1). This does not necessarily preclude the option of using domestic livestock rearing as a means to better conserve wildlife, though it does warn of the complexities of the endeavour, particularly from the perspective of rural livelihoods.

4.2.3 Traders as a critical entry point

Between the hunter and the consumer can be a diverse range of stakeholders involved in the bushmeat "commodity chain." These might include wholesalers, "chop bar" owners, who sell bushmeat soup, and market traders. These different stakeholders may also have a role to play in improving the viability of the bushmeat trade, yet their role tends to be overlooked. For example, there is little information on who sets prices along the commodity chain, or which stakeholders tend to make most money from the trade.

4.2.4 The logging industry as a critical entry point

As logging has increased, the logging industry itself has become an important new stakeholder in the trade. The increase in logging has had several effects on the bushmeat trade by:

- Increasing access for hunters because loggers build roads that go further into the forest, opening up new sources of wildlife that were not profitable to hunt when transportation and access costs were higher;
- Providing access for hunters into forests, such as those who hitch into the forest on logging trucks in Congo (Bowen Jones, 1998);

- Facilitating transportation of bushmeat from rural to urban centres, using the logging trucks (Blake, 1994; Bowen-Jones, 1998). In south Cameroon, 85% of meat taken by poachers is removed on logging trucks (Bowen-Jones, 1998);
- Encouraging human population migration (Wilkie, 1996);
- Introducing a new demand for animal protein. Logging companies may rely on bushmeat entirely as a source of protein, especially in more remote areas where substitutes, such as domestic animal protein, are not available (WWF, 1997). Hunters often sell directly to the logging companies (Stromayer and Ekobo, 1991);
- Degrading forest environments. While this may have some benefits for animal populations (e.g. pioneer tree species such as Musanga, which recolonise logged-over areas, are readily eaten by elephants and many ungulates), the long-term effects on loss of habitat and fruiting species, and opening up forest to land conversion by farmers, are likely to be significant.

Additionally, little is known about the importance of some game species in ensuring regeneration of timber species. Government agencies with more long-term logging strategies could be reducing future potential harvest if hunting is controlled.

Logging companies are an increasingly important stakeholder group that influence supply and demand for bushmeat, and so they should be involved in management interventions. There are already some initiatives from which lessons can be learned. For example, the *Wildlife Conservation Society (WCS)* have an extensive research programme in the region, and are now working on an NGO/logging company partnership in Congo to try to reduce hunting. Further, there is some evidence that subsidised supply of alternative protein (e.g. imported frozen mackerel) does appear to affect the demand for bushmeat in logging camps in Central Africa.

4.2.5 Community Wildlife Management

Community involvement in wildlife management is widely held to be desirable (Auzel and Wilkie, 2000; Eves, 2000; Fa, 2000). The grounds for this are almost the same as those for community involvement in any form of forest management (Brown, 1999). For example:

- *Proximity:* local populations are the immediate custodians of the resource and best placed to ensure its effective husbandry;
- *Equity and livelihoods:* bushmeat figures strongly in the livelihoods of the rural populations of the range states, particularly the poor; they are thus important stakeholders in its management; the community-level benefits are central to the justification for sustainable management;
- *Capacity and cost-effectiveness:* bushmeat producing areas tend to be large and distant from major administrative centres, and the relevant government departments tend to be severely understaffed; there is little choice but to involve those who reside in such areas in their management;
- *Knowledge:* hunters can be expected to have detailed knowledge of the resource and its habits; given the dearth of detailed knowledge of the biology of the

resource, the hunter's knowledge is likely to be of central value to improved management;

- *Practicality and impact:* there is little prospect of improved management if the major users are excluded from participation.

However, there are several constraints on increasing community involvement in forest areas, even where (as is rarely the case) the necessary legislative framework exists:

- Lack of clarity as to the identity of the relevant 'community';
- Linkage between wildlife and other aspects of natural resource management, such that governments are unwilling to make sufficient concessions on the former that will affect their own claims over the latter;
- Ambiguity of the legislative framework, particularly as regards the definition of 'communities';
- Low population densities and large area coverage required for control of wildlife, leading to high transaction costs of management;
- Weak and contested local institutions for natural resource management;
- Competing claims over land and other resources;
- Permeation of local politics by externally-based elites; while this often has positive aspects, it also leaves many opportunities for abuse;
- Lack of controls on population movements and settlement;
- The hostile profile of many environmental agencies (governmental, international and NGO), resulting in unwillingness to participate in co-management experiments;
- The fact that the areas with the highest populations of forest game tend to be those with the lowest populations of humans poses numerous difficulties for forest management. Historically, such areas have tended to be 'stateless' (i.e. lacking in the political structures of the [pre-colonial] state), and to constitute congeries of small independent ethnic groups, with localised identities and distinctive languages.

These constraints are present in the West African refugia (Sierra Leone-Liberia-Ivory Coast), and much of Central Africa. As a result, there tend also to be few viable institutions for natural resource management at any but the lowest levels, and those that do exist are often lacking in binding authority. The higher the level at which collaboration is sought, the more likely are inter-community conflicts. Transaction costs for any form of resource management are likely to be high, both on the grounds of low ratios of human population-to-resource area, and on the grounds of the social conflicts that need to be resolved (see Sharpe, 1998).

Some ground rules for improved community management are beginning to emerge:

- Wherever feasible, privileged access to local resources must be given to resident communities in preference to outsiders with no long-term interest in the sustainability of the resource;

- This requires actions to control the activities of itinerant hunters (often, it is alleged, in the pay of urban entrepreneurs) who are able to compensate for the depletion of wildlife in one area by moving on to another;
- This involves some kind of recognition of local rights as a form of 'property', and the granting to the rights holders the power to sanction abusers and to deny others access to the resource;
- This privileged access may include transferable rights, although it is inevitable that transfers will have to be controlled, if the outcome is not just an increase in external rents;
- With such generation of rights, goes the potential to centralise (at least to a degree) the marketing of the resource; without some degree of centralisation, it is difficult to see how control over commerce can be achieved.

4.2.6 Alternatives to active management of wildlife and hunting

Aside from the active management of wild bushmeat harvesting, three management strategies are popular in the literature. These are captive breeding of wild animals, wild fish harvest, and the search for substitute animal protein from domesticated species. One or other of these has often figured in aid-funded 'integrated conservation and development projects', implemented as a way of 'selling' conservation goals to local forest dwellers (Brown, 1998).

Captive breeding schemes

Several authors advocate captive breeding of game species as a possible way to satisfy local demand without compromising the wild stock (Auzel and Wilkie, 2000; Bennett, 2000; Fa, 2000). This has obvious attractions where bushmeat fetches a high price (e.g. Asibey and Child, 1991), and logically, it could lead to reduced demand for wild-caught specimens. On the other hand, there is evidence that the major species with potential for domestication have long since been discovered, and there are doubts as to whether the targeted wild species have (or can be bred so as to develop) the behavioural and reproductive patterns conducive to domestication. Terborgh *et al*. (cited in Smythe, 1992), for example, view "the concept of raising wild animals in captivity as well intentioned but without adequate biological basis".

Captive breeding schemes have not generally proven very successful for innovative species. Even where technically feasible, the economics have often been wrong for peasant livelihoods. For example, the typical peasant family has a preference for a range of activities that cut risk and reduce capital and labour requirements, but captive breeding schemes are often high risk and relatively capital and labour intensive. Semi-captive game ranching works in some situations (e.g. capybara harvesting in South America), but again such contexts are usually already known. The problem tends, therefore, to be less a lack of knowledge than a lack of potential.

An additional problem is that the species that lend themselves most readily to captive breeding (e.g. grasscutters) tend to be species that thrive best in degraded environments – and hence are least at-risk from hunting pressure. There is an urgent need for an understanding of the underlying economics, and for greater realism as to

the potential for success outside of development assistance initiatives. There is some evidence that captive production can be successful where urban demand is high (this has already happened with land snail production in Ghana and Nigeria), although this is likely to be outside of the main bushmeat production areas.

Fishing

Several authors have claimed that significant freshwater fish stocks exist in many bushmeat source areas and question why these are not more extensively exploited (Redford and Robinson, 1987). Some authors are of the view that the preference for hunting over fishing is largely cultural, and indicative of some kind of irrational preference for meat on the part of hunting communities. No studies have been unearthed for this report that address the decision-making issues involved. However, from what is known of peasant livelihoods in forest areas in general, it seems likely that the underlying causes are more economic than cultural, and that the preference for bushmeat is quite rational. Fishing does tend to become more attractive when human population densities increase to the point where returns to farming and hunting decline appreciably (see Boserup, 1966), although this prospect is probably quite far off in most bushmeat source areas. However, simplistic assumptions that river systems in forest areas are teeming with uncaught fish are rarely true. In the view of a freshwater fisheries expert consulted for this study, "unless locals have access to a major floodplain fishery, the yield from fishing is likely to be pretty low. And, if there is a major floodplain, the chances are someone will be fishing it already" (I.Watson, NRI, pers.comm).

Substitution of farmed meat

While research on farming as an alternative to hunting is legitimate and may lead to useful solutions to the problem of excessive hunting pressure, there is a need to proceed with caution in this area. The following issues must be considered:

- There is rarely any direct link between the proposed substitution activity and the hunting activity to be foregone. Indeed, in some instances, the target population differs for the two. Hunting appeals to young self-employed male peasant farmers without significant capital, while cattle ranching appeals to wealthy capitalists, able to draw on the pool of wage labour. Thus, there is no guarantee that success in producing substitute protein will reduce hunting pressure.
- Class shifts, from peasant to capitalist agriculture, also have important welfare dimensions that should not be underestimated from a social perspective. While, for example, banning of hunting by peasant farmers and the migration into agricultural day labour may have benefits for the conservation of wild fauna, such a move may well have negative social effects. These include decreased standards of living, population concentration in urban settlements leading to rising levels of disease, and increased *propensity for social unrest.*

The advocacy of alternative options is often based on simplistic development models and faulted economics. For example, the fact that small numbers of domestic livestock thrive in free-range conditions in forest villages tends to be extrapolated by advocates of protein substitution to imply that the only economic problem is the

underpricing of wild-caught meat. It is likely that the pricing of wild meat suffers from policy and market failures - the cost of its replenishment is not factored into the price and the resource figures as more or less a 'free good'. Steps may need to be taken to rectify this situation. Additionally, the potential for increasing domestic stock production may be much less than the casual observer assumes. Free-range animals can usually survive quite well in what are essentially domestic foraging conditions around forest villages, but two constraints may inhibit the scaling-up of production:

- Lack of sufficient food waste from the domestic household. Tropical peasants produce much less waste food than typical industrial families;
- The lack of animal enclosures or fencing. Except where human population densities build up to high levels (which is rarely the case in hunting areas), it may be excessively costly to fence off either animals or crops. Thus, domesticated animals living in free-range conditions can only be tolerated in small numbers around forest settlements.

Concentration of small stock in intensive farms is costly, and increases the risk of disease. It is only feasible close to major urban settlements with large consumer populations that have significant purchasing power. Generally, where such schemes have potential, they have already been developed. Increasing the potential would require not only that the policy and market failures associated with hunting are addressed but also that the wealth of the nations increases so as to overcome the purchasing power constraint for the poor.

An added consideration here is the issue of free trade. While increasing local protein production in the tropics may be desirable, it may well not be economically practicable, given the relative costs of imports.

Alternative options have tended to be associated with donor-funded ‘integrated conservation and development projects’ (ICDPs). ICDPs have figured extensively in the conservation literature, and have been relatively well researched. They are to be the subject of a major WWF-sponsored international conference and book in 2001. The successes have, however, been relatively few. Some have worked reasonably well, particularly in South America, while many, particularly in Africa and Asia, have had problems and have not been readily transferable across national and regional boundaries.

Finally, and this is a major concern, there is a risk that consideration of alternative options, valid though it may be, will divert attention away from the more pressing issue of bringing game hunting under effective management. To a significant extent, proposals for alternatives have tended to figure in policy circles as ‘solutions in search of a problem’ rather than as solutions tailored to the problem that actually exists.

4.2.7 Health issues

Concern has been expressed over the health aspects associated with the consumption and transport of bushmeat. In particular, the biological similarities between humans and primates are believed to increase the likelihood of species jumps by pathogens,

especially monkey viruses that closely resemble human viruses, such as those of the lentivirus group (HIV, HTLV) and filovirus group (Ebola, Margurg, Lassa). Where humans have been affected by monkey viruses (such as Green Monkey B), this often has well-documented lethal effects. In addition, claims have recently been made as to the association of bushmeat with other diseases such as Herpes, Foot and Mouth, Anthrax and "numerous other diseases".[4] The scientific basis for such claims is often conjectural. As regards the health issues associated with the international trade in bushmeat, the conditions under which the commodity is shipped into the UK (often several days in air-transit) are certainly unsavoury, and unlikely to be without some health risks.

Within the producer nations there are important positive health benefits from bushmeat, in particular in areas where there is little access to affordable alternative animal protein sources and dried bushmeat provides a storable supply of protein. These benefits do not negate the health concerns, but they should temper the presentation of the bushmeat issue by the Western media.

4.2.8 Theme: Work with hunters as a critical entry point for improving the sustainability of the trade

Research framework

To what extent, and how, can the bushmeat trade be managed in a more sustainable manner through direct intervention with the hunters themselves?

Questions

- Who is driving the level of hunting and technologies used?
- Is the relevant entry point the hunter or those who supply guns and ammunition, those who supply credit, or those who purchase meat from the hunter?
- Could a controlled, legalised system of improved technology snares be a better tool for increasing sustainability of off-take than controlled shooting (given that this is also a pro-poor technology)?

Research framework

Can the 'by-catch' problem for threatened species be reduced or eliminated through the instigation of different management regimes for different species, and if so how?

Questions

- Which hunting technologies should be encouraged if selectivity is desired?
- What measures can be used to encourage hunters with guns to discriminate between threatened and non-threatened species?

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[4] See the London *Evening Standard*, 31 May 2001, page 18.

- Can non-threatened species such as grasscutter still be promoted when there are primates around without endangering the primates?
- Is single species hunting for larger bodied animals simply an opportunistic result of general hunting, and thus, can single-species restrictions work?
- What are the potential management systems that will prevent cheating such restrictions, and how effective are these?

Research framework

What are the viable alternatives for people who hunt if they are required to reduce their level of hunting?

Questions

- Will people reduce their levels of hunting if there are not alternative and feasible livelihood or protein alternatives?
- Are there any examples of hunters switching to alternative livelihood opportunities even when bushmeat species are available?
- How can non-related development projects be structured to reduce their potential to increase hunting?
- How can urban development be a tool for increasing the sustainability of the trade?
- To what extent is farming as an alternative to hunting a function of soil fertility?

Research framework

Is the policy environment conducive to restricting the catch and excluding some individuals or groups from hunting?

Research framework

Why do people hunt?

Questions

- What is the value of hunting to a poor person relative to their other livelihood activities?
- What are the key determinants of how much people hunt in one outing or per year?
- How important is recreational hunting and how will incentives to reduce this type of hunting differ from incentives to reduce hunting for livelihoods?

4.2.9 Theme: Engage urban consumers as a critical entry point for managing the bushmeat trade.

Research framework

How can consumption of wild-caught bushmeat (both volume and at-risk species) be reduced in large urban areas?

Questions

- Are the general lessons or are drivers of demand case specific?
- How important is urban demand, where bushmeat is priced at a premium, relative to rural demand and cross border trade?
- Are the largest consumers the rich or the poor?
- In an urban setting how much demand is for markets, and how much for restaurants?
- To what extent does price, culture or availability in urban areas drive demand?
- Given the large and urbanised population of Nigeria relative to the region, how important is consumption in Nigeria to regional trade and should it be a focal point for regional intervention?

Research framework

- Can public opinion be changed in urban areas where bushmeat often sells at a premium?

Questions

- Are there any methods for attempting to encourage consumers to avoid threatened species?
- Are urban populations in LDCs a stakeholder group that exerts pressure on people and governments to conserve their natural heritage (or could they take on this role)?
- Under what conditions, if any, can domesticated meat or fish be offered as a substitute for bushmeat (assuming such an option were feasible)?
- Will changes in consumer preferences or attitudes change hunting behaviour?

4.2.10 Theme: Improve management of the bushmeat commodity chain as an entry point to increase the sustainability of the overall trade

Research framework

What incentives exist or can be created to improve the sustainability of legal trade?

Questions

- Would trade improvements such as improved storage or processing lead to a reduction in off-take?
- What are the potential 'added value' approaches available for bushmeat management and would they encourage more or less trade in bushmeat?

Research framework

Would it be beneficial to promote and market less at-risk species and if so, how could this be done?

Questions

- What lessons can be learned from the commercialisation of other non-timber forest products (NTFPs)?

