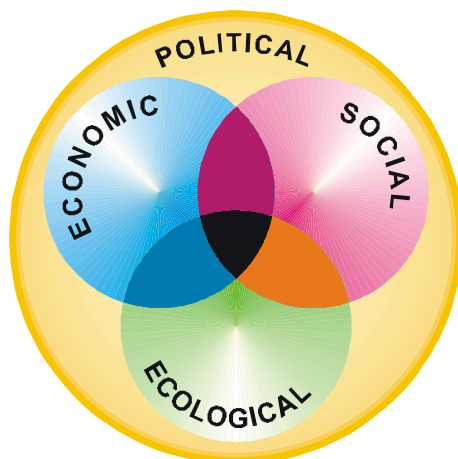


Southern Africa Sustainable Use Specialist Group



FROM SUSTAINABLE USE TO SUSTAINABLE DEVELOPMENT

Evolving Concepts of Natural Resource Management

Conceptual Framework of the
SASUSG Working Group on Sustainable Development

November 2009

Scribe: Rowan Martin

PREFACE

Sustainable development is difficult to achieve because of –

POVERTY

Poor people who are unable to organise themselves collectively
will overexploit their resource base in order to survive

GREED AND CORRUPTION

Where people fail to cooperate for the greater good of their own societies,
the field is open for individuals to use resources unsustainably for their personal gain

PERVERSE INCENTIVES

Laws and policies which promote or protect single uses of land or species at fixed scales
prevent the adaptation and innovation needed to derive wealth sustainably
from natural resources over larger landscapes

WRONG MODELS OF THE HOW THE WORLD WORKS

Failure to appreciate the complex nature of social-ecological systems
results in an undesirable and inflexible approach to development where
'best practices', 'greater efficiency' and 'optimal yields' are seen as essential objectives

Based on: Walker & Salt (2006, final chapter – *Resilience versus Greed*), Beinhocker (2006, chapter 16 – *Organisation: A Society of Minds*), Berkes (2007, *Community-based conservation in a globalized world*)

FROM SUSTAINABLE USE TO SUSTAINABLE DEVELOPMENT

Evolving Concepts of Natural Resource Management

CONTENTS

Preface.	-ii-
BACKGROUND.	1
INTRODUCTION.	4
CORE CONSTITUENCY.	10
NATURAL RESOURCE MANAGEMENT REGIMES.	15
Private Property Regimes.	15
Private Individual Property.	15
Corporate Private Property.	15
Communal Property Regimes..	17
The State.	19
Regional Resource Management Regimes.	22
International Regimes and Policies.	23
OPERATIONAL IMPLICATIONS.	25
Sustainable Use Revisited.	26
Evolving approaches to implementation.	29
Lessons learnt from complex systems..	32
DISCUSSION.	33
REFERENCES.	50

APPENDICES

1: Empowering local communities to conserve and manage natural resources	35
<i>(Resolution adopted by the World Conservation Congress in October 2008)</i>	
2: Complex Systems	37
3: Matching Scales in Social Ecological Systems	43
4: <i>The Origin of Wealth</i> – Extracts from Eric D. Beinhocker (2006)	45

ACRONYMS

AHEAD	Animal Health for the Environment and Development
CAMPFIRE	Communal Areas Management Programme for Indigenous Resources
CBD	Convention on Biological Diversity
CBNRM	Community-Based Natural Resource Management
CCC	Convention on Climate Change
CI	Conservation International
CITES	Convention on International Trade in Endangered Species
EIA	Environmental Impact Assessment
IUCN	World Conservation Union
KAZA TFCA	Kavango- Zambezi TFCA
MDG	The Millenium Development Goals (UNDP)
NGO	Non-Government Organisation
RDC	Rural District Council (Zimbabwe)
SASUSG	Southern Africa Sustainable Use Specialist Group
SES	Social Ecological System
SSC	Species Survival Commission of the IUCN
SUI	Sustainable Use Initiative
SUSG	Sustainable Use Specialist Group
TFCA	Transfrontier Conservation Area
UNEP	United Nations Enviromental Programme
WSSD	World Summit on Sustainable Development
WWF	World-Wide Fund for Nature

ACKNOWLEDGEMENTS

Up until the stimulating meeting held in Xai Xai in July 2008, I referred to myself as the ‘author’ of SASUSG’s various drafts of sustainability principles: I have changed that term to ‘scribe’ or ‘writer’ because – for the first time – this work-in-progress has had the benefit of inputs from a number of SASUSG members. I thank all those people (listed in Footnote 7) who gave so kindly of their time and valuable experience at the Xai Xai meeting. I also thank David Cumming for discussions and comments on the first draft.

Written comments on the first draft of this document were received from Mike Jones, Fred Nelson and Liz Rihoy. Hopefully, these inputs have resulted in a much improved version of the original document.

MATTERS ARISING

Since its inception, SASUSG has been a strong advocate of devolution of authority over natural resources to the local peoples on whose land these resources occur. SASUSG has also diagnosed the poor performance of most community resource management regimes as lying in the inadequate devolution of such authority. Recently, this approach has been described as limited *“the tired mantra of aborted devolution”*. Instead, it is argued that SASUSG would be performing a more useful rôle if it *“acknowledged the central role of political context and encouraged analysts and implementers to understand power relations and the political landscape in their quest for better governance and socio-economic and political empowerment”* (Liz Rihoy, comments on the first draft).

SASUSG stands at some sort of cross-roads. Whilst the advocates of devolution would not disagree with the reality that political factors are of overriding importance in determining the success of community natural resource management, to date they have not placed sufficient emphasis on understanding the political minefield and have not been strategic in engaging with it. If the advocates of a shift in SASUSG’s academic thrust towards a greater understanding of the political landscape can be criticised, it is for a rather passive acceptance of the *de facto* realities of African politics – as if this is an immutable ‘given’ which sets the stage for all other activities.

Fortunately, some new insights are available to attempt a synthesis of the two approaches. Beinhooker (2007) examines the economic advancement of groups, businesses and societies around the world in terms of the extent to which people are able to cooperate with each other for their individual wellbeing and the greater good of their nations. Few would deny that Africa’s economic performance is below expectations and this could be diagnosed as emanating from difficulties in cooperation and cohesiveness amongst its peoples at scales varying from the village to the national level. In this second draft of the document a ‘discussion’ section has been added which addresses these issues. Understanding the fundamental causes is one thing – how SASUSG should plan its interventions to influence the *status quo* is another.