4.2.11 Increase the positive management role that the logging industry should be playing with regards the bushmeat trade

Research framework

How can the logging industry, which affects the supply of, demand for and access to bushmeat, become a collaborator in improving the sustainability of the bushmeat trade?

Questions

- How can logging concessions be allied with sustainable management?
- Do sufficient data exist concerning which taxa are most affected by logging (positive and negative impacts on habitat; impacts on consumption patterns of local people) to engage with the logging industry?
- Under what circumstances if any will logging companies be willing to give up the 'subsidy' of bushmeat as a 'free' source of animal protein for their employees or as a financial perk through transportation or selling?

Research framework

How does logging influence the sustainability of the bushmeat trade, and how does the removal of game species affect the sustainability of logging?

Questions

- What are the direct effects, both positive and negative, of logging on wildlife populations (much of this is known in general terms)?
- What are the long-term implications of the removal of important fruit-bearing tree species from tropical ecosystems, particularly with regard to frugivorous species that enter the bushmeat trade?

- Should restrictions be placed on logging companies with regard to the harvesting of tree species whose fruits and other products are consumed by mammals with important roles in human livelihoods and ecosystem maintenance?
- Is removal of game species reducing the potential for sustainable timber off-take?

Research framework

Is certification a potential solution for reducing unsustainable game hunting in West and Central Africa?

Questions

- What lessons have been learned from current certification processes – does certification reduce hunting, or make it more sustainable?
- Can certification be made more relevant to West and Central Africa?
- Can certification promoted for its benefits in controlling bushmeat be used to increase the pressure on logging companies to gain accreditation?

4.2.12 Theme: Increase community involvement in wildlife management whilst ensuring sustainability as a common objective

Research framework

How, and under what conditions, can community management contribute towards a more sustainable bushmeat trade?

Questions

- For community management does ownership have to be transferred or is it the distribution of awards that matters?
- How critical is land tenure in increasing the chances of sustainable bushmeat management?
- How can access to natural resources, including bushmeat, be enabled and limited in the current socio-political context of West and Central Africa?
- Do traditional value systems still influence the bushmeat trade and if so, are they a good basis for transferring rights based on traditional systems?
- What evidence exists – or what data should be collected – to determine whether increased local ownership will result in more sustainable management of wildlife resources?
- What are the circumstances that influence the relative benefits of wildlife versus alternative uses of land and the resource in the equatorial forest region of Africa?
- What are the key social, economic and biological data needed to set up and monitor a community-based bushmeat management situation and how can this be collected in a cost-effective way?

- What legislative models are appropriate for the management of community-based hunting, and how can these be adapted to the realities of commercial as well as subsistence hunting?

4.2.13 Theme: Carry out a realistic assessment of the practical alternatives to hunting as a source of income and food

Research framework

Under what specific circumstances is domestication a feasible alternative?

Questions

- Who are the winners and losers under such a system?
- What complementary initiatives also have to be in place?
- Can high tech approaches to domestication using modern selective breeding and genetic profiling produce greater results in a shorter time than more traditional techniques?
- Is domestication economically feasible in comparison to importation of domestic meat from other areas?
- What are the social implications of such schemes?

Research framework

What examples of successful introduction of alternatives exist?

Questions

- Are these alternatives relevant to West and Central Africa?

Research framework

Is tourism a viable alternative to bushmeat hunting for communities in West and Central Africa?

Questions

- Which types of countries are most likely to be able to substitute tourism for bushmeat hunting?
- Is the use of tourism only possible in savannah regions or is it also possible in forested areas?
- Can wild animals be habituated to human presence in areas where tourist volumes have historically been low and are likely to remain so?
- Is eco-tourism a possibility?

- Can the dangers of tourisme de vision for the most sought-after (but also large and potentially hostile) charismatic species such as elephant and lowland gorillas be overcome?
- Can wildlife be marketed if there are no large charismatic species and, if so, how big is the potential market, e.g. bird watching?
- What mechanisms can be used to ensure that local communities benefit from such tourism, and that they see it as linked to conservation of their natural resources?

4.2.14 Theme: Clarify the health issues surrounding bushmeat as a crucial protein source for the rural poor.

Research framework

What evidence is there that bushmeat can pose a health risk, and what are the relative health benefits?

Questions

- Are the negative health aspects only relevant to primate species? How much risk can be attached to more common rodents?

  What are the implications of international trade in terms of disease risk?

4.3. ECOLOGICAL THEMES

4.3.1 Direct efforts to protect wildlife

Traditional ecosystem management has relied on the creation of protected areas, many of which preclude any form of exploitation or severely restrict local access. Protected area approaches, combined with punishment of hunting, have tended to lead to conflict between people living near to the protected area, who have traditionally relied on bushmeat for consumption and income, and those government bodies responsible for protecting wildlife. Further, such approaches have often been ineffective, typically burdened by weak forest authorities and under-funding.[5]

Despite the poor track record of protected-area approaches, they may offer the potential for solutions that benefit those dependent on bushmeat and those concerned with the conservation of wildlife. One innovative idea that combines protection of some areas with legitimisation of managed hunting is to use a 'source-sink' approach (see Output 1, p. 39 for details). The 'source' is the protected area, the 'sink' is the area where hunting occurs. Animals move without restriction between the two areas,

[5] For a more detailed discussion see Output 1, Section 5 (pp. 19-20)

but are 'safe' whilst in the source area.[6] A protected-area policy of this sort moves the emphasis away from exclusion areas primarily as conservation sites with local interests being compensated by actions in surrounding buffer zones, to a more user-oriented perspective in which protected areas figure primarily in the service of consumer populations.

There are problems in creating effective management models (see Output 1, p. 21), in particular how to ensure that people do not hunt in the source area where animal densities are likely to be much higher. Additionally, extremely rare species may still need special protection, implying selective hunting may also be required. However, a 'source-sink' approach does have the potential to offer a 'win-win' situation for livelihood and conservation concerns.

4.3.2 Examples of successful bushmeat controls

From the literature and available case studies there seems to be a lack of examples of areas or projects where attempts to control the bushmeat trade have been successful. This may be, in part, because many of the initiatives within the region are relatively young. There are, however, interventions that have been tried in other tropical forest areas where hunting is a problem (see Appendix 1). These interventions need to be assessed in the context of West and Central Africa to determine the extent to which they are relevant and transferable.

Even within the region, much of the analysis of wildlife and the bushmeat trade is specific to a particular area within West and Central Africa, and it is equally important to determine the extent to which lessons can be learned from and extrapolated to other areas within the region.

4.3.3 Stock data

The bushmeat trade tends to be hidden, both in official statistics and in practice. Moreover, monitoring bushmeat species, whether wildlife in forested areas or meat dried for sale, is often difficult. To what extent accurate data are needed, or can realistically be expected to be collected, has not been answered. Although considerable pockets of data have been collected for specific regions or specific species, comprehensive detailed data are not available.

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[6] For example, in Mbaracuya Reserve in Paraguay, Aché Indians hunt intensively over an area of approximately 57 square kilometres; the 'source' area is approximately 394 square kilometres, a ratio of 1:7 (Bennett and Robinson, 2000).

4.3.4 Theme: Assess the most appropriate mechanisms for the direct protection of vulnerable wildlife populations, and their current conservation status

Research framework

Is a traditional protected area approach a complete or partial solution to protecting vulnerable wildlife populations affected by the bushmeat trade?

Questions

- How can alternative protected areas be created and financed?
- Is the establishment and community management of community hunting reserves around well-designed core areas feasible?
- Can such reserves be financially self sustaining?
- What are the roles for different institutions within this context?
- Do current protected areas lend themselves to being converted into areas with more holistic management objectives?
- Are the large areas required to secure the survival and genetic future of many mammalian species in the tropics compatible with the potential for community management and the high costs of policing the resource?
- Does the present coverage of existing protected areas correlate sufficiently with the distribution of species that are potentially vulnerable to the bushmeat trade?
- How does this coverage correspond to existing biodiversity hot-spot data and priority habitats?

Research framework

Are there circumstances whereby hunting bans can work?

Questions

- Given that hunting bans are unlikely to work in isolation, what ‘co-factors’ are required?
- What lessons can be learned from attempts to impose bans in fisheries?

Research framework

Experience from the fisheries sector indicates that multi-species off-take limits the potential for quota modelling – is this true of the bushmeat trade where there are less demographic data?

Research framework

What lessons can be learnt from other natural resource sectors – such as non-timber forest products (NTFPs), charcoal production, the fuelwood trade?

Research framework

What are the necessary conditions for there to be a controlled legalised trade that is biologically sustainable, and is this possible?

Questions

- Does a legalised trade that feeds money back into effective protection and enforcement mechanisms, and promotes good practice, stand more chance of working than the current illicit trade?

4.3.5 Theme: Find transferable data sets, models and control methods that have been shown to work and could be used as replicable models to improve bushmeat management.

Research framework

Are there transferable models that can be applied from other regions and would work in the ecological context of tropical Africa?

Questions

- Which are the lessons from the savannah areas of East and Southern Africa that are relevant to West and Central Africa?
- What lessons can be learned from other regions such as the Neotropics and tropical Asia?

Research framework

Can findings be extrapolated from a small island situation?

Questions

- Considerable research and data collection has been undertaken on Bioko Island. Are these data valid for extrapolation to mainland conditions and if so under what conditions?
- Are island situations similar to those in many protected areas, and do island biogeography principles apply to hunting?

4.3.6 Theme: Meet the ecological information needs that still exist with regards the bushmeat trade

Research framework

Can game populations be monitored for purposes of control and management of the bushmeat trade, and if so can indicator species or surrogates be used to determine whether the wider bushmeat trade is sustainable or not?

Questions

- Do the appropriate data exist?
- How could biological monitoring data be used in a community management model?
- Where should populations be monitored, as wildlife or once in the bushmeat trade (both are probably necessary but usefulness and feasibility will vary)?
- How accurate is extrapolation of carcass data to the actual effect that this hunting is having on the game populations involved?
- Which are the species that have the reproductive potential to be hunted at sustainable levels but for which data does not exist to determine optimal off-take? Collect this data.
- Where can new field DNA-testing methods be best employed in monitoring or control of the bushmeat trade?
- What time-scale is necessary to ensure that monitoring is effective, and how can such data gathering and analysis be made financially sustainable?
- What would be the most appropriate and accurate indicator species.
- Would such a scheme of monitoring using surrogates be cost-effective?
- Can such indicators provide early warnings of stock collapses or will stochastic variations mask signs for so long that preventative action is not possible.

Research framework

On a regional level what are the most important areas for bushmeat production, and how do these coincide with the most important areas for biodiversity conservation?

Research framework

How important are protected areas and endangered species in the trade as source areas and game species, respectively?

Questions

- What proportion of the trade involves non-threatened species (such as grasscutters and other rodents)? (Much of these data exist but may not be in easily accessible or useable forms).
- What proportion of bushmeat comes from degraded areas and what proportion is from primary forests?

4.4. Policy and institutional themes

4.4.1 Institutions, laws, and policies

The legislative framework for hunting in the tropics has been a neglected aspect of sustainable forest management, which has only recently begun to be addressed. Early attempts to reform the hunting legislation often created as many problems as they solved. The starting point has tended to be the interdiction of commercial peasant-based hunting and the idealisation of subsistence activity, which, as was noted in Output 1, flies in the face of local realities. Paradoxically, this has often been associated with the promotion of a legislative framework that has increased the incentives to high-tech commercial sports hunting, involving elite and expatriate interests. This has been the case in Cameroon, for example. 'Community hunting zones' are restricted to non-commercial activities, and are probably too small to be viably managed, while the larger *'zones cynégetiques de chasse'*, where commercial activities are permitted, are tailored to the needs of the expatriate sports hunter and the firms who service them.

The Southern African 'CAMPFIRE' model has often been advocated as the way forward for the forest societies, although evidence is lacking as to whether it is likely to be effective in such environments. It seems unlikely to work well in relation to a trade that is informal, dispersed and under-monetised.

Governments and their international partners tend to proceed on the basis of dubious assumptions, for example: regarding the nature of traditional rights over land (it being assumed that proximity is the normal basis of traditional 'ownership', and that the geographical and social communities are one and the same); the assumption that unpopulated areas can have no legitimate hunting claims upon them (such an assumption is not applied to North Atlantic fisheries); and that forest areas are subject to single usage (most areas of forests, even in the low-population density areas of Central Africa, have multiple claims upon them).

Capacity building is undoubtedly a challenge in many areas, where populations are low and historically highly atomised. However, rather than reinforcing the powers of local authorities (including decentralised local government), most programmes serve to diminish local ownership, being expatriate-led, top-down and dismissive of local potential.

Wildlife management tends to be consigned by governments to specialist NGOs. However, successful management of the bushmeat trade cannot be undertaken only through wildlife policy. Multiple stakeholders are involved in the trade both directly and indirectly, and for many, policy concerning poverty may be equally if not more important than direct wildlife policy. Wildlife and environmental NGOs tend to be weak on the social side, and, because of their non-governmental status, find it difficult to make effective inputs into national policy. Governmental wildlife agencies tend to be distrustful of incorporation into agencies with broader functions, preferring to maintain their specialist identities and partnerships, even to the detriment of their effectiveness.

Some progress has been made in helping to integrate hunting legislation internationally, within the producer regions (this is one of the main aims of the Central African bushmeat working group). However, concerns remain that such policies are likely to have little relevance to realities on the ground, given the low capacity for national and international policing, particularly in isolated border areas.

4.4.2 The role of the intercontinental trade

Since the original CITES agreement in 1973, international efforts to conserve animal species have focused in large measure on transnational trade controls. Questions are increasingly being asked about the effectiveness of these controls, and of the preservationist ethos that they tend to inculcate. With regard to bushmeat, the CITES regulations are among the justifications given for firmer import controls (and figured particularly strongly in the recent UK court case on bushmeat that was given wide press coverage).

4.4.3 Theme: Improve the regulation of the bushmeat trade at national and regional levels in Central and West Africa

Research framework

Which are the key government departments with which Wildlife departments must work towards ensuring a sustainable trade – how can bushmeat be mainstreamed?

Questions

- What mechanisms could be used to cover the costs of enforcement and management in the existing legislative regimes within the region.
- How can different departments be encouraged to work together and take into account repercussions of their actions in terms of hunting.

Research framework

How much influence does formal law enforcement have on the bushmeat trade?

Questions

- Which situations tend to be enforced or enforceable and which not?
- Why are regulations not being enforced?
- Are there regulations that cannot be enforced?
- How much relevance does formal legality have in West and Central Africa, in a management context?
- Is there an alternative structure of incentives and deterrents for hunters and consumers that could be used to encourage their cooperation in managing the trade?

Research framework

What legislative models exist for the management of community-based hunting, and how can these be adapted to the realities of commercial as well as subsistence activities?

Questions

- Within the existing structures how can local communities control access to their wildlife resources?
- Are there legal definitions that could be used to separate subsistence from commercial hunting?
- What are the minimum requirements for area coverage in the differing local situations, and how can an effective balance be found consonant with the realities of the commercial trade?
- What national preconditions are required to support the attempts of the range states to coordinate their legislations and policies, as is presently under deliberation in the CITES working group?

Research framework

How can local institutions be integrated at regional and supra-regional levels, and how can they be made sustainable?

Questions

- What prior tenurial and institutional issues need to be addressed at local level before regional and supra-regional institutions can be established?
- What are the prospects for harmonisation of law and policy at regional level in the range states?
- What funding mechanisms can be instituted to ensure that high-level institutional activities have a chance of sustainability?
- Do civil society organisations and networks exist that would champion the cause?

Research framework

What hard evidence exists as to the effectiveness of savannah sports hunting models such as ‘Campfire’ in forest environments?

Questions

- What are the existing levels of sports hunting in forest areas, and what financial returns do these offer, both locally and internationally?
- What is the potential for increasing the level of off-take of trophy species in forest areas, without threatening the viability of the species?
- What potential exists for a greater retention of financial benefits at the local level?

- How important is tourist infrastructure to the success of 'Campfire' type approaches, and what are the implications in the West and Central African situations?

Research framework

What institutional arrangements would be needed to introduce a degree of centralisation into the bushmeat trade, and what are the chances of these being sustainable?

Questions

- What is known about the organisation and integration of the major bushmeat markets in West and Central Africa?
- Where is the value added in the bushmeat commodity chain(s)?
- What are the implications of the 'architecture' of the bushmeat trade for the imposition of centralised management?
- How successful are tagging schemes proving, and what are the chances of abuse?

Research framework

Where would statutory management plans that detailed sustainable catches, enforcement mechanisms, and monitoring and evaluation systems for particular areas be applicable and how could these be instituted?

Questions

- What is the long-term viability of existing pilot schemes?
- How transferable are the models in question to other areas with differing levels of the resource, and different social and economic contexts?
- How cost-effective are monitoring and evaluation systems likely to be?