BACKGROUND

At its first meeting in Pilanesburg, South Africa, the Southern Africa Sustainable Use Specialist Group produced a set of ecological, economic and social principles for sustainable use (SASUSG 1995). These were written up in the form of a booklet *Sustainable Use Issues and Principles* which was distributed at the First World Conservation Congress in Montreal, Canada (SASUSG 1996). The booklet was redesigned and reprinted by the Namibia Nature Foundation for the World Summit on Sustainable Development in Johannesburg, South Africa, in September 2002 (SASUSG 2002). Much of what is contained in the SASUSG booklets went on to become IUCN Sustainable Use Policy under the Sustainable Use Initiative (SUI 1996 & 1998).

The Convention on Biological Diversity (CBD) developed its Ecosystem Approach in 1998.¹ From the outset, the Parties were insistent that sustainable use principles should be developed in accordance with the Ecosystem Approach. In 2003, IUCN's Sustainable Use Specialist Group prepared a set of principles for *Sustainable Use within An Ecosystem Approach* (CBD 2003),² most of which were incorporated into the Addis Ababa Principles and Guidelines for the Sustainable use of Biodiversity (CBD 2004).

In the 1990s SASUSG (and the SUI) was struggling for the recognition of sustainable use as a valid conservation tool.³ It is no longer fighting that battle. It should be well satisfied that its sustainable use principles, with some modification, form the basis for IUCN policy and have been incorporated into the major environmental treaty on biodiversity. However, it is not satisfied – time has moved on and new concepts have emerged.

Prior to the Tenth Meeting of SASUSG held in the Blyde River Canyon, South Africa, in June 2006, the Chair of SASUSG (Brian Child) had suggested that SASUSG should republish its original sustainable use principles. Several members demurred – arguing that if it were to be published again it would require updating and expansion.

-
1. The Ecosystem Approach (the Malawi Principles) were developed at a workshop held in Lilongwe, Malawi, in January 1998 sponsored by the Governments of the Netherlands and Malawi. The report was presented in May 1998 to the 4th Conference of the Parties to the CBD in document UNEP/CBD/COP/4/Inf.9. The writer participated in the workshop.
 2. The Principles [drafted by the writer] were submitted by the Executive Secretary of the CBD to the Fifth meeting of the CBD Subsidiary Body for Scientific, Technical and Technological Advice (SBSTTA) on 24 January 2003 (UNEP/CBD/WS-Sustainable Use/4/4) and used at four workshops on Sustainable Use of Biodiversity (UNEP/CBD/WS-Sustainable Use/4/INF/2). The fourth workshop held in Addis Ababa, Ethiopia, in May 2003 produced the set of principles adopted by the CBD in May 2004.
 3. e.g. For the 11th CITES Meeting in 1996, SASUSG produced a pamphlet titled *The Key Considerations for Sustainable Use of Wild Fauna and Flora* in response to the Humane Society's *Criteria for Assessing the Sustainability of Trade in Wild Fauna and Flora*.

The matter was discussed⁴ and the members identified a number of issues with which they were uncomfortable. The Meeting felt that sustainable use and conservation of biological diversity, in their treatment under the CBD and IUCN, are being considered within rather narrow confines. Both of these topics form no more than a subset of the larger principles affecting sustainable development and, without the reality check provided by the developmental needs of people, the present sustainable use principles would have limited application. They expressed the wish that the entire subject be re-examined and the writer was given the task of producing a first draft of new principles. A draft was prepared in October 2006 and presented to the SASUSG meeting held in Grootbos, Cape, from 1-5th May 2007.

In this First Draft (SASUSG 2006), the contributions of five authors were presented as background material to the principles⁵ and the number of principles was limited to seven. The CBD Addis Ababa Principles were strongly criticised as failing to solve the inherent conflict between the needs of development and conservation of biological diversity –

“Conservation of biological diversity is given primacy over both sustainable use and sustainable development in the Addis Ababa principles. Clearly, that this will not work. For development, some biodiversity will have to be sacrificed: a more pragmatic approach to the Principles would have acknowledged this. The Principles (and, perhaps, the Treaty itself) give the impression that all biodiversity, wherever it is at the moment, should be conserved. Moreover, it would seem that there is a fixed quota of biological diversity on the planet which can only be maintained or decline – the possibility that biodiversity can be increased under the correct suite of incentives is not considered.”

The review of the Addis Ababa Principles concluded that they are overly elaborate and prescriptive and do little to foster innovation and experimentation. The sheer unwieldiness and impracticality of the operational guidelines accompanying the principles would require a vast bureaucracy for implementation.

This First Draft was not put forward for adoption by the meeting – partly because the writer felt that further work needed to be done.⁶ The meeting agreed that a further draft should be prepared for the next SASUSG meeting. A Second Draft titled *Sustainable Development based on Natural Resource Management: The Development of New Principles for Sustainability* was prepared (SASUSG 2007) in which the list of Principles was expanded with a major emphasis on complex systems and communal resource management.

-
4. A joint presentation by Marshall Murphree and the writer was given to the meeting suggesting certain changes to and inclusions in the original work.
 5. Cumming (2005), Holling (2001), Murphree (2000), Parker (1993), Ruitenbeek & Cartier (2001)
 6. In particular, a wealth of material from Simon Levin's (1999) *Eight Commandments of Environmental Management*, Walker & Salt's (2006) concluding chapter *What would a resilient world be like?* and *Murphree's Laws* (Martin 2009) needed to be included.

A presentation based on this draft was given to a meeting of the global SUSG in Florida in July 2007. In the debate which followed it became apparent that there was a major divergence between the SUSG approach to sustainable use and that of SASUSG. The SUSG focus was on the use of single species; it endorsed the Addis Ababa Principles; it was attempting to develop indicators for sustainability and it was largely uninfluenced by complex systems science. SASUSG, on the other hand, was more interested in the broader issues of land use and sustainable development; saw the future as one where uncertainty was the order of the day and where adaptability and innovation would become increasingly important in the face of major change; and identified its core constituency as small-scale rural farmers where greater devolution of rights over land and resources was needed for them to develop resilience.

The same presentation was shown at the SASUSG AGM held at Didima, Cathedral Peak, KwaZulu (4-9th May 2008). It was suggested that the next stage was to prepare the document for publication as a SASUSG booklet but the writer argued that the work was still too much of a 'one-man show' and needed the focussed input of other members. The time to publish would be after the full membership of SASUSG had formally adopted the principles. It was agreed that a small working group could be convened to review the work and re-shape the document.

Accordingly, a small working group⁷ met in Xai Xai, Mozambique from 7-10th July to chart a direction for SASUSG's future outputs in this field. The working group felt that **SASUSG should continue to maintain a southern African focus and that the time had come to move forward with the transition from 'sustainable use' to 'sustainable development'**.

Sustainable use issues are rarely confined to closed, biologically defined systems. Sustainability in the use of any species is usually embedded in larger ecosystem sustainability and this, in turn, is embedded in larger social systems with cultural, economic and political dimensions. Issues of sustainability cannot be adequately addressed independently of these macrostructural components. (Murphree 1996b)

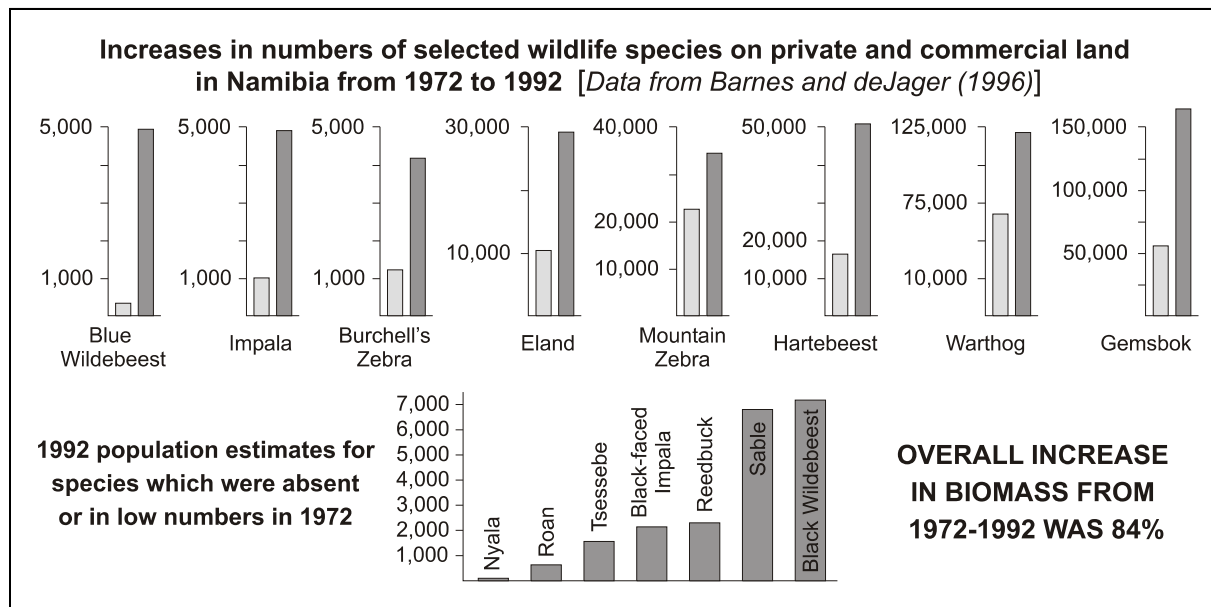
It was agreed to depart from the earlier intention to produce an updated set of 'principles' and, instead, to shape the new document into an overarching conceptual framework for the thematic groups around which SASUSG's 2008 Work Plan had been developed. The framework would be modified as and when needed to accommodate new concepts emerging from the thematic groups themselves. Some of these groups have met since August 2008 and the first draft (SASUSG 2008) was prepared in time for their meetings.⁸

-
7. Participants in the Working Group were Simon Anstey, Masego Madzwamudze, Rowan Martin, Marta Monjane, David Mulolani, Marshall Murphree, Shylock Muyengwa and Fred Nelson. Kule Chitepo, David Cumming and Michael Murphree were invited but unable to attend.
 8. The SASUSG Working Group on Governance issues has prepared a publication titled *The Politics of Natural Resource Governance in Africa* which is in press at the time of writing (Nelson 2009).

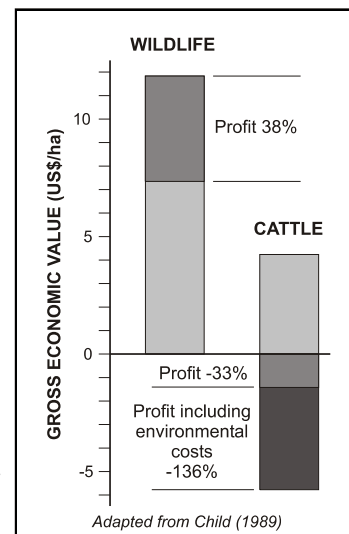
INTRODUCTION

Southern Africa has been experimenting with land use based on natural resource management over the past 50 years. The members of SASUSG have played a significant rôle in this experimentation so that the conceptual framework which follows is grounded in the outcomes of these experiments in social ecological systems (SEs). The apparent 'wildlife bias' of SASUSG's publications arises largely because of the significant contribution which wildlife management has made to this developmental process.

The first key point is that **decline in biological diversity is not inevitable**. In southern Africa biodiversity has been increased and enriched over much of the region as a result of policies which promoted wildlife management as a form of land use. For example, wildlife populations on private land in Namibia increased by 80% from 1972-1992.



Secondly, **wildlife management may be the most profitable land use** over most of the arid and semi-arid savanna rangelands in southern Africa. Child (1995, p127) describes the experimentation in game ranching on private farm land in Zimbabwe which began in 1959 at a time when wildlife was in a general decline outside the Parks and Wild Life Estate. Initially focussed on game cropping, the industry began to show significant advantages over cattle farming in the 1970s when higher valued uses of wildlife such as safari hunting became part of the management. Child (1989 – see box) compared the economic value of cattle and wildlife systems on Buffalo Range in the south-east lowveld of Zimbabwe and found the profitability of wildlife greatly exceeded that of cattle especially when the condition of the rangeland was brought into the equation. By 1995 the area of commercial farmland under wildlife management in Zimbabwe was one and a half times that of the State Protected Areas.