4.4.4 Theme: Assess the significance of the inter-continental trade and improving its monitoring and regulation.

Research Framework

How important are international trade regulations in general, and CITES in particular, in successfully managing bushmeat production and furthering conservation goals in the range states?

Questions

- How important are CITES-listed species in the trade, particularly the intercontinental trade?
- What are the relative merits of CITES and the CBD as forums within which to advance the management agenda?

- What are the provenances of bushmeat species entering the intercontinental trade, and what are the implications for sub-regional and regional-level controls?
- How important are intra-regional markets in supplying the intercontinental trade?
- What potential exists to control the intra-regional markets?
- Is there a constituency in the producer states that would help champion the cause of limiting and better disciplining the export trade?
- What potential exists to improve the quality of controls applied within the consumer trade blocks (e.g. European Union)?
- What difference would improved enforcement capacity make at both the national level, in the range states, and the inter-continental level among consumer nations?
- How important are increased penalties likely to be in deterring the trade?
- Is there a need for greater expenditure on publicity and public sensitisation in the range states and in Europe and the UK?
- Are existing trade control measures sensitive enough to cultural considerations both in Europe/UK and in the range states?
- If not, what cultural guidelines need to be put in place?

5. RECOMMENDED DIRECTIONS FOR FUTURE DEFRA BACKED RESEARCH

5.1. Criteria used to prioritise the researchable constraints for DEFRA

The process of prioritising the research questions from the previous section involved determining which areas of research need to be answered most urgently and are most appropriate for DEFRA.

Furthermore, a decision was made on which areas of research were feasible to undertake and were most likely to have a high impact in terms of reducing the pressure on at-risk species whilst improving the stability of the livelihoods of those involved in the trade. This is detailed for each priority under 'general rationale'.

DEFRA, as a UK governmental department, has existing priorities and defined roles that were taken into account. The department's current involvement in the bushmeat issue consists of:

- Its remit for involvement in CITES, and the UK's role in the CITES Bushmeat Working Group. This working group was created after a UK submission to the secretariat in 2000 (Brown and Hunter, 2000), and is now part funded by DEFRA. It consists of a group of West and Central African officials and fits with the regional focus of this report as put forwards in the original DETR TOR.
- DEFRA has contributed money, allocated for 'bushmeat issues', to a flagship species fund to be managed by Fauna & Flora International, and funds the Tropical

Forest Forum. Thus, there are two specific areas of DEFRA's work where the potential links into this project should be as strong as possible.

As with all donors, DEFRA will want to select geographic areas based upon the relative chances of success and the potential efficiency of investment. This is dependent on current political realities within the region, the institutions present that could become involved in any given project, the current depth of knowledge on the area involved, and the extent and severity of the problem, etc.

In any selection of potential researchable constraints DEFRA has to deal with the wider environmental policy realities of the Convention on Biological Diversity (CBD), which the majority of countries in West and Central Africa have ratified. Thus, biodiversity criteria are important as potential determinants of where DEFRA can assist countries most efficiently in implementing conservation related activities.

Finally, the CBD obliges all signatory countries to pursue sustainable development, which the UK government is committed to facilitating through its various foreign aid programmes. Thus, livelihood issues are also important.

Thus, this section identifies what DEFRA should be prioritising as the most important researchable constraints on the bushmeat trade based on:

1. General rationale
2. Existing DEFRA activities
3. Potential efficiency of investment
4. Biodiversity value
5. Livelihood gain within a sustainable development framework

5.2. Prioritised Livelihood Researchable Constraints

5.2.1 Increase the positive management role that the logging industry should be playing with regards the bushmeat trade

Research Framework
1. **How can the logging industry, which affects the supply of, demand for, and access to bushmeat, become a collaborator in improving the sustainability of the bushmeat trade?** 2. **How does logging influence the sustainability of the bushmeat trade, and how does the removal of game species affect the sustainability of logging?** 3. **Is certification a potential solution for reducing unsustainable game hunting in West and Central Africa?**
Problems to be addressed
• The logging industry affects the supply of, demand for and access to bushmeat plus potentially the regional and national sustainability of the trade. • The industry often benefits from a cheap supply of bushmeat protein for its staff,

especially in areas where there are few if any alternative cost-effective sources of animal protein, and so it may not be in its short-term interest to cooperate.

- Logging degrades forested areas which has a differential impact on game species.

Specific research questions	
1.	• How can logging concessions be allied with sustainable management? • Do sufficient data exist concerning which taxa are most affected by logging (positive and negative impacts on habitat; impacts on consumption patterns of local people) to engage with the logging industry? • Under what circumstances if any will logging companies be willing to give up the 'subsidy' of bushmeat as a 'free' source of animal protein for their employees or as a financial perk through transportation or selling?
2.	• What are the direct effects, both positive and negative, of logging on wildlife populations (much of this is known in general terms)? • What are the long-term implications of the removal of important fruit-bearing tree species from tropical ecosystems, particularly with regard to frugivorous species that enter the bushmeat trade? • Should restrictions be placed on logging companies with regard to the harvesting of tree species whose fruits and other products are consumed by mammals with important roles in human livelihoods and ecosystem maintenance? • Is removal of game species reducing the potential for sustainable timber off-take?
3.	• What lessons have been learned from current past certification processes – does certification reduce hunting, or make it more sustainable? • Can certification be made more relevant to West and Central Africa? • Can certification promoted for its benefits in controlling bushmeat be used to increase the pressure on logging companies to gain accreditation?

Criteria for selection of priority theme	
General	The logging industry is an integral part of the bushmeat trade yet typically ignored. It is a stakeholder close to the wildlife and so any successful efforts to work with the industry should have a high impact on the trade's sustainability. Potential for influence from the West is high because this is where many logging companies are based.
Existing DEFRA activities.	DEFRA has put in place a strict procurement policy on timber, which is now mandatory on all UK Government Departments and their associated bodies. However, little is known of how effective 'sustainably sourced' wood is in terms of controlling unsustainable hunting.
Potential efficiency of investment	High given the multiple interactions of the logging industry with bushmeat (supply of, demand for, and access to). The increasing pressure put on logging companies to not harm other ecosystems will likely increase their willingness and enthusiasm to cooperate.
Biodiversity value	Most of the common species in a given region are likely to be present within allocated concessions, which could also potentially contain rarer, limited distribution species. Thus, with appropriate specific management interventions to limit hunting, together with good logging practice that minimises impact on game species, these areas could become useful source areas for commoner species, and could protect rarer species from exploitation.

Livelihood gain	Although there may be a negative impact on the livelihoods of a small number of hunters in the short term, in the long term bushmeat will be valued more appropriately (rather than being 'free' to the loggers) and the benefits will be distributed more equitably. There could also be large gains from increasing the overall stock available outside the concessions if they become 'source' areas.

Methodological approach and data requirements

- Identify an area where the logging industry is willing to cooperate in action-oriented research and piloting of recommendations. A fully participatory approach is required that engages the logging industry from the start of the process.
- Determine in what ways logging industry affects trade in bushmeat (e.g. hunting for own consumption, providing access routes for commercial hunters and traders).
- Identify who currently benefits from bushmeat linked to the logging industry and how they benefit (e.g. through stakeholder analysis).
- Determine what levels of hunting of particular bushmeat species (if any) could be undertaken sustainably on logging concessions.
- Determine costs to logging concession and other stakeholders of complying with reduced hunting and consumption of bushmeat.
- Evaluate potential for sourcing of alternative cost-effective animal protein to substitute for reduction in consumption of bushmeat by loggers.
- Assess the extent to which existing policy and regulation would work with or against efforts to involve logging industry.
- Identify and evaluate different mechanisms for enforcing regulations.

Outputs

1. Identification of ways in which the logging industry can contribute towards improving the sustainability of the bushmeat trade.
2. Clear data on the ecological effects of logging on game species, how this affects the sustainability of the bushmeat trade, and how off-take of game affects the sustainability of logging.
3. Models for how certification could be applied, if feasible, to the situation of logging in West and Central Africa in order to reduce unsustainable hunting within certified concessions.

Anticipated impact

- Reduction of conflict between loggers, local populations dependent on bushmeat, and conservationists.
- Increase in populations of bushmeat species, particularly those at risk, in logging concession areas.

Example target countries, institutions, and policy makers

Example target countries	• British interests are strong in Ghana and research is already under way on this theme in Cameroon and Gabon. Research contacts need to be maintained.
Institutions	• Governmental institutions and sub-regional processes such as CEFDHAC and the 'Brazzaville Process'. • Industrial forums including the World Bank CEO's conference • International Tropical Timber Organisation (ITTO) • Forest Stewardship Council (FSC) • Professional Foresters' Associations in the range states • Trade Unions in the Forest Sector in the range states

5.2.2 Engage urban consumers as a critical entry point for managing the bushmeat trade

Research Framework
1. **How can consumption of wild-caught bushmeat (both volume and at-risk species) be reduced in large urban areas where demand is driving the trade?** 2. **Can public opinion be changed in urban areas where bushmeat often sells at a premium?**
Problems to be addressed
• If preference for bushmeat were only based on competitive price an appropriate conservation strategy would be to flood the market with low-cost domestic animal protein. However, there is evidence of a cultural preference for bushmeat, leading to willingness to pay a price premium, especially in urban areas where attempts to substitute domestic protein have not been successful. • Hence the availability of alternative protein sources, even if competitively priced, is unlikely alone to reduce demand for bushmeat.
Specific research questions
1. • Are the general lessons or are drivers of demand case specific? • How important is urban demand, where bushmeat is priced at a premium, relative to rural demand and cross border trade? • Are the largest urban consumers the rich or the poor? • In an urban setting how much demand is for markets, and how much for restaurants? • To what extent is demand driven by price, culture, or availability in urban areas? • Given the large and urbanised population of Nigeria relative to the region, how important is consumption in Nigeria to regional trade and should it be a focal point for regional intervention? 2. • Are there any methods for attempting to encourage consumers to avoid threatened species? • Are urban populations in LDCs a stakeholder group that exerts pressure on people and governments to conserve their natural heritage (or could they take on this role)? • Under what conditions in urban areas, if any, can domesticated meat or fish be offered as a substitute for bushmeat (assuming such an option were feasible)? • Will changes in consumer preferences or attitudes change hunting behaviour?
Criteria for selection of priority theme

General	Demand for bushmeat drives the trade. In densely populated urban areas there may be scope for reducing consumption without harming people's livelihoods in the long run.
Existing DEFRA activities.	Links to commercial trade in bushmeat and the effects this has on endangered species.
Potential efficiency of investment	High in areas where demand is clearly too high to be sustainable in the medium to long term and must be reduced if bushmeat trade is to continue.
Biodiversity value	Potential reduction of share of endangered species in the trade, and increase in overall sustainability if this point of entry were demonstrated to be effective.
Livelihood gain	In the short term those who supply bushmeat may be harmed as demand is reduced and prices may be depressed. However, a reduction in demand will permit stocks to increase and thus improve returns to hunting and improve the long-term viability of the trade.

Methodological approach and data requirements

- Determine elasticity of demand for bushmeat with respect to price, income, and other animal protein sources in the selected urban area.
- Identify and develop approaches to encourage consumers not to demand endangered species.
- Identify the most appropriate alternative protein sources and how they would be sourced, including non-wild-caught bushmeat.
- Determine short-term (and long-term) impact of reduced demand on other stakeholders (such as traders) and devise short-term options to mitigate any negative impacts.
- In particular assess the links between changes in urban demand and changes in hunting pressure (location, species, volumes, those most affected).

Outputs

- Plan that links strategies to reduce urban demand for bushmeat, in particular endangered species, with identification of practical alternative protein sources.

Anticipated impact

- Reduced demand for bushmeat in urban areas, especially for endangered species.
- Reduced pressure on bushmeat species leading to build up of stocks over medium to long term.

Example target countries, institutions, and policy makers

Example target countries	• Ghana, Cameroon, Gabon (middle-income, high urban demand); Equatorial Guinea is an interesting case, given both the case study potential of Bioko, and the rapid growth of this new oil economy.
Institutions	• Bushmeat (and other meat) traders and vendors associations. • Government Wildlife Departments, Ghana Wildlife Society.

5.2.3 Increase community involvement in wildlife management whilst ensuring sustainability as a common objective

Research Framework	
How, and under what conditions, can community management contribute towards a more sustainable bushmeat trade?	
Problems to be addressed	
• Local populations are the immediate custodians of the resource and best placed to ensure its effective husbandry. Moreover, there is little prospect of improved management if the major users are excluded from participation. • There are few viable institutions for natural resource management at any but the lowest levels. • Transaction costs for any form of resource management are likely to be high, both on grounds of low ratios of human population-to-resource area, and on grounds of the social conflicts that need to be resolved.	
Specific research questions	
• For community management does ownership have to be transferred or is it the distribution of awards that matters? • How critical is land tenure in increasing the chances of sustainable bushmeat management? • How can access to natural resources including bushmeat be enabled and limited in the current socio-political context of West and Central Africa? • Do traditional value systems still influence the bushmeat trade and if so, are they a good basis for transferring rights based on traditional systems? • What evidence exists – or what data should be collected – to determine whether increased local ownership will result in more sustainable management of wildlife resources? • What are the circumstances that influence the relative benefits of wildlife versus alternative uses of land and the resource in the equatorial forest region of Africa? • What are the key social, economic and biological data needed to set up and monitor a community-based bushmeat management situation and how can this be collected in a cost-effective way? • What legislative models are appropriate for the management of community-based hunting, and how can these be adapted to the realities of commercial as well as subsistence hunting?	
Criteria for selection of priority theme	
General	Livelihood needs must be satisfied in areas where key wildlife species and populations are present. Community management is increasingly recognised as desirable for sustainable management of wildlife and the bushmeat trade.
Existing DEFRA activities.	No direct links but relevant to general DEFRA objectives.
Potential efficiency of investment	High where the policy and institutional setting is enabling, although implementation of community-based solutions can take time.

Biodiversity value	Community Wildlife Management has the potential to conserve stock of both common and uncommon species, and promote awareness of natural resource limitations in its broadest sense, which in turn can have wider biodiversity conservation value.
Livelihood gain	High. Community management offers a mechanism for local populations to benefit from wildlife in ways most appropriate to them.

Methodological approach and data requirements

- Determine costs and benefits of community-based management in a range of scenarios with varying and graded population densities.
- Undertake comparative cost-benefit analyses for bushmeat production, live wildlife management (by species) and alternative land uses.
- Assess costs and benefits/long-term sustainability of existing preferential schemes, aimed at benefiting local communities (e.g. tagging of traded meat and monitoring of the commodity chain).
- Identify indicative targets for community-based management (area coverage requirements by species and per unit of management, etc.).
- Identify the range of relevant contingent factors (e.g. proximity to urban markets, proximity to international borders, access and communications, etc.).
- Review experience from cognate sectors with a history of community involvement (e.g. general forest management, NTFPs).
- Support interventions at policy and legislative levels to promote rights of local users and hunters against externally-based entrepreneurs.

Outputs

- Pilot community-based management system implemented.

Anticipated impact

- Improved livelihoods of local populations, coupled with more sustainable management of wildlife.
- Endangered species are more likely to be protected if local communities see specific benefits from protection.

Example target countries, institutions, and policy makers

Example target countries	• Ongoing work in Cameroon, Ghana, etc. should be followed up. • In the longer term Liberia is a country of great potential interest on both biodiversity and social/managerial grounds.
Institutions	• Government institutions, including community forestry units and wildlife departments; international development programmes such as the EU's ECOFAC and DFID's CFDP. Civil society and community organisations.

5.2.4 Work with hunters as a critical entry point for improving the sustainability of the trade

Research Framework	
Can the 'by-catch' problem be reduced or eliminated through the instigation of different management regimes for different species, and if so how?	
Problems to be addressed	
• Many endangered and at-risk species are not hunted deliberately but rather are 'by-catch' because hunting tends to be non-discriminatory. • In particular, poorer people will always use snares, which are not selective.	
Specific research questions	
• Which hunting technologies should be encouraged if selectivity is desired? • What measures can be used to encourage hunters with guns to discriminate between threatened and non-threatened species? • Can non-threatened species such as grasscutter still be promoted when there are primates around without endangering the primates? • Are multi-species and single-species hunting different issues or is one simply a facet of the other, and thus, can single-species restrictions work? • What are the potential management systems that will prevent cheating such restrictions, and how effective are these?	
Criteria for selection of priority theme	
General	Hunters ultimately determine the extent to which endangered and at-risk species are killed and so are a critical entry point for tackling the loss of species.
Existing DEFRA activities.	Relevant to CITES and to some extent the CBD.
Potential efficiency of investment	Targeting hunters is one of the few ways of having a direct impact on which species are in the bushmeat trade. However, the combination of the requirement for suitable hunting technologies and the willingness of hunters to comply means that success will be difficult to achieve.
Biodiversity value	Attempt to reduce number of at-risk and endangered species in the trade without banning all trade.
Livelihood gain	Low impact in short-term but reduction in catch of endangered species should improve attitudes towards the trade as an important contributor to livelihoods.
Methodological approach and data requirements	
Ecological • Identify species that can be hunted at sustainable levels and determine optimal off-take. • Identify at-risk species that should not be hunted at all. • Develop a system for monitoring changes in populations of key indicator species. • Develop appropriate technologies to enable differential hunting.	

Livelihood

- Calculate the short-term cost to hunters from changing their hunting practices and the potential long-term benefits by determining changes in costs of hunting (effort and hunting technology) and returns to species caught.
- Identify perceived 'winners' and 'losers' from changes (e.g. using a participatory stakeholder analysis).
- Identify other stakeholder groups that will be affected by changes in hunting practices and hunting volumes and anticipate the impacts on their livelihoods. Consult to consider their willingness to cooperate.

Policy

- Within the existing structure determine the extent to which the local community can control access to the wildlife resource.
- Develop mechanisms for local community to restrict access to hunting.

Enforcement

- Develop a structure to provide incentives and deterrents for hunters and consumers to cooperate in managing the trade.
- Identify the costs of enforcement and management efforts and mechanisms for covering costs.

Outputs
• Management plan detailing species that should not be caught, acceptable levels for species that are not at risk, acceptable technologies, and enforcement regimes (incentives and deterrents). • Recommendations for cost-effective monitoring system.
Anticipated impact
• 'By-catch' of at-risk species reduced to sustainable levels. • Improved cooperation and understanding between hunters and conservation-oriented groups. • Convergence of objectives of different stakeholder groups.
Example target countries, institutions, and policy makers

Example target countries	• Cameroon and Equatorial Guinea (Bioko)
Institutions	• Government wildlife and forestry departments, police; ministries of commerce and trade licensing authorities; hunters' unions.

5.3. Prioritised Ecological Researchable Constraints

5.3.1 Assess the most appropriate mechanisms for the direct protection of vulnerable wildlife populations, and their current conservation status

Research Framework	
Is a traditional protected area (PA) approach a complete or partial solution to protecting vulnerable wildlife populations affected by the bushmeat trade?	
Problems to be addressed	
• Traditional protected areas approaches have tended to cause resentment among communities, through protectionist strategies that prevent use. • The current PA system in West and Central Africa is being adversely affected by the bushmeat trade as there is continued poaching inside gazetted areas. • Governmental resources are already strained, and enforcement already a critical problem, thus alternative strategies have to be examined.	
Specific research questions	
• How can alternative protected areas be created and financed? • Is the establishment and community management of community hunting reserves around well-designed core areas feasible? • Can such reserves be financially self sustaining? • What are the roles for different institutions within this context? • Do current protected areas lend themselves to being converted into areas with more holistic management objectives? • Are the large areas required to secure the survival and genetic future of many mammalian species in the tropics compatible with the potential for community management and the high costs of policing the resource? • Does the present coverage of existing protected areas correlate sufficiently with the distribution of species that are potentially vulnerable to the bushmeat trade? • How does this coverage correspond to existing biodiversity hot-spot data and priority habitats?	
Criteria for selection	
General	PAs are threatened by the trade but could also be key to ensuring sustainability at regional and national levels.
Existing DEFRA activities.	This approach fits the broad environmental remit, and is potentially linked to the Flagship Species Initiative.
Potential efficiency of investment	Complex. Re-thinking the current PA strategy could increase the sustainability of these areas and reduce external funding needed in the future.
Biodiversity value	Some of the PAs contain 50% of the entire African mammal fauna, thus this topic is significant to biodiversity conservation.
Livelihood gain	Revision of traditional PA management provides ample opportunity to ensure direct and indirect livelihood gains and is a pre-requisite for PAs to have a long-term future.
Methodological approach and data requirements	

- A multidisciplinary approach involving socio-economists, biologists and protected area specialists from the range-states, assisted with external expertise where appropriate would be the most valid way to tackle these issues.
- Some of the work can also be done remotely, e.g. comparing existing biodiversity hotspots with protected area coverage, and seeking alternative models from other sectors that could become the theoretical basis to develop innovative strategies.
- Other work requires targeted fieldwork, e.g. on potentially vulnerable species, to determine their current populations in known bushmeat producing areas.
- Policy work requires meaningful participation between external and national agencies from all sectors that could potentially benefit from a more holistic approach to PA planning.

Outputs

- An assessment of the most appropriate mechanisms for the direct protection of vulnerable wildlife populations, and their current conservation status based in the emerging realities of the bushmeat trade.

Anticipated impact

- This should become a key instrument in revising current protected area planning strategies to improve existing areas.
- The effect of this may well be to suggest that there should be an emphasis on making the existing PA system work by revising current objectives, and switching the emphasis from gazetting further parks where the funds and expertise in country are already insufficient.
- It should also identify where further novel PAs may be necessary based upon actual threat, and how they could be created without imposing further strain on the countries involved.

Example target countries, institutions, and policy makers

Example target countries	• Could include in the short-term Cameroon and Ghana, in the medium term Congo Brazzaville, Equatorial Guinea and Liberia, in the longer-term DRC.
Institutions	• Governmental institutions in-country and external institutions: bi-laterals, multi-laterals, NGOs, Foundations and Trusts.

5.3.2 Meet the ecological information needs that still exist with regards the bushmeat trade

Research Frameworks

1. **Can game populations be monitored for purposes of control and management of the bushmeat trade, and if so can indicator species or surrogates be used to determine whether the wider bushmeat trade is sustainable or not?**
2. **On a regional level what are the most important areas for bushmeat production, and how do these coincide with the most important areas for biodiversity**

conservation?

3. **How important are protected areas and endangered species in the trade as source areas and game species, respectively?**

Specific research questions	
1.	• How could biological monitoring data be used in a community management model? • Where should populations be monitored, as wildlife or once in the bushmeat trade (both are probably necessary but usefulness and feasibility will vary)? • How accurate is extrapolation of carcass data to the actual effect that this hunting is having on the game populations involved? • Which are the species that have the reproductive potential to be hunted at sustainable levels but for which data does not exist to determine optimal off-take? Collect this data. • Where can new field DNA-testing methods be best employed in monitoring or control of the bushmeat trade? • What time-scale is necessary to ensure that monitoring is effective, and how can such data gathering and analysis be made financially sustainable? • What would be the most appropriate and accurate indicator species. • Would such a scheme of monitoring using surrogates be cost-effective? • Can such indicators provide early warnings of stock collapses or will stochastic variations mask signs for so long that preventative action will not be possible?
3.	• What proportion of the trade involves non-threatened species (such as grasscutters and other rodents)? (Much of these data exist but may not be in easily accessible or useable forms). • What proportion of bushmeat comes from degraded areas and what proportion is from primary forests?

Criteria for selection	
General	There is still a deficit in terms of simple methods that can be used to support potential management and enforcement schemes by supplying sufficiently accurate data on the stock populations involved. If biological sustainability is a goal, then such monitoring or the determination of suitable proxies is a necessity.
Existing DEFRA activities.	This approach fits the broad environmental remit for biodiversity conservation and is of potential importance for CITES enforcement.
Potential efficiency of investment	This is a key issue to assess the efficiency of potential and actual interventions.
Biodiversity value	As per above.
Livelihood gain	The development of realistic monitoring procedures could facilitate the development of management options that could include those most beneficial for livelihood gains.

Methodological approach and data requirements

- Well designed long-term field research involving as many national scientists, forestry officials, etc. as possible to encourage the mainstreaming of planning on this issue within the national context, and also, where appropriate, to build in-country capacity through experiential learning.
- All research conducted within a problem solving framework that aims to improve the potential for sustainability through explicitly recognising both livelihood and

conservation contexts. • Geographic Information Systems should be employed when analysing spatial variables as a key tool for putting key messages across to decision makers. The data needs to aid in the promotion of this problem as one requiring serious political commitment through all major departments in the countries involved.
Outputs
• A way to judge whether monitoring of game populations is a suitable basis for control and management purposes and if so how. • The identification of the most important areas for bushmeat production, and how these relate to the most important areas for biodiversity conservation. • Is it possible to develop a system for monitoring changes in populations of key indicator species that determine whether the wider bushmeat trade is sustainable or not? • The importance of protected areas and endangered species in the trade as sources areas and game species, respectively.
Anticipated impact
• With some of these key information needs met, there should be the basis for a better-informed dialogue and more complete baseline for future decision making both in-country and in the donor nations.

Example target countries, institutions, and policy makers	
Example target countries	• Potentially could include: in the short-term Cameroon and Ghana; in the medium term Equatorial Guinea and Liberia; and in the longer-term DRC.
Institutions	• Governmental institutions in Cameroon: Ghana:Equatorial Guinea. • External institutions: bi-laterals, multi-laterals, NGOs, Foundations and Trusts.

5.4. Prioritised Policy & Institutional Researchable Constraints

5.4.1 Assess the significance of the inter-continental trade and improving its monitoring and regulation.

Research Framework
How important are international trade regulations in general, and CITES in particular, in successfully managing bushmeat production and furthering conservation goals in the range states?
Problems to be addressed
• The increasing volume of bushmeat entering the UK and Europe from producer states is a high-profile issue in the UK Press and a matter of public concern. • It is unclear to what extent public and media concerns relate to the health issues,

cultural preferences (and aversions) and/or conservation issues.

- What benefits are likely to be derived from increased regulation and monitoring of the trade?
- What are the likely risks in so doing, and how can these be managed?

Specific research questions

- How important are CITES-listed species in the trade, particularly the intercontinental trade?
- What are the relative merits of CITES and the CBD as forums within which to advance the management agenda?
- What are the provenances of bushmeat species entering the intercontinental trade, and what are the implications for sub-regional and regional-level controls?
- How important are intra-regional markets in supplying the intercontinental trade (there is some evidence of entrepot trading out of Nigeria and Ghana of bushmeat harvested elsewhere)?
- What potential exists to control the intra-regional markets?
- Is there a constituency in the producer states that would help champion the cause of limiting and better disciplining the export trade?
- What potential exists to improve the quality of controls applied across the European Union?
- What difference would improved enforcement capacity make at the national level in the range states and the inter-continental level among consumer nations?
- How important are increased penalties likely to be in deterring the trade?
- Is there a need for greater expenditure on publicity and public sensitisation in the range states and in Europe and the UK?
- Are existing trade control measures sensitive enough to cultural considerations both in Europe/UK and in the range states?
- If not, what cultural guidelines need to be put in place?

Criteria for selection of priority theme

General	The intercontinental trade is the highest profile aspect of the trade in the UK media, and excites strong public emotions both for and against.
Existing DEFRA activities.	Potentially high relevance to DEFRA CITES work, and high profile in terms of HM Customs CITES team activities. Resolution of this issue has strategic importance for DEFRA, and the balance of efforts between CITES and CBD.
Potential efficiency of investment	High in terms of time allocations of DEFRA and other bodies with regulatory functions. May be lower in conservation terms, given the low proportion of the trade volume that crosses continents.
Biodiversity value	Unknown – to be researched; may be less than the media coverage would imply, as above.
Livelihood gain	Not necessarily significant, to the extent that the value added is largely higher up the commodity-chain, and primarily benefits commercial interests with international connections.

Methodological approach and data requirements

- Through collaboration with customs and other authorities in producer (or re-export) countries, establish provenance of trade items entering the UK, and identify the

dominant species.

- Assess direct and indirect significance relative to CITES.
- Appraise quality of traveller sensitisation at both ends of the chain, and seek ways to improve public awareness.
- Improve information on consumer demand in the UK, and address the cultural issues involved.
- Collaborate with cognate institutions in Europe to better understand and control re-exports from mainland Europe to UK.
- Determine part played by airlines and handlers in the growth of the trade.

Outputs

- Improved understanding of the provenance, volume and beneficiaries of the international trade.
- Briefing materials for UK officials on issues of great cultural and political sensitivity.
- Protocols developed for work with airlines and their agents.

Anticipated impact

- Significant benefits to be experienced in UK and other importing states.
- Increased DEFRA authority in CITES and related negotiations.
- Improved capacity of DEFRA, HM Customs, etc. to deal with sensitive issues in the public eye.
- Range state benefits will depend on the conservation implications of the trade (yet to be discerned).

Example target countries, institutions, and policy makers

Example target countries	• Main UK concerns are imports from Ghana and Nigeria because these are the main major exporters (or re-exporters?) from which airlines fly direct into the UK.
Institutions	• Customs and trade departments in both exporter states and the UK. • Local Government bodies in the UK, and health authorities such as the Trading Standards Department of the Corporation of London. • Commercial interests in both exporter states and the UK, including chambers of commerce. • European Union (DG-Environment and others). • European MS. • Airlines and baggage handling agents in UK and Africa; onward shippers from Brussels, Frankfurt and Paris.

5.4.2 Improve the regulation of the bushmeat trade at national and regional levels in West and Central Africa

Research Framework	
What legislative models exist for the management of community-based hunting, and how can these be adapted to the realities of commercial as well as subsistence activities?	
Problems to be addressed	
• The inadequacy of the existing legislative and policy framework governing the bushmeat trade in many producer nations. • Existing legislative models are ill-adapted to local realities, and dependent on arguably invalid distinctions between subsistence and commercial activities.	
Specific research questions	
• Within the existing structures, how can local communities control access to their wildlife resources? • Are there legal definitions that could be used to separate subsistence from commercial hunting? • What are the minimum requirements for area coverage in the differing local situations, and how can an effective balance be found consonant with the realities of the commercial trade? • What national preconditions are required to support the attempts of the range states to coordinate their legislations and policies, as per current deliberations of the CITES working group?	
Criteria for selection of priority theme	
General	The existing frameworks are widely recognised to be inadequate but little has been done to date to rectify the situation (which accounts for the very limited success of project-level interventions). National wildlife legislation is often the 'missing link' between project level and international interventions.
Existing DEFRA activities.	Without adequate legislative and policy framework in the range states, attempts by UK and others to improve management and conservation are unlikely to be successful. DEFRA is well-placed to support deliberations at policy level, less so to support field trials and activities (where DFID has comparative advantage).
Potential efficiency of investment	Links well to the regional activities and deliberations of the CITES working group.
Biodiversity value	Fundamental to, and underpins, general conservation goals.
Livelihood gain	Likely to be high for local populations, but negative for external hunters and investors with questionable long-term interest in the local resource.
Methodological approach and data requirements	
• Existing legislative rules must be reviewed, for a sample of states, against biological and management criteria.	

- Assessment of costs and benefits against institutional, area and population parameters.
- Research on the practical realities of hunting and the trade in local contexts, to improve understanding of actors and balance between commercial and subsistence activities.

Outputs
• Guidelines for legislative reform in favour of community-based wildlife management for consumptive use
Anticipated impact
• Increased local capacity to sustainably manage bushmeat production. • Knock-on benefits in relation to inter-state harmonisation and regional processes.
Example target countries, institutions, and policy makers

Example target countries	• Cameroon (as an example of the francophone model). • Ghana and Sierra Leone (as contrasting cases to Central African models, given frequent community ownership of the resource).
Institutions	• National Forestry Ministries/Wildlife Departments; Ministries of Justice. • Legislators and national parliaments. • Development assistance projects and their partners. • CITES Central Africa Working Group.

Research Framework
How much influence does formal law enforcement have on the bushmeat trade?
Problems to be addressed
• Does enhanced law enforcement in the range states represent a workable approach to improve management of the resource? • If it is judged not to do so, then what are the implications for conservation strategies? • What conditions would need to be in place for law enforcement to act as a driver for regulation of the trade and improved conservation?
Specific research questions
• Which situations tend to be enforced or enforceable and which not? • Why are regulations not being enforced? • Are there regulations that cannot be enforced? • How much relevance does formal legality have in West and Central Africa, in a management context? • Is there an alternative structure of incentives and deterrents for hunters and consumers that could be used to encourage their cooperation in managing the trade?
Criteria for selection of priority theme

General	Enforcement of existing laws is seen as the priority need by some environmentalists but treated sceptically by the development lobby. To the extent that the approach is pursued, this would interfere with, and perhaps pre-empt, more developmentally-oriented strategies.
Existing DEFRA activities.	Important in the context of DEFRA's CITES work, given the centrality of enforcement to this convention. Important for determination of the balance of UK efforts between CITES and CBD. Important links to the inter-continental trade theme.
Potential efficiency of investment	Resolution of this issue is crucial to progress on the bushmeat management issue, given the strong support for the enforcement option in some UK environmental quarters.
Biodiversity value	Realistic, implementable regulation is essential to the protection of important wildlife populations, and thus is a key policy issue.
Livelihood gain	In the short term, any attempts to refine and enforce existing laws (many of which date from colonial times) are likely to be highly detrimental to the interests of the rural populations. Particularly in francophone states, where popular rights as enshrined in law are often minimal and almost any economic activity can be construed as illegal. In the longer term reform of the legislative structure is likely to be in the interests of the rural populations, to the extent that this enhances local rights and offers reliable means of redress.