A critical feature of the successful development of wildlife on Zimbabwean commercial farmland was the complete devolution of authority over wildlife to the individual landholders.^{9, 10} Despite the obvious lesson, in the wave of ‘CBNRM’ projects which has swept across southern Africa since 1978¹¹ **there has been no similar devolution of rights over wildlife – or other natural resources – to local communities in any country.** Thus assessments of whether communities are capable of managing their natural resources remain flawed – the initial conditions for successful management have not been met. Murphree (2000) likened the situation to –

*The Christian ideal has not been tried and found wanting ;
It has been found difficult and left untried.*

What’s Wrong with the World, ‘The Unfinished Temple’

G.K. Chesterton, 1874-1936

The CAMPFIRE programme in Zimbabwe (Martin 1986) was a forerunner for many communal natural resource management programmes in the southern African region. The original concept envisaged local communities forming resource cooperatives to manage self-defined areas. However, the Ministry of Local Government in Zimbabwe foresaw that cooperatives would effectively excise the people, land and resources involved from communal land and resisted this aspect of the proposal. The alignment of communal resource institutions with political constituencies (districts, wards, villages) has resulted in an imperfect model ever since. However, not all analysts have seen it that way –

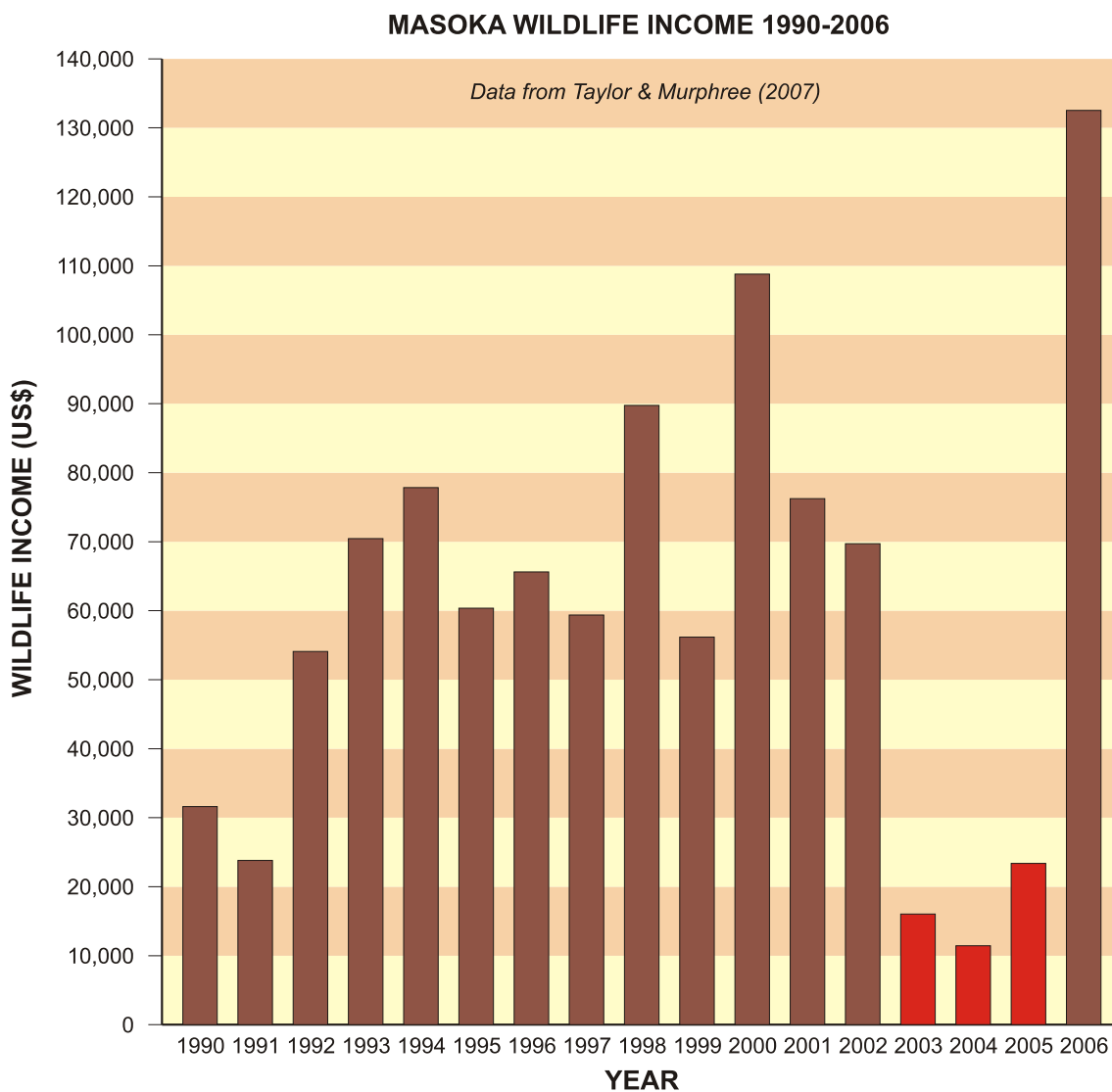
The flexibility of CAMPFIRE has been one of its major strengths, as it has allowed considerable variation in functioning to emerge. From this, adaptive solutions to differing social, environmental and other circumstances materialised. By not insisting on rigid adherence to some preconceived plan, those who promoted the CAMPFIRE concept ensured that local communities and outside interests could forge relationships that they thought best fitted their circumstances at the time. In so doing a much greater sense of local ownership and commitment has been developed.

Frost & Bond (2008)

9. Only in the case of Specially Protected Species were farmers obliged to consult with Director of Wildlife – in all other respects they enjoyed a legal authority equal to that of the Director.
10. This empowerment has since been compromised by a regulation introduced in 1996 requiring farmers to obtain the approval of the State wildlife agency for their annual management plans. The deleterious effect of this regulation (which is in conflict with the primary legislation) has been described by Martin (2007).
11. The first of these may have Project WINDFALL in the Sebungwe region of Zimbabwe (Martin 1977).

Between 1989 and 2001, eighteen Rural District Councils earned a total of US\$20.3 million from CAMPFIRE, 97% of which came from just 12 districts (Frost & Bond 2008). One of the major contributors to this total was the Masoka community in the Kanyurira Ward in Guruve District in the north-east of Zimbabwe. The wildlife income which accrued to the community over the period 1990-2006 is shown in the figure on the next page. This income (in normal years) would be about half of that paid to the RDCs, i.e. the community's income is highly taxed..

In the years 2003-2005 (the red bars in the figure) the community income dropped to an all-time low – caused primarily by Guruve RDC retaining most of the community's funds at a time when, due to the economic collapse in Zimbabwe, the Council was receiving very little funding from government. The Masoka community realised their power and threatened to withdraw from CAMPFIRE unless the situation was redressed. The all-time high payment in 2006 reflects their success in bargaining (Taylor & Murphree 2007).