Methodological approach and data requirements

- Broad survey of existing legal frameworks throughout the range states.
- Complemented by a sample survey of wildlife case law in key states.
- Identify differential impacts of existing laws, and the extent to which they are applied.
- Review cognate aspects of legal frameworks, relating to other aspects of regulation of natural resource use (e.g. timber exploitation, slash and burn cultivation).
- Assess livelihood impacts of existing laws (if applied) and alternatives.

Outputs

- Comparative review of existing legal frameworks.
- Recommendations for refinements that aim for effective and just application.

Anticipated impact

- Submitting wildlife management to the authority of just and effective laws is a prerequisite both for effective management and suppression of rent-seeking behaviour, which is a widespread substitute for regulation.

Example target countries, institutions, and policy makers

Example target countries	• Francophone states in Central Africa.

Institutions	• Relevant government and legislative institutions. • Legal authorities and practitioners. • Customs Service.

6. APPENDIX 1: LITERATURE REVIEW

6.1. Introduction

Bushmeat is herein defined as *wild animal protein that is hunted for human consumption*.

The main sources for this review of the bushmeat issue include several recent key publications and syntheses and information from organisations working in West and Central Africa.

6.1.1 Key publications and syntheses

Recently, there have been several key publications and syntheses on the subject of hunting of wild meat.

Global reviews

Bakarr M. I., da Fonseca G. A. B., Mittermeier R., Rylands A. B. and Painemilla K. W. (2001)

Coverage: the Centre for Applied Biodiversity Science team produced a review entitled "**Hunting and bushmeat utilization in the African rain forest – perspectives toward a blue print for conservation action**". This volume, with contributions by different authors on subjects from colonial history as a background to the current situation to bioeconomic modelling, is the most up-to-date review of the bushmeat issue.

Main conclusions: that a multi-faceted approach to finding solutions needs to be made, taking account of both human and wildlife dimensions that will persist as people continue to hunt. They argue that more data is required to come up with more accurate models and warning capabilities, and that improvement of existing legal structures and enforcement mechanisms should be a prime focus for interventions.

Robinson and Bennett (2000)

Coverage: Robinson and Bennett (2000), ***"Hunting for Sustainability in Tropical Forests"***, was published after three years in press. Despite this delay it is the most complete global overview of the current effects of hunting on wildlife and people in the tropics. It contains case-studies and results of research from Africa, Asia and the Neotropics. The final chapter has been revised and re-published as a World Bank Environment Department Paper (Bennett and Robinson, 2000), with more emphasis on potential and attempted solutions.

Main conclusions: the clearest message from the book is that hunting is usually unsustainable on a biological level. The problem is also a human one, with huge amounts of wild meat being an important resource to different sectors of society. The

main solutions discussed are controlling illegal hunting, and maintaining effective protected areas, which are proposed in the context of factors that increase or decrease the likelihood of sustainability, e.g. national parks and logging respectively.

African studies

In the last few years, there have also been several key works concentrating on Africa:

TRAFFIC (2000)

Coverage: TRAFFIC published the report ***"Food for Thought: The Utilization of Wild Meat in Eastern and Southern Africa"***. Although this is predominantly concerned with the bushmeat trade in non-forested areas of Africa, the detailed country studies make it an important reference and it highlights the wider essence of this emerging problem.

Main conclusions: questionnaires in seven countries suggested that supply was decreasing in all cases. The economic importance of the trade in all countries is highlighted, and the importance of bushmeat as a source of protein for rural poor confirmed. Also, there is clear evidence that with diminishing alternative resources traditional taboos are being ignored and commercial trade is becoming a more significant element of the trade. TRAFFIC confirm that international trade within Africa is not significant in comparison to domestic consumption but that significant amounts of meat are still involved. They suggest that tenure policies and ownership are key issues to increasing chances of community management and therefore sustainability.

Bowen-Jones (1998)

Coverage: the author reviewed the situation in West and Central Africa in a report written for the Ape Alliance, ***"The African Bushmeat Trade – A Recipe for Extinction"***. The report is a working paper summarising literature on the regional trade – its biological, socio-economic and legal aspects, plus its links to logging. It concentrates on this region because it comprises the majority of ape range states. The report's recommendations are based on this review plus consultations with conservation organisations and individuals from Africa, the UK and USA.

Main conclusions: the report concludes that access, improved hunting technology, increased commercialisation and increasing demand have facilitated an increase in hunting that now threatens vulnerable species with extinction. It also highlights how logging has exacerbated this problem by opening once remote areas up and fuelling increased demand. A range of potential options to reduce both 'local supply' and 'resource exploitation linked supply' are then presented along with a draft code of conduct for logging companies.

Neotropical studies

Robinson and Redford (1991)

Coverage: another key publication is ***"Neotropical Wildlife Use and Conservation"*** (Robinson and Redford, 1991). This is specific to Latin America but contains a wealth of information of direct relevance to developing ideas on rational use of wildlife including details of attempted ranching and domestication schemes for wild animals.

Main conclusions: because of the variety of case-studies there is not an emphasis on overall conclusions, but the editors note that there is a contrast between the potential for commercial exploitation in different ecosystems. Generally, more species diverse habitats, e.g. forests, contain species with low reproductive capacity and low population densities. By contrast seasonal open habitats tend to support large-bodied species at relatively high densities, and with greater reproductive potential. These have more potential for commercial exploitation. The work also highlights the blurred boundaries between susbsistence and commercial off-take of wildlife.

6.2. The bushmeat trade

6.2.1 Why Hunt?

People hunt for subsistence or commercial reasons, and usually a mixture of both. There are other reasons to hunt (sport, recreational, cultural, pest control, etc.) that are, for the most part, not covered in this review. However, in numerical terms, animals killed for these purposes are insignificant in comparison to those killed for bushmeat.

6.2.2 Bushmeat – its importance for people

Bushmeat is critical to the livelihoods of the rural poor

Bushmeat provides a flexible source of income, a direct source of animal protein with good storage qualities, and a safety net in times of particular hardship. The benefits from bushmeat accrue to many stakeholder groups along the 'commodity chain', including the hunter and his family, traders along the rural to urban transportation routes (often women), the 'chop bar' owners, and the final consumers. Local people can benefit from the improved management of this source of income and nutrition.

Bushmeat as a source of protein

Bushmeat is important relative to other sources of animal protein. For example, it is estimated to provide 98% of animal protein consumed by villagers adjacent to the Dja Reserve in Cameroon, and 80% in the nearest town (Muchaak and Ngandjui, 1999) (Table 1).

Table 1. Estimates of contribution of bushmeat to total animal protein intake

Country	% of consumption	Data Source
Dja Reserve	98% adjacent to reserve	Muchaak and Ngandjui (1999)

	80% in nearest town	
Northern Cameroon	25%	Njifgorti (1996)
Ghana (1960s-80s) Ghana (1990s)	70-80% in past 5% now	Njifgorti (1996) Ntiamoa-Baidu (1998)
Botswana (1960s-80s)	40-60%	Ntiamoa-Baidu (1998)
Zimbabwe(1960s-80s)	60%	Ntiamoa-Baidu (1998)
Gabon	73% for rural hunters	Lahm (1993)

6.2.3 What is the size of the trade?

No official data regarding the size and importance of the bushmeat trade exist: much of the trade is informal, and often illegal. However, estimates from many of the countries in West and Central Africa suggest that bushmeat is significant both in terms of trade and nutrition. For example, in Liberia Anstey (1991) estimated the bushmeat trade to be worth more than the timber trade. Table 2 gives some estimates of the size of the bushmeat trade in a range of African countries.

Table 2. Estimates of the size of the bushmeat trade

Country	**Estimated trade**	**Data Source**
Gabon (1993)	US$21 million rural US$26 million urban	Steel (1994)
Liberia (1988)	US$24m	Anstey (1991)
Ivory Coast	US$117m	Fa, in Bowen-Jones (1998)
Nigeria and Ghana	Similar to Liberia	Fa (1997)

6.2.4 Where does the trade take place?

Although much trade is intra-country, trans-border trade does occur through known trade routes throughout the region, and there is a limited amount of inter-continental trade from Africa to Europe (see Bowen-Jones, 1998).

6.2.5 Who is involved in the trade

Many different stakeholders are involved in the bushmeat 'commodity chain', in particular hunters, traders, loggers, 'chop bar' owners, and consumers.

Who eats bushmeat?

Ntiamoa-Baidu (1998) classified consumers as those who eat bushmeat out of preference and therefore have strong preferences for 'choice' species, and those who

have no (viable) alternative, specifically those in remote rural areas, who are likely to be less choosy. Consumers' preferences are reflected partially in the price of bushmeat. In cities bushmeat is a luxury item and more costly than domestic alternatives. For example, in Libreville bushmeat is 1.6 times as expensive as the most popular beef cut (Steel, 1994). In Nigeria, bushmeat sold in local markets was found to be more costly than all other meats except premium imported steak (Martin, 1983).

The hunters themselves may also be consumers. Often larger animals are sold to market whilst smaller animals (mostly rodents, such as rats and squirrels) are consumed by the family, or hunters sell the bushmeat and purchase cheaper protein such as fish (Ntiamoa-Baidu, 1998, finding from Ghana).

Spatial patterns of pricing and consumption also emerge. In the more remote rural areas, especially those close to forests, bushmeat is typically cheaper than domestic animal protein and often provides a higher percentage of total animal protein consumption as compared with urban areas.

The role of hunters

Although almost exclusively male and mostly young (in Korup, Cameroon: Infield, 1988), hunters are not a homogenous group with similar objectives and attitudes to hunting. From her work in East Africa, Homewood (unpublished data) identified three categories of hunters: local opportunists, specialist guilds, and outside commercial hunters. Although these categories apply in West and Central Africa, an additional and important group of hunters comprises those who could be classed 'local professionals' (either full-time or part-time). For some of these individuals hunting is their chief occupation, providing a primary source of income (Auzel and Wilkie, 2000; Fimbel *et al.*, 2000).

Whether hunters are local or migrants is very much location specific. For example in Cameroon, in Korup most hunters were local, whereas in Lobéké 85% of hunters were found not to be local, of which three quarters had originally come to the areas in question to work for logging companies and stayed on to hunt (Bowen-Jones, 1998).

Hunters tend not to specialise with respect to particular species, other than elephant (Bowen-Jones, 1998), although WSPA (1996) found specialised gorilla hunters in southern Cameroon. Some ethnic groups consider different species taboo for hunting (Hammond, 1997), although many such beliefs are being eroded as the profit motivation increases (Bowen-Jones 1998).

Large proportions of communities can be involved in hunting. In the Korup area in Cameroon Infield (1988) found that 33% of the village income came from hunting. In Congo's forested areas, Eves (1996) found that approximately 50% of households earned income from bushmeat sales.

Access to hunting may be controlled through many channels including local leaders, outside patrons or investors or authorities, or military leaders (Homewood, unpublished data). Hunting associations may also attempt to regulate hunting through, for example, managing hunting permits, and providing financial assistance

(see, for example, Ntiamoa-Baidu, 1998). The financial barriers to entry are low for hunting. Individuals need only purchase the materials for making a snare, and hunting can be undertaken when other demands or opportunities for labour are scarce. In cases where there is excess demand for bushmeat but where there is under-capitalisation, professional bushmeat traders may supply ammunition and shotguns to the best hunters in exchange for exclusive rights to purchase the meat. This is increasing the availability of guns to hunters (Gadsby, 1990).

The role of traders

Few efforts have been made to study traders in the same detail as hunters. Typically traders are women. In Ouesso, Congo, women travelled by boat or truck to distant villages to buy meat directly from the hunter (for example, Bennett Hennessey, 1995). Traders will often remain near the hunting villages until they have a full load, and then take the load to the market (Infield, 1988). However, the trade is complex and sometimes it is unclear who controls it, who sets the prices, and who merely act as agents or intermediaries.

The role of loggers

As logging has increased, the logging industry itself has become an important new stakeholder in the trade. Truck drivers frequently transport bushmeat, along with timber, from logging areas to urban centres (Bowen-Jones, 1998; Blake, 1994). In south Cameroon, 85% of meat taken by poachers is removed on logging trucks (Bowen-Jones, 1998). Additionally, hunters often sell directly to the logging company, which saves the company money in terms of feeding their workforce (Stromayer and Ekobo, 1991).

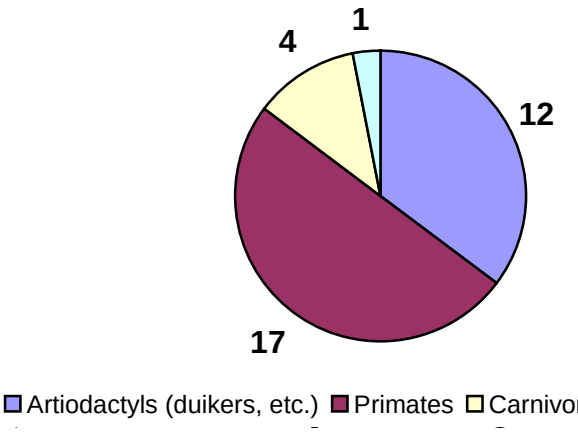
6.3. Bushmeat – the conservation aspects

6.3.1 Many bushmeat species are threatened with extinction

Many species consumed as bushmeat are threatened with extinction. Hunting pressure has been specifically identified as a threat for 84 mammalian species and subspecies from West and Central Africa (IUCN, 2000). Thirty-four of these species are listed as threatened with extinction (i.e. listed in the threat categories: Critically Endangered, Endangered, or Vulnerable). The majority of these species are primates (17), followed by duikers (forest antelopes and related taxa) (12), carnivores (4) and rodents (1) (Chart 1). The other fifty species are listed as Lower Risk and Data Deficient. The majority of these species are duikers and related taxa (38), followed by primates (8), rodents (3) and carnivores (2) (Chart 2).

Annex 2 lists primate species that are recorded as having been killed for bushmeat in various studies (Bowen-Jones and Pendry, 1999). Of the 32 species, nine are threatened with extinction and six are in the lower risk category.

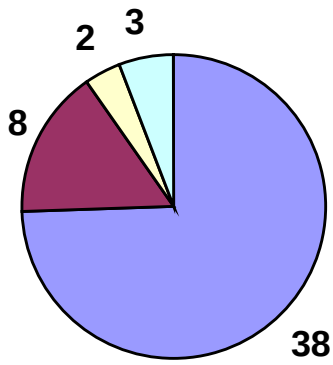
Chart 1: Red-listed Species with hunting as a major threat
(listed as Critically Endangered, Endangered or Vulnerable, *n* =34)



6.3.2

The tru… are known …ved that this …ers. comm.) …all mamma… …00; Townse… …ing countrie… …ngo has som… …ake, 1993; F… …ber of animal species in the world (Caldecott *et al.*, 1994). This indicates that the potential problem resulting from bushmeat hunting is a direct loss of biological diversity; the prevention of this loss is recognised as important at an international level th… …the countrie…

Chart 2: Red-listed species with hunting as a major threat
(listed as Lower Risk and Data Deficient, *n* =50)



6.3.3

Hunting … in which t… …00). Individu… …rest elephan… …are crucial …

Thus, c… …of great co…

6.3.4

Globally, the most important bushmeat by volume is that from mammals, principally ungulates (deer and pigs). In Asia the ungulates make up over 80% by weight of the catch per year (Bennett, 2000). In West and Central Africa, duikers (forest antelopes) are the most numerous species taken (Robinson and Bennett, 2000). Analyses of market data from West and Central Africa indicate that duikers make up between 42% and 84% of the off-take (Anstey, 1991; Steel, 1994; Bennett Hennessey, 1995; Dethier, 1995; Fa *et al.*, 1995; Malonga, 1996; Vanwijnsberge, 1996), while primates

can make up between 8% and 22% of the catch (Bowen-Jones and Pendry, 1999). Smaller-bodied mammals, such as cane rats and porcupines in Africa, are also important, tending to become increasingly numerous as large game is depleted (Fa *et al.*, 1995). Fa *et al.* (1995) observed this situation in Bioko, Equatorial Guinea and suggested that it was due to commercialisation of hunting on the island. Thus, the main taxa hunted can be temporally and spatially variable depending on the stage of development of the bushmeat trade.

Larger-bodied birds such as hornbill, guinea fowl and turacao are also taken in smaller numbers, along with reptiles such as crocodile and python (Bennett Hennessey, 1995; Steel, 1994; Vanwijnsberge, 1996). These studies found carnivores to be a minor constituent often caught as a by-catch of snaring.

6.4. Bushmeat - balancing conservation and livelihood concerns

6.4.1 There is a possible conflict between livelihood and conservation objectives

The potential for conflict between conservation and livelihood objectives under different bushmeat management systems needs to be acknowledged and addressed. Protection of species that cannot withstand hunting needs to be balanced with the rational off-take of those that can.

The sustainability of conservation measures is likely to ultimately depend on buy-in from local people; potential conflicts should be identified and minimised. For example, where the conservation imperative is sufficiently strong, alternatives may have to be sought that provide ecologically friendly income generation for the 'losers'. The requirement to reconcile the needs and demands of conservation and livelihood perspectives has long been recognised. Asibey and Child (1990) commented that '*what is most required is a broad-based commitment to the sustainable utilization of wildlife resources for rural development*'. Robinson and Redford (1991) stated that '*it is only through reducing conflicts between local communities and wildlife managers that the pace will be set for sustained benefits to be obtained from wildlife in the long term*'. Yet such reconciliation has proven difficult, even where conservation of particular species may be consistent with livelihood ambitions.

Substantial evidence suggests that the bushmeat trade in its current form is unsustainable and that local and global extinctions are imminent. Simply banning bushmeat hunting to protect the most vulnerable species, even if it were possible to implement, would extinguish a key livelihood strategy and likely reduce nutrition status for many rural poor. Hunters and consumers can relatively easily substitute different bushmeat species as and when they become scarce or locally extinct but, from a conservation perspective, there is no substitute for an extinct species.

6.5. Patterns in the bushmeat trade

Although comprehensive data are not available a pattern emerges:

- Bushmeat makes a considerable contribution to the economies of West and Central Africa, although the contribution is hidden from official statistics;
- Bushmeat is a key animal protein source for rural populations, and is typically cheaper than domestic animal protein;
- Bushmeat is a sought after food in urban areas and people are willing to pay a premium.

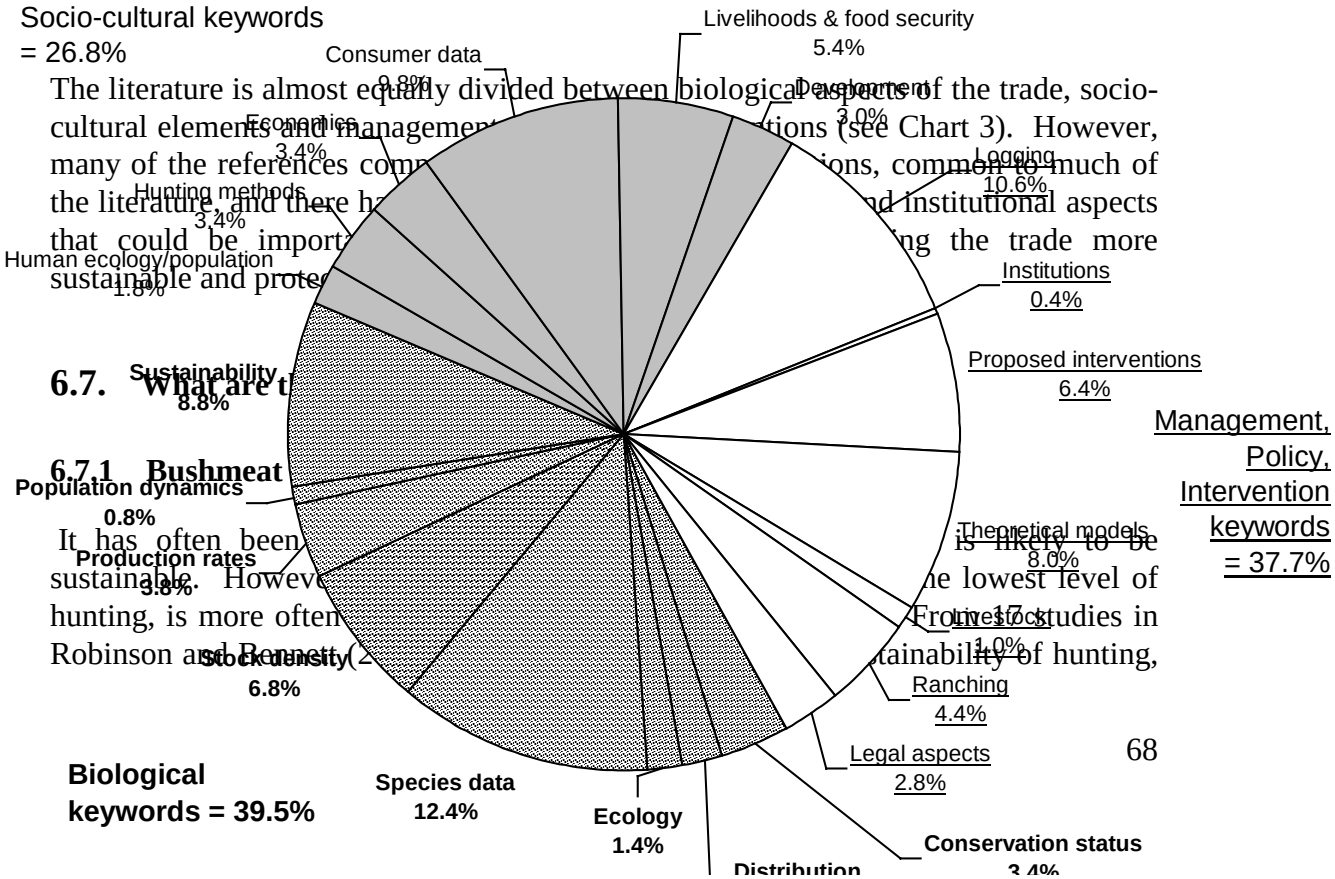
6.6. Trends and patterns in the literature

6.6.1 Quantitative analysis of the literature

A database of 588 references was compiled for this work. It includes book chapters, articles, and reports with specific relevance to the bushmeat situation in West and Central Africa. Also included are relevant parallel models of management and intervention from other regions, relating to bushmeat and other sectors. This database is extensive but not exhaustive. The following quantitative analysis is not comprehensive but the general trends in this database indicate the research effort and theoretical emphasis within the bushmeat literature.

The database was searched using a set of keywords and title phrases for references fitting into the categories of biological, socio-cultural, and management-policy-interventions. Many of the references contained several keywords and therefore are counted more than once – highlighting the overlap between the different areas of research required to understand the bushmeat trade.

Chart 3: Breakdown of literature database into subjects and keywords (carried out with 490 references available to the authors in Jan 2001)**.**



6.7. What are t

6.7.1 Bushmeat

It has often been is likely to be sustainable. Howeve e lowest level of hunting, is more often From studies in Robinson and Bennett (2 tainability of hunting,

14 concluded that hunting was currently unsustainable for some species involved, and the others predicted this situation in the near future. This is due to 'r*apidly increasing human populations, with a tendency towards urbanization and improved technology, and commercialisation of markets with greater access to formerly remote areas…*' (Bowen-Jones & Pendry 1999).

What is sustainability?

Hunting can be defined as sustainable *when the number of animals* (of a given species) *being killed is no greater than those being produced from the population over a given period of time, so long as this population is not reduced to a point at which it is unable to fulfil its role in the ecosystem involved.*

How is biological sustainability assessed?

The main method of assessing *biological* sustainability for a given species comes from a formula developed by Robinson and Redford (1991) that gives an estimate of optimum sustainable harvest that can then be compared with actual harvest rates. Details of how this is calculated are given in Annex 3.

Rates of production in tropical forests are low

In comparison to temperate domestic livestock production or wildlife production in savannah regions, the amount of meat that can be hunted sustainably per square kilometre of rainforest is very low, limited to about 200kg/km²/year (Robinson, 2000). Animals feed mainly from the forest canopy, and so ungulates do not have the same ability to browse as in a savannah. The low wild animal density limits the number of humans that a square kilometre can support sustainably, given minimum protein requirements. Calculations of minimum protein requirements are often based upon the US Recommended Daily Amount (RDA) of 0.28kg per person per day, which equates approximately to consumption within West and Central Africa (Bailey and Peacock, 1988; Lahm, 1993). Hence, one square kilometre of forest can, theoretically, support sustainably one person's consumption requirements per year (Robinson and Bennett, 2000). Most indigenous forest groups live at well below this density when hunting purely for subsistence, although additional agriculture may allow increased human density (Wilkie, 1989). Modern-day agriculturalists live at higher densities without the same subsistence needs (because of the nutritional value of crops) but still hunt, both for commercial reasons and because they want to eat game (Redford, 1993). These data suggest that hunting is likely to be locally unsustainable unless undertaken by indigenous forest groups solely for their own consumption.

6.7.2 Bushmeat hunting can lead to species extinction

Species declines

Primates are a group where there is unambiguous data on population decline; for example, on Bioko (Equatorial Guinea) Fa *et al.* (1995) found rates of hunting up to 28 times the sustainable level for crowned monkey. In Central Africa, duikers - often assumed to be resilient to hunting - such as *Cephalophus dorsalis*, *C. ogilbyi* and *C.*

callipygus are being depleted (Payne, 1992; Fa *et al.*, 1995; Muchaal and Ngandjui, 1995; Noss, 2000), and there is data to suggest that other taxa, with a lesser role in the trade, such as slender-snouted crocodile, are also declining (Behra, 1993).

The fact that endangered species are regularly being affected by hunting through direct off-take or accidental injury in snares (Eves, 1986; Noss, 2000) suggests that their populations are being depleted. Even small loses of rare species can have a profound effect on the overall population. For example, hunting of ape populations at a rate of 5-7% per year is unsustainable (Kano and Asato, 1994).

Vulnerability

The vulnerability of species to population declines and local and total extinction vary. In general, slower breeding, late maturing, larger-bodied species are most at risk (Alvard, 1993; Bodmer, 1995). Species such as giant pangolin, elephants and some larger-bodied primates (Oates and Davies, 1986; Bennett Hennessy, 1995) are more susceptible to over-hunting than other animals; while more common species, such as the greater white-nosed monkey and moustached monkey, may be less affected by hunting pressure (White, 1994). Additionally, the behaviour of a given animal can exacerbate the situation. In the case of drills, Africa's most endangered primate (IUCN 1996), there is a low encounter rate with hunters, because of their rarity, but when a hunter does come across a group he tends to kill many of them. This is because the group will cluster together and climb a tree for protection, and thus become an easier target than if they had fled.

Economic extinction

Most bushmeat hunting is opportunistic and therefore non-selective. That is, if a hunter comes across a rare species whilst engaged in pursuit of more common animals it is probably worth his while to shoot it. This particularly applies to large-bodied animals such as gorilla and white-bellied duiker (*Cephalophus leucogaster*). Hence, the principle of economic extinction will be overridden, because although it may not be worthwhile going and looking for the last few individuals of a reduced density population, there are other species to hunt.

Local and global extinction

Hunting studies show that the number of game animals decreases close to settlements where hunting activity is greatest (Mitchell and Raez Luna, 1991; Alvard, 1993; Alvard,1995; Alvard, 2000; Bennett *et al.*, 2000; Eves and Rugiero, 2000; FitzGibbon *et al.*, 2000; Hart, 2000; Peres, 2000).

Local extinctions are becoming more common because of the tendency of opportunistic hunting to deplete species indiscriminately, whether common or rare (Alvard, 2000; Bennett *et al.*, 2000; Clayton and Milner Guilland, 2000). Ultimately, numerous local extinctions over a wide enough area will result in species extinction. This is particularly likely for species with limited geographical ranges. The confirmation of the loss of Miss Waldron's colobus as a result of over-hunting in West Africa (Oates, 2000) marked the first primate extinction (albeit of a subspecies)

in 200 years. There are also historical accounts of over-hunting being a major cause of extinction; one of the main factors in the loss of both the passenger pigeon, in the US, and the dodo, in Mauritius, was hunting for human consumption. In the case of the passenger pigeon, Bucher (1992) and Du Plessis (in Hutton & Dickson, 2000) cite forest fragmentation and destruction as other major factors leading to the extinction. It is precisely this combination of threats that now threatens the vulnerable fauna of West and Central Africa.

Ecological effects of reduced density

Some species are resistant to local extinction from hunting and may be able to persist at low densities (Bennett and Robinson, 2000). However, other species have a minimum critical density below which they cannot reproduce at sustainable levels and so will die out even if hunting ceases.

Also, a given species may not be able to carry out its ecological functions when its population reaches a certain level. Therefore important functions such as seed dispersal, pollination and seed predation may be disrupted (Robinson, 1996), which may impact on human activities, for example by preventing regeneration of timber species. There is, however, little information on the relationship between timber species and game animals, which could be a powerful argument for reducing bushmeat consumption in timber concessions.

The effect of removing trees that provide food for bushmeat prey species is also not well known, but work by Greiser Johns (1997) and that in progress in the Iwokrama Project in Guyana suggest that logging is likely to be highly detrimental to the conservation of wildlife stocks.

Additionally, a decrease in prey populations could reduce the number of animal predators that a given area can support. For example, in south India the prey-base of tigers has been reduced in many areas, limiting tiger numbers (Mahusudan and Karanth, 2000). Such a reduction could also increase human/tiger conflict, and reduce the chance of long-term benefits for local stakeholders from ecotourism.

6.7.3 Pressures and shocks make the level of hunting unsustainable

There is growing consensus that the bushmeat trade is currently unsustainable. Species extinctions are likely and livelihood strategies dependent on the bushmeat trade are threatened. Most of the data are qualitative and based on human perception. For example, TRAFFIC's *"Food for Thought"* report (2000) found that hunters and consumers in Kenya had noticed a decline in wildlife populations and volumes traded, and an increase in prices. Time series data on prices, quantities hunted, and returns to hunting effort have not been collected in a systematic way.

The line between hunting for personal consumption and for sale has become blurred, and in many areas any extra meat that is generated from a hunt is sold. Money rather than food is increasingly the prime motivation for hunters (Hart and Hart, 1986; Wilkie *et al.,* 1992; Vanwijnsberghe, 1996). With the high demand for bushmeat there are an increasing number of professional/commercial hunters (Fa 2000). The

hunting pressure throughout the region is intensifying from what was already unsustainable in many areas.

The apparently increasing unsustainability of the bushmeat trade appears to have been caused by the combination of gradual pressures and shocks over the past several decades.

Technology 'shocks'

Several changes in hunting technology have occurred that have had an impact on the effectiveness of hunting effort, how discriminatory that effort is in terms of species caught whether deliberately or not, and the amount of waste. Steel snares are increasingly replacing those made from natural materials such as vines. In Gabon steel snares are imported (illegally) exclusively by a majority-owned company (Hammond, 1997). Traps are indiscriminate, cheap and easy to make. They tend also to be wasteful; the level of waste being higher in the dry season (Dethier, 1995; Muchaal and Nganjui, 1995; evidence from Dja) and further from the hunting base (Muchaal and Nganjui, 1995).

Hunters' access to guns is increasing, in part as a by-product of civil strife and in part because of the increase in the supply of ammunition and shotguns by professional bushmeat traders (Gadsby, 1990). The use of guns in place of snares could have a positive ecological impact because guns, unlike snares, permit an increase in discrimination over which species are killed, and can reduce the amount of waste. However, the increase in the number of guns has also resulted in an increase in indiscriminate nighttime hunting when jack-lights are available (Steel, 1994; Hammond, 1997). Gadsby and Jenkins (1992) suggest that, in practice, daytime shooting is just as indiscriminate as hunting with snares because hunters shoot anything they can and sell what they do not eat, and guns may be adding to, rather than replacing, traditional snares.

Different technologies target different types of animals. Bonobos in Democratic Republic of Congo are hunted exclusively with guns (Bowen-Jones, 1998), while *Cephalophus callipygus* is captured almost exclusively in traps (Bowen-Jones, 1998). Hence, changes in hunting technology might also be expected to change the pressures on different species. One technological advance has been reversed; the production of Chevotine cartridges, which made it possible to kill a gorilla with one shot, has been stopped after a campaign targeted against the manufacturer (Pearce and Amman, 1995).

Logging pressures

The increase in logging has had several effects on the bushmeat trade by:

- Increasing access for hunters because loggers build roads that go further into the forest, opening up new sources of wildlife that were not profitable to hunt when transportation and access costs were higher;
- Providing easier and quicker access for hunters into forests, such as Pygmies hitching into the forest on logging trucks in Congo (Bowen Jones, 1998);

- Facilitating transportation of bushmeat from rural to urban centres, using the logging trucks (Blake, 1994; Bowen-Jones, 1998);
- Encouraging human population migration (Wilkie, 1996);
- Introducing a new demand for animal protein. Logging companies may rely on bushmeat entirely as a source of protein, especially in more remote areas where substitutes, such as domestic animal protein, are not available (WWF, 1997).