Summarising SASUSG's experience with natural resource management in southern Africa, **incomplete devolution of rights over natural resources** – particularly wildlife – **remains the single most disabling constraint on sustainable development based on natural resources.** The distribution of political power largely determines the success of institutions for natural resource management and sustainability depends on who has what power and how they use it. The all-pervasive tendency which has to be resisted is for the centre to accumulate power to its own ends and the detriment of the periphery.

The issue has assumed a new urgency arising from the unprecedented ecological and economic global changes likely to affect human populations in the near future.¹²

We are now in an era of transformation, in which ecosystem management must build and maintain ecological resilience as well as the social flexibility needed to cope, innovate and adapt. Holling (2001)

Sustainable Use as a Tool to Conserve Biodiversity

Many supporters of sustainable use justify the practice on the grounds that it is a means to conserve biological diversity. This attitude permeates the Addis Ababa Sustainable Use principles of the CBD. SASUSG believes that if conservation of biological diversity is set as the primary aim of sustainable use principles, they are unlikely to be successful. **If the long term needs of people are the goal, conservation of biological diversity should follow automatically.**

Conservation is the same thing as sustainability and entails –

- both biological and human sciences
- dealing with change; and
- considering resilience rather than stability

Murphree (2001)

12. This is the thrust of the draft resolution put forward by Resource Africa in collaboration with SASUSG which was adopted by the World Conservation Congress held in Barcelona, Spain, in October 2008 (**Appendix 1**, page 35).

The Way Forward

The key departures from SASUSG's 1995 Principles for Sustainable Use are –

- (1) to prioritise **Sustainable Development** and make **Sustainable Use** subsidiary.
- (2) to see **SASUSG's core constituency as local communities** and to argue that the acronym **CBNRM has outlived its usefulness**.¹³
- (3) to **connect natural resource governance outcomes to broader political-economic factors and trends within African countries**.¹⁴
- (5) to place **greater emphasis on the full range of renewable resources** instead of wildlife as has been the tendency in SASUSG's previous work.
- (6) to **modify SASUSG's past emphasis on the monetary value of resources** to one which places greater weight on proprietorship and peoples' own valuation of cultural and livelihood factors.¹⁵
- (7) to incorporate **Complex Systems** concepts into its approach to sustainability, to recognise **uncertainty** and to emphasize that **adaptability, resilience and innovation** are the key attributes that will enable people to modify behaviours in the face of the dramatic impending changes expected to affect the world in the near future.
- (8) to **transform the present scenario** where increasing resource values and patterns of trade create greater incentives for further **central control** and capture of resource rents, to one where such values can **reinforce local rights**, voice, and collective action.¹⁶
- (9) to **cease to accord undue status to international treaties such as CITES and the CBD** and place greater weight on those multilateral conventions and programmes addressing **climate change, health and poverty alleviation** (e.g. CCC, MDG, WSSD, AHEAD).

13. It allows the relationship between local communities and their resource base to be conveniently consigned to an irrelevant compartment and trivialised. There is a tendency in southern Africa for governments to cause such systems to remain in undesirable regimes, often poverty traps, locked in maladaptive cycles from which escape becomes difficult.

14. The research question which might be asked here is whether the trends in natural resource governance in African countries are indicative of broader advances and retreats in local and national democratic governance or whether valuable natural resources are particularly resistant to reform (Nelson 2009).

15. SASUSG recognises the difficulties here both in relation to scale and to discounting the future. Different cultures and individuals, clans of self-interest within communities, and communities themselves discount the future at different rates – with enormous implications for how renewable natural resources are used or abused.

16. This challenge is political in nature and stands as a priority bridging development, conservation, and democratic interests and constituencies (Nelson 2009).

Sustainable Development

SASUSG is anxious that its commitment to a path of sustainable development is not misconstrued. SASUSG does not see itself as a facilitator for commonly-understood conventional development entailing highly visible concrete infrastructure. The members of SASUSG share a common vision of healthy landscapes supporting lifestyles for people who have a large degree of control and purpose in determining the quality of their own lives. We believe that, in the interests of self-preservation and aesthetic satisfaction, most people or communities of people will take individual or collective decisions which ensure the perpetuation of the things they value and the maintenance of their social capital. We believe also that, **where their lifestyles are threatened by external factors, most people will display resilience and adapt in ways which offer the best prospects for their future and that of their environment – provided they are not prevented from doing so by a lack of autonomy.**

Sustainability is the capacity to create, test and maintain adaptive capability. Development is the process of creating, testing and maintaining opportunity. **Sustainable development is the goal of fostering adaptive capabilities and creating opportunities.**

Holling (2001)

The current sustainable development paradigm that underpins environmental policy should be replaced with the concept of resilience. *Sustainability is about maintaining the stability of current life-styles and production systems, whereas resilience is about change and adaptation*

The capacity to self-organise is the foundation of resilience

Abel (*et al* 2006)

SASUSG recognises that simple cause-effect models are not adequate to describe the relationships between people and natural resources. Where deterministic science is limited to addressing problems of simpler systems, the science of complexity represents a major change in scientific paradigm able to accept surprises. A number of complex systems attributes are included in the main sections which follow and the key concepts which characterise Complex Systems are presented in **Appendix 2** (page 37). Some of the operational implications of these principles for resource management are given on pages 25-32.

CORE CONSTITUENCY

*The social, friendly, honest man,
Whate'er he be,
'Tis he fulfils great Nature's plan,
And none but he.*

Epistle to Lapraik, No.2, 87

Robert Burns 1759-1796

A diverse set of constituencies based mainly on land tenure categories is responsible for natural resource management in southern Africa. For SASUSG, **the most important constituency is small scale traditional farmers on communal land**. There is much at stake and many good reasons why SASUSG should apply a major part of its energies to this constituency.

Poverty alleviation

Most of Africa is communal land. The future use of this land will determine the livelihoods and well-being of millions of people. Development based on natural resource management may offer many local communities the best prospect for sustainable, profitable and desirable lifestyles.

A vulnerable sector

It is this sector of the population which is likely to suffer the most under rapid environmental change and which is least prepared for the challenges it will bring (Rihoy 2007). It is the poor who are the most vulnerable with the least ability to adapt. Food and water security, shelter and livelihoods, environmental management and biodiversity conservation, the spread of diseases and population migrations will all be affected adversely by climate change. Climate change is expected to compound the many development challenges already confronting African peoples and it will constrain Africa's ability to achieve the poverty reduction and sustainable development goals of the Millenium Assessment Programme.