Urbanisation

Increasing urbanisation has brought with it a higher demand for bushmeat. Bushmeat is often a preferred source of protein for urban dwellers.

Shocks from other sectors

The bushmeat trade in West and Central Africa is affected not only through direct shocks but also shocks to other sectors of the economy. For example, when men lose livelihood opportunities they may return to rural areas and take up hunting for subsistence and/or income generation.

In short, most of the recent shocks and trends appear to have made the bushmeat trade more unsustainable:

- Increased capitalisation of the trade;
- Increased access to bushmeat (reduced transportation costs) as logging has increased;
- Increased demand for bushmeat from urbanisation and new logging communities;
- Negative shocks to the rest of the economy have a knock-on effect.

6.7.4 Economic value and volumes along the commodity chain are under-studied

The proportion of bushmeat traded rather than consumed locally is under-studied. The few studies that have been undertaken suggest that the data will be location specific. Although typically much bushmeat is traded as a commodity, King (1994) found that in Bakossiland in west Cameroon most bushmeat is consumed locally by the hunter's family and neighbours. Wilson and Wilson (1991) followed the commodity chain in south-west Congo and found that 50% of captured animals were sold at the main markets.

Similarly, few studies have explored the returns to bushmeat along the commodity chain. Gally and Jeanmart (1996, reported in Wilkie and Carpenter 1999a) calculated the value added along the commodity chain for three monkeys. The hunter's profit was 30%, the trader 19%, and the chop bar owner 21%. In general, the share of profits along the commodity chain will in part be determined by which group has market control and can set prices. In this example, no one group appears to have market control.

6.7.5 **Existing policy and institutions have proved to be ineffective in managing the bushmeat trade in a sustainable manner**

Policy framework

With very few exceptions, the existing policy and legislative frameworks of the range states are unconducive to sustainable management of natural resources, bushmeat included.

The bushmeat sector suffers from major policy and market failures in that its price on the market fails to acknowledge the scarcity of the resource and the (potential) cost of its replacement, and no policies exist to correct for these deficiencies. Not much has been written on these failures as they apply to bushmeat, although they have been well documented for the timber industry (Repetto and Gillis, 1988; Barbier *et al.*, 1991; Richards, 1999) and for other aspects of wildlife management, such as the ivory trade (Swanson and Barbier, 1992; Hutton and Dickson, 2000).

These failings reflect the marginalisation of bushmeat from the arenas of both international and national decision making. While the centrality of bushmeat to many developing country economies is now widely documented (Asibey, 1974; Anadu *et al.*, 1988; Asibey and Child, 1991; Brocklesby and Oji, 1998; Eves, 2000; Fa, 2000; FAO, 2000; Robinson and Bennett, 2000), and its nutritional and commercial importance is not in doubt, the topic suffers in international environmental arenas from its association with illegality, and is rarely acknowledged at the level of national financial planning and statistics (Asibey and Child, 1991). Only in Ghana has there been an attempt to correct this (*ibid*) although even there the statistics are inadequate (World Bank, 1998). Given the unpropitious international context, range state governments are unlikely, without encouragement, to seek to correct this deficiency.

The legislative dimension: property rights in bushmeat

Most of the major bushmeat producing nations inherited their basic legal frameworks from francophone colonial regimes (France and Belgium). In this system tenure of land, trees and forest products resides in the state not the local community, except in those rare cases in which land has passed into private freehold ownership (less than 1% of land area in Cameroon).

Outside the francophone countries the situation varies somewhat. Liberia is similar to the ex-French territories in that the state has appropriated all land and forest resources. Except for occasional blanket bans (such as that imposed in the late 1980s in the latter years of the Doe Government), subsistence and commercial hunting and gathering of non-timber forest products (NTFPs) on state lands is tolerated, usually without sanction, although timber resources are entirely the property of the state. In Sierra Leone a distinction exists between community land, which is held in customary tenure under the ultimate authority of the Paramount Chief, and forest reserves, where the state is custodian of the land, and farming, timber felling and commercial hunting rights are controlled by legislation. In southern Ghana most rural lands and trees are ostensibly owned by the landholding communities as represented by the traditional (stool) chiefs, although the reality is less encouraging than might be assumed because

forest resources are largely vested in the state in trust for the nominal owners. Forest reserves are managed, on the basis of statute, by the Forestry Commission on behalf of the Government, although 'owned' by the landholding communities (Kotey *et al*., 1998). The weak levels of property rights in forest resources, including wildlife, in the francophone territories have a number of negative effects. For example, at the level of forest residents:

- They have no authority to restrict external access to local resources, specifically the exploitation of game by 'outside hunters';
- Lacking secure property rights in the resources they exploit, rural dwellers have little incentive to adopt long-term strategies for their management;
- Their decision-making tends, therefore, to be short-term and opportunistic, maximising whatever rents they are able to pick up on the basis of minimum effort (this tends to apply both to natural harvests and to relations with, say, timber operators).

As concerns government strategy:

- The laws concerning land use that are on the statute books tend to be heavily control-oriented, with little concession to user rights;
- Thus, interventions in the sector have tended to favour punitive 'fines and fences' approaches, that are more concerned with punishing transgressors than with accommodating existing realities or promoting sustainable use.

The fact that governments have often adopted, with little if any modification, the wildlife and forest management laws and regulations of their former colonial rulers contributes to the low levels of national ownership, and diminishes the laws' effectiveness.

In most cases, there are few if any controls, *de jure* or *de facto*, on subsistence use of wildlife, although commercial use is nominally subject to licensing, as is control over most firearms. In some cases (e.g. Cameroon) rights of subsistence use have been reasserted in the latest forest law (1994). Species are nominally classified by level of protection, with commercial exploitation rights varying from complete protection to unrestricted (though probably licensed) use. Licensing laws are often more or less inoperable, however, because the fees are too high to be paid easily by the rural people and are bureaucratically cumbersome. Licensing authorities tend to be located in the major urban centres, far from the exploitation zones, to target the literate, and to offer permits for short-term exploitation only (maximum one year). Where control over licensing has been decentralised officials are often unaware of their duties (World Bank, 1998). It is little exaggeration to say that the sole function of most licensing regulations is to increase the opportunities for rent-seeking behaviour of government officials.

Ecosystem management

In most countries (Ghana is a partial exception) attempts at ecosystem management focus on the creation of protected areas of various classes, most of which either preclude any form of exploitation or severely restrict local access. The primary

interest of the host governments has tended, in recent years, to be the achievement of the international targets for protected area coverage set by the international conventions, environmental agencies, and NGOs, not to effectively secure their boundaries or (still less often) to develop a land use policy that has genuine local support. This approach has been encouraged by the fact that the rural lands in question are largely under state ownership and have a low, often negligible, market price. Bringing them under nominal protected area status implies few costs for the relevant governments.

Opinions vary as to the effectiveness of the existing protected area strategies (Brandon and Wells, 1992). With the exception of some of the forest reserves in Ghana (which have been locally valued because of their environmental functions in support of the cocoa crop), most protected areas in West and Central Africa are widely viewed as little more than 'paper parks'. However, one recent survey (which is pan-tropical in its focus) presents a more optimistic assessment, at least from the ecological perspective (Bruner *et al.*, 2000). Notably, however, even this study questions the effectiveness of most parks from the point of view of hunting controls.

Other controls on wildlife exploitation

Most attempts to control any form of natural resource use in the situations typical of West and Central Africa are hampered by the weakness of forest authorities and the very limited controls exerted over field personnel. Forestry Departments tend to be weak and under-funded (for example, less than 10% of the operational budget of MINEF, in Cameroon, is ever received by the ministry's core line staff), and marginalised within the decision-making structures of the government.

This situation reflects the power of the forest industry. There are often strong links between the industry and the political order (particularly in election years), and there are allegations that governments have been 'co-opted' by the industry. Forest ministries and departments often overlap or conflict with environmental protection agencies, and are poorly integrated with other cognate departments and ministries. Field staff are few and far between, underpaid and lacking in mobility. They often have little control over the forest industry, and it may often be easier for them to ignore regulations in return for financial rewards.

The ever-present danger in such situations is that any attempts to introduce new controls on resource use are more likely to function as means by which government officials can extract rents from local users than as means to improve the management of the resource.

Where governments have attempted to institute controls over hunting and bushmeat, these have tended to be of a punitive character. While they may be palliative as emergency measures, they are unlikely to lead to major changes of behaviour in the long-term. Cameroon's *"Plan d'urgence de lutte anti-braconnage"* (anti-poaching strategy, 1999) is a case in point. Implemented under pressure from the international community, and heavily weighted to policing operations at key communications points (major roads, railways, lorry parks and railway stations, and airports), it does

little to address the demand side and is unlikely to be sustainable once the initial enthusiasm has worn off.

Legislation for community co-management

In recent years, there have been a number of attempts to create a legislative framework for local involvement in forest management. Most of these have been externally driven and hence have lacked local legitimacy and champions. Egbe (2000) studied the implications of Cameroon's 1994 Forest Law for wildlife management. He is highly critical of this Law, as drafted, and casts doubt on its usefulness as an instrument of policy. He notes:

- The law is excessively focused on so-called 'traditional hunting' rights, the products of which can only be used for subsistence and cannot form the object of *any* commercial transaction (he comments "a law which makes the most common form of conduct illegal is itself an instrument of indiscipline and serves neither the interests of the State nor… the communities");
- The procedure for acquiring 'community hunting zones' (CHZ) is unclear, under-formulated and open to abuse;
- Priority for awarding CHZ is based on physical proximity, although this may not be the basis of existing claims;
- The law lacks clarity on who the members of such a 'community' might be (it is particularly problematic in relation, for example, to itinerant groups such as pygmies, although the interest of 'strangers' is also unclear);
- The maximum area allowed, 5000ha, is inadequate for effective wildlife management;
- The requirement that any proposed zone is free from any other exploitation title is likely to render the law inoperable;
- Provisions for community benefits from wildlife management lack coherence and are also doubtful on practical grounds; they focus more on the redistribution of tax revenues than on changing the behaviour of harvesters;
- Local government authorities are marginalised under the provisions of the law, which is likely to be perceived by local populations as the brainchild of external projects and NGOs.

The Wildlife Sector is increasingly the focus of international support efforts, although the legislative dimensions tend to be neglected. For example, World Bank support to Ghana (1998 - present) focuses on organisational and managerial changes in the Wildlife Department, preparation of park and reserve management plans, and implementation of a conservation awareness programme, without any inputs at legislative level.

6.7.6 There are very few effective management models in place

If the institutional and legislative dimensions are poorly represented in the African literature, the same may be said of models for wildlife management. Community

involvement in wildlife management is widely held to be desirable (Auzel and Wilkie, 2000; Eves, 2000; Fa, 2000). The grounds for this are almost the same as those for community involvement in any form of forest management (Brown, 1999). For example:

- *Proximity:* local populations are the immediate custodians of the resource and best placed to ensure its effective husbandry;
- *Equity and livelihoods:* bushmeat figures strongly in the livelihoods of rural populations of the range states, particularly the poor; they are thus important stakeholders in its management. The community-level benefits are central to the justifications for sustainable management;
- *Capacity and cost-effectiveness:* bushmeat producer areas tend to be large and distant from major administrative centres, and the relevant government departments tend to be severely understaffed; there is little choice but to involve those who reside in such areas in their management;
- *Knowledge:* hunters can be expected to have detailed knowledge of the resource and its habits. Given the dearth of detailed knowledge of the biology of the resource, the hunter's knowledge is likely to be of central value to improved management;
- *Practicality and impact:* there is little prospect of improved management if the major users are excluded from participation.

However, there are several constraints on increasing community involvement in forest areas, even where (as is rarely the case) the necessary legislative framework exists:

- Lack of clarity as to the identity of the relevant ‘community’;
- Linkage between wildlife and other aspects of natural resource management, such that governments are unwilling to make sufficient concessions on the former that will affect their own claims over the latter;
- Ambiguity of the legislative framework, particularly as regards the definition of ‘communities’;
- Low population densities and large area coverage required for control of wildlife, leading to high transaction costs of management;
- Weak and contested local institutions for natural resource management;
- Competing claims over land and other resources;
- Permeation of local politics by externally-based elites; while this often has positive aspects, it also leaves many opportunities for abuse;
- Lack of controls on population movements and settlement;
- The hostile profile of many environmental agencies (governmental, international and NGO), resulting in unwillingness to participate in co-management experiments.

The fact that the areas with the highest populations of forest game tend to be those with the lowest populations of humans poses numerous difficulties for forest

management. Historically, such areas have tended to be 'stateless' (i.e. lacking in the political structures of the [pre-colonial] state), and to constitute congeries of small independent ethnic groups, with localised identities and distinctive languages. This is the case as regards West African refugia (Sierra Leone-Liberia-Ivory Coast), and much of Central Africa. As a result, there tend also to be few viable institutions for natural resource management at any but the lowest levels, and those that do exist are often lacking in binding authority. The higher the level at which collaboration is sought, the more likely are inter-community conflicts. Transaction costs for any form of resource management are likely to be high, both on the grounds of low ratios of human population-to-resource area, and on the grounds of the social conflicts that need to be resolved (see Sharpe, 1998).

Traditional methods of management

Whether, in former times, local communities ever effectively managed wildlife in the core producer areas is a theme in the literature. Assumptions to this effect tend to underwrite the view (referred to as the 'ecologically noble savage' approach by its detractors) that all that is needed is to reassert pre-existing forms of community control. While some authors have strongly supported this approach (e.g. Western and Wright 1994), there is a counterview that, in Central Africa at least, rules were often minimal, and that, even where such systems did exist in the past, there is no guarantee that they will work in the future.

Resettlement of migrants

An added difficulty is that forest areas often have a frontier character, functioning to resettle migrants from over-populated zones. While this has to date been a limited problem in the moist forest areas of Central Africa (an exception being Cameroon's South West Province, Sharpe, 1998), it is a live political issue in Ivory Coast and Ghana (Brown, 1999). Even in Central Africa, however, migration and itinerance in forest areas has implications for management (Giles-Vernick, 1999). By and large, post-colonial governments have been very reluctant to intervene to restrict population movements within their territories, fearing that this will unleash tribal forces inimical to nation building. To a significant extent, such attempts as have been made in recent years to achieve this stabilisation have been left to environmental projects and NGOs, despite major questions as to the legitimacy of their mandates so to do.

Several potential management approaches have been documented

The most successful and well-documented cases of wildlife management in Africa come from the dry savannah zone in the south, rather than the Guinea-Congolese forest zone. These are summarised below but Appendix 4 gives more details of these approaches.

<u>CAMPFIRE</u>

The best known is 'CAMPFIRE' ('Communal Areas Management Programme for Indigenous Resources') in Zimbabwe (Mofson, 2000). This model has limited direct relevance in the present context for the following reasons:

- The tenurial context is much more favourable;
- There is a broad national constituency in Zimbabwe in favour of sustainable use;
- The savannah zone is more propitious for game management and harvesting;
- The tourism potential is much more favourable.

Caprivi strip and ADMADE

Rather similar approaches are being developed elsewhere in Southern Africa, such as the Caprivi strip of Namibia, studied by Ashley (2000), and the ADMADE programme, which offers incentives for wildlife management in Zambia (Clarke, 2000; Gibson and Marks, 2000). Most of these incentives are based in areas with significant tourist potential (Ashley and Roe, 1998). These are not without interest in the present context, although there are concerns:

- There is a danger of their over-enthusiastic adoption, on the assumption that, at some unspecified future date, tourism will be able to provide the returns needed to sustain the approach;
- The time frame for this is likely to be very long indeed;
- It is most unlikely that tourism will feature systematically in the management of hunting in the Central African forest zone, within the next decade.

Other options outside the savannah region

Outside of variants of the savannah community-hunting model, options are rather limited. Attempts to manage bushmeat hunting have hitherto been largely focused on limited controls on inputs and efforts. In the conditions that pertain in Central Africa, few of these have been successful.

Very few instances exist in the literature of the active management of bushmeat harvesting and sale, and those few examples that do exist are generally too recent to allow for meaningful lesson learning.

- ***Mount Cameroon Project***

  The DFID-supported Mount Cameroon Project is one example that is attempting to control hunting and sales in Cameroon's South West Province (Acworth *et al*., 2001; Olsen *et al.*, 2001). Some successes have been reported in controlling hunting volumes, and wildlife sightings are said to be on the increase. On the other hand, it has not yet been possible to control outside hunters, and there is a question mark over the cost-effectiveness of control efforts, given the depleted state of the game stocks.