Many parts of Africa already experience highly variable rainfall and other climatic extremes and Africans have developed coping strategies to deal with this variability. But the ability of African institutions and people to adapt to climate change impacts is limited by widespread poverty, over-stressed ecosystems, weak institutions and attitudinal and knowledge barriers amongst government agencies, political representatives and local communities. Despite the serious implications, there is relatively little emphasis on climate security coming from African governments and civil society. Unless present policy, legislative and bureaucratic constraints are removed which limit peoples' ability to adapt rapidly, the future appears bleak.

SASUSG has a rôle in raising awareness of the options and issues for this constituency.

An unjust colonial legacy

THE NATURAL JUSTICE OF OWNERSHIP

European conservation law was imposed on Africa with no knowledge or thought for either prevailing conservation practice or the systems of land tenure to which they must have been married. **Divorcing land ownership from *de facto* ownership of wild animals and other wild resources is the primary reason why conservation law has been so generally disregarded.** When the state claims ownership, the outcome is inevitable. Wildlife will be used without the thought of sustainability that a sense of ownership imparts and, where the state's claim inflicts losses and barriers to development, **wildlife will be actively exterminated.**

The cliché “local people must benefit from wildlife if conservation is to succeed” is heard across the length and breadth of Africa. In many countries the state tries to woo local people by passing on some of the wildlife revenues. Yet, in such gestures, governments and the conservationists advising them miss the point that these benefactions exacerbate the landowners belief that they do, as an aspect of common sense and natural justice, have a prior right both to use and to benefit from the wild animals on their land. Further, it is inseparable from the powers of decision regarding general use that go with ownership (i.e., what, when and where to cultivate, what livestock to keep). Unless they have similar powers of decision – or as nearly as possible the same powers – **wildlife must automatically be an inferior prospect to be replaced if possible.**

Parker (1993)

A continued policy failure

In the post-colonial era environmental policy processes have shown no better performance, pandering to a consortium of professional-cum-commercial conservationist interests while allocative decisions have consistently been determined by political and economic interests. The real question – how to ground economic and political (institutional) goals in sustainability principles (e.g adaptability, diversification, building resilience) – has hardly been addressed.

‘Implementational stasis’ results when the State does not have the resources to effectively impose its policies and communities do not have the resources to implement locally generated policy alternatives. This is a situation where the State is unwilling to surrender its technicist and proscriptive policy approaches while lacking the resources to make them effective and the local community lacks the authority and incentives to create effective policies and regimes responsive to local imperatives.

Murphree & Mazambani (2002)

Expectations for the present must be tempered by the recognition that common property resources are currently hostage to larger politico-economic realities. **SASUSG should still pursue the grail of good common property policy and practice.**¹⁷

CBNRM

The acronym **CBNRM has outlived its usefulness.** It allows the relationship between local communities and their resource base to be conveniently consigned to an irrelevant compartment and trivialised. A properly empowered communal resource management institution in essence should not be different to any other private property regime except insofar as it does not ‘own’ the land on which it operates. In most of Sub-Saharan Africa farmers live on land and use resources which the state legally claims as its own. Their authority and responsibilities over land and natural resources are ambiguous and weakly linked, they do not have the rights of exclusion necessary for their institutions to function effectively and their lack of strong tenure is a disincentive to conservation investments. The status of the land allows various tiers of government to impose unwarranted taxes on their operations. **Such conditions are a recipe for the failure to link sustainable rural development to natural resource management.**

In southern Africa governments have caused such systems to remain in undesirable regimes, often poverty traps, locked in maladaptive cycles from which escape becomes difficult. Poverty traps at the local level may be an inevitable consequence of rigidity at some higher level of scale maintained by subsidy and cross-scale interaction that enables the capture of local capital by large scale actors. Such conditions are a recipe for failure and will do no more than exacerbate and perpetuate the poverty traps that most communal lands have become. Common property regimes have much to offer as an alternative to state regimes which are becoming ever more exploitative.

Centralized prescriptions over land use, tenure, and resource access rights effectively stifle innovation and the development of adaptive co-management regimes at larger scales and across land tenure categories. Releasing the creative capacities of farmers, resource managers, and communities may go a long way towards solving food and environmental security problems (Cumming 2005).

For long-term sustainability CBNRM requires a fundamental shift in national policies on tenure in communal lands. The core of the matter is strong property rights for collective communal units – not only over wildlife and other natural resources – but over the land itself. The era of externally-derived innovation in CBNRM should be brought to an end. The era of self-determined, tenurially robust communal natural resource management should be brought into being.

Murphree (1995)

17. Liz Rihoy (comments on the first draft of this document) observes “An analysis of the requirements for effective CBNRM and for the development of ‘participatory’ democratic politics illustrates that at least rhetorically they share a common vision - the development of accountable and representative governance institutions which institutionalize local participation, empower all citizens equally and have effective linkages with institutions at other levels. CBNRM and democratisation are in theory mutually reinforcing processes between which there are important synergies and complementarities.”

Noting that the phrase ‘indigenous communities’ is contained in the Preamble and Articles of the CBD, is included in the Addis Ababa Principles and is used liberally in IUCN resolutions, it nevertheless does no favour to the cause of sustainable development to treat this group of people as if they were a race apart. In Africa, indigenous and local communities are one and the same thing and they are the majority. And they should require no special differentiating provisions under the CBD or under national legislation to enable them to function effectively as managers of biological diversity. Unfortunately, the Addis Ababa principles are larded with references to ‘indigenous communities’ in a style which could be interpreted as patronising and distasteful.

Donor involvement

Donor involvement in communal resource management has contributed to the entrenchment of CBNRM as a ‘project model’. Underpinned by optimisation strategies, a drive for efficiency and the aim of importing ‘best practices’, donors have brought rigid project designs into the arena that are **unable to accommodate the changing preferences typical of complex systems**.^{18,19} Such projects tend to ignore the fact that people are human.

In the drive for efficiency, by eliminating redundant or duplicated systems, the resilience may be removed from communal resource institutions. The risks attached to disruptions in the *status quo* of social-ecological systems are seldom adequately anticipated. By introducing new interaction patterns in an *ad hoc* fashion and focussing entirely on material rewards, social criteria for success are often overlooked. (Ruitenbeek & Cartier 2001).

Communal management regimes require far more than ‘involvement’, ‘participation’ and ‘decentralisation’. *Participation* and *Involvement* turn out to mean the co-option of local elites and leadership for derived programmes and *Decentralisation* turns out to mean the addition of another obstructive layer to the bureaucratic hierarchy which governs natural resource management (Murphree 1991).