- ***Duiker ranching***

  Elsewhere in the sub-region, management models have figured more as theoretical propositions than established fact. Fimbel *et al.* (2000), for example, consider the management implications of their findings on hunting levels in the Lobéké Region of South East Cameroon, where both blue and red duikers are being harvested at rates far in excess of the likely sustainable levels. Noting the restricted options for

effective management in local conditions, given the limited knowledge on the biology of the species harvested and the modest means of the DFAP (the national wildlife agency), the authors favour adoption of an area-based management approach.

- ***Source-Sink***

Spatial harvest theory developed by McCullough (1996) advocates division of areas under management into hunted and non-hunted (protected) zones ('sinks' and 'sources'), with animals moving without restriction between the two (see also Novaro *et al*., 2000). A generous estimate of the latter area relative to the former allows wide potential margins for over-harvest, and acts as a counter-balance to the lack of biological knowledge. The proximity of a sink to areas that may be able to replenish stocks may allow densities of some hunted species to recover or remain high (McCullough, 1996; Novaro, 1999; Bodmer, 2000; Fimbel *et al*., 2000). Much is likely to depend on the social structure of the species involved.

- ***ECOFAC***

Similar approaches to land-use zoning are planned by the ECOFAC project in the buffer zone around the Ngotto Reserve, in Central African Republic, and in a logging concession in Gabon, under a project of the University of Gembloux and WWF. A third instance is possibly the IUCN project in the Dzanga-Sangha Dense Forest Reserve in the Central African Republic, although this case has yet to be fully researched.

- ***Approaches outside Africa - RCTT***

A comparable approach has been well-documented by Bodmer and Puertas (2000) in the Reserva Comunal Tamshiyacu-Tahuayo (RCTT) in Norht East Peru. Initial findings suggest that community-based co-management is improving conservation prospects in the RCTT, although different species may require different management responses. Large-bodied species such as tapir are particularly vulnerable, although its high market value may limit the options for the successful imposition of management controls. Expansion of the relevant source area may be the only viable option.

Alternatives to hunting have been proposed

Aside from the active management of wild bushmeat harvesting, three management strategies are popular in the literature. These are captive breeding of wild animals, wild fish harvest and the search for substitute animal protein, from domesticated species. One or other of these alternatives has often figured in aid-funded 'integrated conservation and development projects', implemented as a way of 'selling' conservation goals to local forest dwellers (Brown, 1998).

Captive breeding schemes

Several authors advocate captive breeding of game species as a possible way to satisfy local demand without compromising the wild stock (Auzel and Wilkie, 2000; Bennett, 2000; Fa, 2000). This has obvious attractions where bushmeat fetches a high price

(e.g. Asibey and Child, 1991), and it could lead to reduced demand for wild-caught specimens. However, there is evidence that the major species with potential for domestication have long since been discovered, and there are doubts as to whether the targeted wild species have (or can be bred so as to develop) the behavioural and reproductive patterns conducive to domestication. Terborgh *et al*. (cited in Smythe, 1992), for example, view "the concept of raising wild animals in captivity as well intentioned but without adequate biological basis".

Fishing

Several authors have noted the significant freshwater fish stocks that exist in many bushmeat source areas and question why these are not more extensively exploited (Redford and Robinson, 1987). Some authors are of the view that the preference for hunting over fishing is largely cultural, and indicative of some kind of irrational preference for meat on the part of hunting communities. No studies have been unearthed for this report that address the decision-making issues involved. However, from what is known of peasant livelihoods in forest areas in general, it seems likely that the underlying causes are more economic than cultural, and that the preference for bushmeat is quite rational.

Fishing does tend to become more attractive when human population densities increase to the point where returns to farming and hunting decline appreciably (see Boserup, 1966), although this prospect is probably quite far off in most bushmeat source areas.

Substitution of farmed meat

There is an emerging debate in the literature as to whether the fundamental drivers of the bushmeat trade are economic or cultural. With regards the former view, the public preference for bushmeat is based on its competitive price so that an appropriate conservation strategy would be to flood the market with low-cost domestic animal protein (this proposition is currently being researched by Wilkie, 2000). There is some evidence to support this view, but there is also evidence of a cultural preference for bushmeat, leading to willingness to pay a price premium (Asibey and Childs, 1991). These two propositions may be reconcilable to the extent that there is a likely change in consumption preferences as bushmeat increases in scarcity; as the price rises the market switches from basic nutrition for the urban population to a luxury food item.

Attempts to substitute farmed domestic species have not met with success. This does not necessarily preclude the option of using domestic livestock rearing as a means to better conserve wildlife, although it does warn of the complexities of the endeavour, particularly from the perspective of rural livelihoods.

6.7.7 There are significant gaps in the literature

Although there already exists a substantial and growing literature on the classification of the bushmeat resource and its ecological characteristics, much of this has concentrated on the nature of the off-take rather than its effects on the ground. On the

socio-cultural side the literature lacks detail on the socio-economic structure of the trade and the dynamics of the demand for bushmeat, whilst the development of management models for the sustainable exploitation of bushmeat is inadequate.

Thus, there is a need for more targeted research on the biological consequences of the trade, and in-depth usage of the perspectives of social science and development management in setting the direction of future solutions and research.

Annex 1: Key organisations and projects within West and Central Africa:

Non-governmental organisations

- *African Wildlife Foundation (AWF)* – working on bushmeat issues in Rwanda, Democratic Republic of Congo and Uganda, with WWF and Fauna & Flora International;
- *Conservation International (CI)* – working in Cote d'Ivoire and Ghana;
- *Fauna & Flora International (FFI)* – working on projects that involve bushmeat off-take mitigation in Afi Mountain (Nigeria), Liberia, and the International Gorilla Conservation Programme, in Rwanda, Democratic Republic of Congo and Uganda, with WWF and AWF. They have also provided technical support to ECOFAC;
- *Mount Cameroon Project (MCP)* – a DFID-supported project attempting to control hunting and sales in Cameroon's South West Province;
- *Vétériniares Sans Frontières (VSF)* – trying to develop small livestock breeding schemes as alternatives to bushmeat consumption;
- *Wildlife Conservation Society (WCS)* – have an extensive research programme in the region, and are now working on an NGO/logging company partnership in Congo to try to reduce hunting;
- *World Wide Fund for Nature (WWF)* – engaged in various projects that include mitigation of bushmeat hunting, for example at Korup (Cameroon) and in Gabon.

Multinational projects and organisations

- *CITES* – the Convention on the International Trade in Endangered Species, to which most range and donor nations are signatories, controls the international trade in certain species, which it lists under its various Appendices. Through the newly formed CITES Bushmeat Working Group, composed of several West and Central African nations, plus selected NGOs and sponsored by the UK government, CITES is now becoming involved in relevant aspects of the bushmeat trade.
- *ECOFAC* – an EU project working in six Central African countries, centred on protected areas. This has previously been research focussed although, in its current phase, it is developing adaptive management techniques. These are focussed around Protected Areas including Dja in Cameroon, Odzala in Congo, and Monte Alen in Equatorial Guinea.

Advocacy groups from outside the region include:

- *Ape Alliance* – is a coalition of UK NGOs that work on ape-related issues. Their Bushmeat Working Group was formed to focus on the bushmeat issue and how it impacts on the great apes, with a remit of increasing the profile of this problem and promoting actions to mitigate it.
- *Bushmeat Crisis Taskforce (BCTF)* –is a coalition of north American NGOs working on policy aspects of the trade, and coordinating certain member actions from their base in the US.

Annex 2. Primate species mentioned in 'carcass data' with their respective threat categories.

Data from Anstey (1991), Bennett Hennessey (1995), Boussougou (1994), Dethier (1995a), Fa *et al.* (1995), Malonga (1996), Steel (1994), and Vanwijnsberghe (1996)

Common name scientific name	**Status**
Family: Galgonidae	
Elegant needle-clawed galago *Galago elegantulus*	Lower Risk: near threatened
Allen's squirrel galago *Galago alleni*	Lower Risk: near threatened
Demidoff's galago *Galagoides demidoff*	
Potto *Perdicticus potto*	
Family: Cercopithecidae	
Sooty mangabey *Cercocebus atys*	Lower Risk: near threatened
Crested mangabey *Cercocebus galeritis*	Lower Risk: near threatened
White-collared mangabey *Cercocebus mitis*	
Grivet monkey *Cercopithecus aethiops*	
Campbell's monkey *Cercopithecus campbelli*	
Moustached monkey *Cercopithecus cephus*	
Diana monkey *Cercopithecus diana*	Vulnerable (A1c+2c)
Red-eared monkey *Cercopithecus erythrotis*	Vulnerable (A1c)
Mona monkey *Cercopithecus mona*	
De Brazza's monkey *Cercopithecus neglectus*	
Greater White-nosed monkey *Cercopithecus nictitans*	
Lesser spot-nosed monkey *Cercopithecus petaurista*	
Crowned monkey *Cercopithecus pogonias*	
Preuss's monkey *Cercopithecus preussi*	Endangered (A1cd+2c)
Sun-tailed guenon *Cercopithecus solatus*	Vulnerable (B1+2a,C1)
Guereza colobus *Colobus guereza*	
Black and white colobus *Colobus polykomos*	Lower Risk: near threatened
Black colobus *Colobus satanas*	Vulnerable (A1c)
Patas monkey *Erythrocebus patas*	
Grey-cheeked mangabey *Lophocebus albigena*	
Drill *Mandrillus leucocephalus*	Endangered (A1acd+2cd, C1+2a)
Mandrill *Mandrillus sphinx*	
Olive baboon *Papio anubis*	
Red Colobus *Procolobus badius*	Lower Risk: near threatened
Pennant's Red Colobus *Procolobus pennanti*	
Family: Hominidae	
Gorilla *Gorilla gorilla*	Endangered (A2cd)
Pygmy Chimpanzee *Pan paniscus*	Endangered (A2cd)
Chimpanzee *Pan troglodytes*	Endangered (A2cd)

Species are listed alphabetically by scientific name, under their respective families. Both scientific and common nomenclature follows Kingdon (1997) and threat categories are taken from the IUCN (1996) Red List.

Annex 3. Estimating biological sustainability

The main method of assessing sustainability comes from a formula, developed by Robinson and Redford (1991), that gives an estimate of optimum sustainable harvest, which can then be compared with actual harvest rates.

The key variables on which the estimate of optimal harvest is made are:

1. *Maximum population increase* – the maximum number of offspring that an individual can produce in a year

2. *Population density* – the number of animals per given area

The figure generated gives the maximum production at the densities involved. The number of animals that can be harvested per unit area per year is only a percentage of this figure. It is usually estimated as 20% of the maximum production for long-lived, 40% for short-lived, and 60% for very short-lived species (Robinson and Redford, 1991).

What are the assumptions involved in this assessment?

There are a number of assumptions that underlie this, the most commonly used method of assessing sustainability of off-take.

1. The percentage that can be harvested per year is based upon an arbitrary division of species into the different age categories and the idea that long-lived species annual mortality is low, and thus there is less to exploit from what would be 'natural wastage', and vice versa with short-lived species.

2. Maximum productivity is assumed to occur at 60% of the *carrying capacity* (the number of animals a given habitat naturally supports) because slightly lower densities of animals allow higher rates of reproduction through reduced competition, etc. (*density dependent* effects).

How confident is the assessment of unsustainability made using this method?

The results of this method of assessing optimum sustainable harvest reflect a best-case scenario. If the rate of population increase is *density dependent* then it is likely to correlate well with the model's prediction. However, accurate biological data from many species are lacking. Robinson and Redford developed their model for Neotropical ecosystems where this was a problem. It is even more problematic for much of West and Central Africa's little known fauna. For example, maximum reproductive rate is often taken from zoo data (which may vary from rates in the wild), and density estimates generated in the field often vary widely. In addition, population densities have been shown to vary widely with differing habitat (Peres, 2000), and data on this variation within the region are very limited.

The model is therefore likely to generate optimum sustainable harvest figures above actual potential sustainable off-take – particularly because actual populations are often below 60% of carrying capacity to start with (Robinson and Redford, 1991).

When figures of *actual harvest* are generated for comparison with the optimum they are often an underestimate because:

- Data are often from commercial markets, which do not include village consumption (Fa, 2000);
- There are high levels of wastage (meat rotting before it can be smoked or consumed) that occur when snaring (Muchaal and Ngandjui 1995, Noss 1998, Muchaal and Ngandjui 1999).

All of these calculations are based on local productivity. At a macro level Novaro *et al.* (1999) showed that dispersal could be a key element in recovery of animal populations. The authors described models that included the effect of *sources* of wildlife in evaluation of hunting sustainability.

The comparison of *optimal sustainable harvest* with *actual harvest* rates is a conservative way of determining whether off-take is *unsustainable* (Robinson and Redford, 1991, Slade *et al*.1998).

7. APPENDIX 2: THE FISHERIES SECTOR AS AN EXAMPLE OF A POSSIBLE MANAGEMENT TOOL FOR BUSHMEAT

The fisheries sector has a number of aspects in common with mammal hunting for the bushmeat trade; this too is a sector that has suffered from over-harvesting (to a point where some commercial stocks have already collapsed and their very biological survival is in doubt). Like bushmeat, the crisis in fisheries has complex dimensions:

- *ecological* (regarding both fish ecology and wider ecosystem functions);
- *economic* (regarding incentives to improved management);
- *social* (a tendency to allow powerful economic interests to take precedence over the social interests, leading to a major decline in the living standards of fishing communities, particularly at the small-scale, non-industrial end of the spectrum).

Like bushmeat hunting, improved management confronts a number of major difficulties:

- High levels of biological uncertainty as to stocks, flows and sustainable harvest levels;
- Conflict between the need for sustainability and social and economic priorities;
- Poorly defined objectives and competition between interested groups;
- Institutional weaknesses relating to the definition of access rights and user participation in management (hitherto, property rights have been dominated by 'open access' regimes and by attempts of governments to define priorities in a top-down way);
- Complexities in management arrangements and goals, making it difficult to identify and agree on clear causes and solutions.

Of particular interest in the present context are the eight principles of fisheries management identified by Cochrane (2000). These are compared for their relevance to bushmeat management.

Table 3. Principles of effective fisheries: Potential relevance to bushmeat management

1.	Stocks are finite, and production constrains yield.	The same biological limitations apply to bushmeat.
2.	Biological production is a function of stock and environment, affected by natural and human factors.	The same is true for other taxa e.g. mammals.
3.	Human demand is in conflict with maintaining low risk to the resource as technology and demand increase.	These are the reasons that bushmeat hunting is increasing.
4.	In a multi-species fishery it is	Bushmeat management is a multi-species

	impossible to maximise yield of all species simultaneously.	problem and could suffer from the same problems. Much depends on selectivity, depending on the technology used. Snares are the least selective, nets fairly unselective, and guns theoretically offer more choice.
5.	Uncertainty in management hinders decision-making, the more uncertainty the more caution is required.	Biological uncertainty is a problem in setting up theoretical limits for bushmeat hunting. The amount of data that is available to fisheries is much greater, and yet quota setting has proved notoriously inaccurate. Thus, the *precautionary principle* must be used in future bushmeat management scenarios.
6.	Short-term dependency will determine the priority of social / economic goals in relation to sustainable use.	This is the case with bushmeat management if livelihoods are central, as suggested by requirements of equity.
7.	Ownership and long-term stakes are most conducive to responsible fisheries.	The same is likely to be true in setting up systems for long-term sustainable off-take of bushmeat, e.g. community hunting reserves around agreed source areas.
8.	Genuine participation by informed users has positive effects in identification of best management systems and compliance with the law.	For sustainable solutions to over-usage of natural resources this type of participation is a necessity. For example, past experience of protected area design without informed involvement from local stakeholders has often led to hostility and suspicion towards conservation objectives.

Cochrane (2000) argues that failures in fisheries management have arisen largely because one or more of these principles have been overlooked for political reasons, not because their importance has not been known. To improve the quality of management he proposes a clear sequence of decision-making responsibilities, which would translate policy objectives into operational rules. His arguments can be linked up with other aspects of the literature on fisheries management that are also of potential interest for bushmeat management. The literature on ITQs is one such body of knowledge (Munro and Pitcher, 1996; Davis, 1996; Inamdar *et al.*, 2000).

Interesting as this case study is, it is as well to bear in mind some of the ways in which it differs from that of bushmeat, for these may also give clues as to the way forward in the latter instance. For example:

- Commercial sea fishing is capable of a much greater degree of centralisation than is the bushmeat trade;
- One of the major problems in fisheries is over-capitalisation (for example, in 1990, excluding the former Soviet Union [which was something of a special case]

operating costs of the global industry exceeded revenues by at least US$41 billion); this is not the major problem for the bushmeat trade (although militarisation is a problem);

- Failures in the fisheries sector have occurred despite massive investments in management on a national and international scale, which can rarely be said of bushmeat.

Suffice it here to note that this looks to be a promising source of comparative data, particularly in view of the dearth of sector-specific models for bushmeat management.

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