‘Best practice’²⁰ in community conservation is not so much about transferring ‘good’ experiences from one project to another – rather it is about strengthening capacities and developing resilience of conservation agencies, communities and managers through the process of adaptive management where they experiment, learn and take decisions within the constraints under which they work (Murphree & Hulme 2001).

-
18. Fred Nelson (comments on the first draft of this document) remarks “A critical problem in donor investments is the portrayal of political issues like devolution of lands and valuable resources in technical terms – since donors ostensibly are ‘apolitical’ which of course in reality is a complete fiction. Attempting to catalyze long-term institutional change through investments in short-term projects is another major problem.”
 19. Mike Jones (comments on the first draft of this document) observes “Donor rigidity goes beyond project design – their policies are rigid. Aid in the form of “basket funding” puts funds (more power) into the hands of rent-seeking elites and maintains the rigidity at a national level that leads to poverty at the local level. The other thing about donor projects and the activities of many NGOs is that they do little to develop the social capital of the rural communities they are meant to serve.”
 20. Mike Jones (comments on the first draft of this document) observes that “There is no such thing as ‘Best Practice’ in adaptive management of complex systems. This phrase is one that should be banned from the SASUSG lexicon if we are ever to change the mindsets of those who think mechanistically about people and nature.”

Management capability of local communities

**Science is still regarded as a specialized domain
outside the realm and mandate of local people**

Murphree (1997)

Dealing with uncertainty is a continuing factor in the lives of local communities and risk-aversion is a pervasive feature of their farming strategies. Their methodology – **adaptive management** – has the highest scientific credentials. It is elegant in its simplicity, robust in its empiricism and striking in its tight application to management decisions.

It has huge potential for the development of locally-based science which goes beyond issues of species off-take. Such science, flexible in its foci and dynamic in its analysis, is far more important than the static domain of "indigenous technical knowledge" – the box to which local insight and experience is condescendingly assigned.

Local communities have problems with the scientific environmental technicism of governments and international agencies. They do not have the resources to conduct it themselves and its conduct by others involves a significant loss of control. They see it as a device which can be applied to stop use which their own science indicates is viable. And they have a healthy scepticism of its ability to produce the predictive certainties expected of it. Where accurate measurements of natural resources may be desirable in theory, in practice, they are often infeasible and may undermine local natural resource management regimes.

This perspective on professional science's epistemology and rôle is cognate to local science. In its applied form it has emerged regionally in new forms of resource and environmental management where uncertainty and surprises become an integral part of a set of adaptive responses. Dissonance remains, however, where bureaucracies retain the expectation that science can provide *a priori* certainties.

SASUSG's methodology in dealing with local communities should be invited rather than imposed, directed rather than directive, facilitative rather than manipulative and it should represent professional science in the service of local civil science (Murphree 2001).

Core Objective

SASUSG sees the core objective of communal resource management as increased capacity for adaptive and dynamic governance in the arena of natural resource use.

**Ultimately the effectiveness of organisation in community conservation
is determined by the will and capacities of communities themselves
and cannot be imported from outside**

Murphree.& Barrow (2001)

NATURAL RESOURCE MANAGEMENT REGIMES

In discussion amongst the SASUSG members, some have advocated that the typology of this core section be based on **land tenure categories** as opposed to the type of resource regime. There are cogent arguments that a division into Alienated Land (i.e. that held under title deeds by individuals or corporate bodies), State Land, and Community Land (variously termed homelands, communal lands, traditional lands, etc.) may be the most useful for southern Africa.

Equally, the typology could be based on **Resource Management Regimes**. It can be postulated that properly constituted communal regimes are a form of private proprietorship. They are similar to collective private regimes but their membership and forms of governance are sufficiently different to merit a separate listing. Being located in communal land, they are under the eminent domain of the State – but even private regimes on private land are subject to the State’s continued indulgence. To remove them from the “private” category (which is where they belong intrinsically) and place them under “communal lands” (a category of state-run land) perpetuates a terminologically engendered misconception. Earlier in this document we have condemned the CBNRM acronym (page 12): **one of the most important perspectives that SASUSG can bring to bear on communal resource regimes is to emphasize that they should be treated no differently to private land institutions.**

The diagram on the next page attempts to reconcile the two typologies by placing **regime types** on one axis (the X axis) and **land tenure categories** on the other (the Y axis). A further dimension has been introduced in the form of **co-management regimes**. The diagram may not lend itself easily to interpretation and, for this reason, it is discussed in some detail.

Resource Management Regimes: Five types of regime are shown – **International, Regional** (which might include several states), **State, Communal** (which refers specifically to properly constituted and effectively functioning communal resource management regimes) and **Private** (which includes both individual and corporate management entities). Communal management regimes and those of private land are grouped together as ‘**Private Resource Regimes**’

Land Tenure Categories: Five categories are given – **Global Conservation Areas, Trans-Frontier Conservation Areas, State Protected Areas, Communal Land** and **Private Land**.

Private Property Regimes

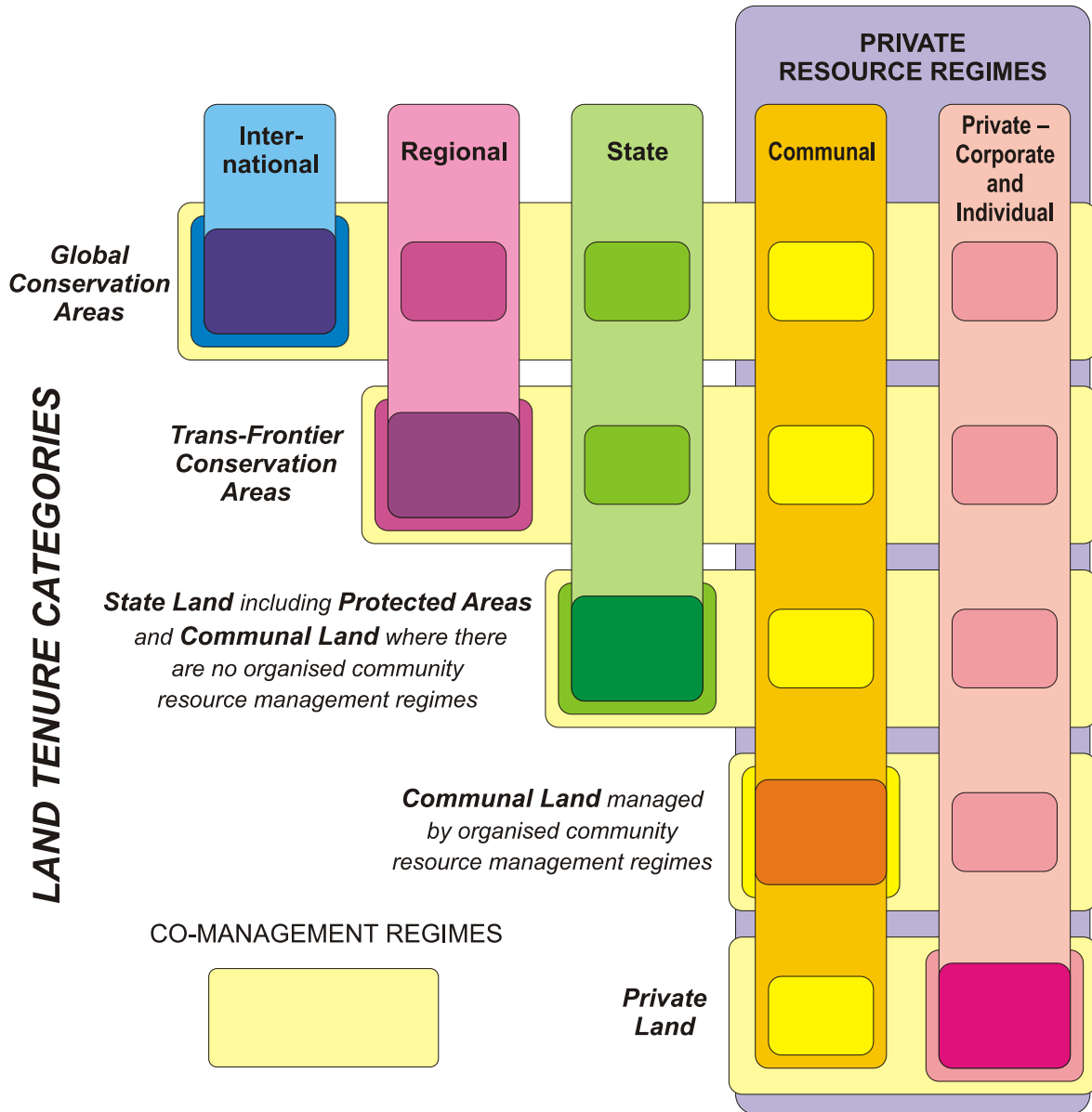
Private Individual Property – a regime under which individuals pursue resource management within a system of policies and laws administered by the State.

Corporate Private Property – a regime where formal or informal groupings of individuals who may be constituted into legal entities (companies, trusts, associations) carry out the same types of activities as private individuals.

Although the distinction between these two regimes is minor, the latter is included because it provides a parallel with communal property regimes and strengthens arguments for their inclusion in the category of Private Property Regimes.

Both of these two regimes operate mainly on **Private Land** – land held under title deeds. However, under leases or concessions, the same resource regimes could operate on State land or in communal land.

RESOURCE MANAGEMENT REGIMES



LAND CATEGORIES

- | | | | |
|---|---|---|--|
|  | Global Conservation Area |  | – managed by International Regime |
|  | Trans-Frontier Conservation Area |  | – managed by Regional Regime |
|  | State Protected Area |  | – managed by State Regime |
|  | Communal Land |  | – managed by Communal Property Regime |
|  | Private Land |  | – managed by Private Property Regime either Corporate or Individual |

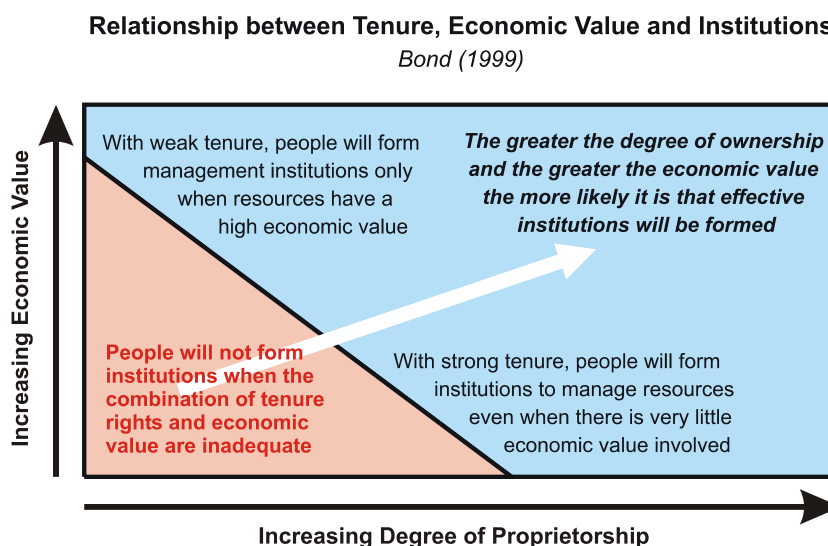
The degree of empowerment of private landholders over the natural resources on their own land varies considerably across the southern African region. Landholders in Zimbabwe enjoyed almost total autonomy from 1975-1996 (**Introduction**, page 5) and this empowerment was the stimulus for the major transition of commercial farmland to wildlife management over the same period. In Botswana, Namibia and South Africa, private landholders enjoy far less autonomy and are subject to numerous State controls including setting or approving quotas for wildlife use.

Communal Property Regimes: These are private communal regimes where individuals organize themselves to act collectively with all the authority and responsibility required for natural resource management in the long term. It is a sad indictment that **none of the many programmes which have tried to address communal property resource management in southern Africa have fully satisfied the required devolutionary conditions.**

These conditions include communities' rights to shape their own institutions, create by-laws, plan the spatial and functional aspects of their management, decide on the use of their resources, define access to their resources (including rights of exclusion), negotiate the involvement of other parties in their management and, finally, to benefit directly from their natural resources and determine how benefits will be distributed (**Appendix 1**, page 35).

Good policy requires the **alignment of authority, responsibility and incentives**. Authority without responsibility is meaningless or obstructive; responsibility without authority cannot be effective and, without responsibility or authority, the incentives to invest, manage or control are lacking. Under **BIG GOVERNMENT** (page 44), the State's authoritative reach exceeds its implementational grasp; extended bureaucracy cannot link inputs and outputs; and incentives are largely political. Under small jurisdictions, linkages of authority, responsibility and incentives are sharply delineated; authority and responsibility can be merged under one or a few actors and incentives are provided by the immediate and apparent relationship between investment and return (Murphree 2000).

Bond (1993) examined the relationship between economic value of wildlife, proprietary rights over wildlife resources and the likelihood of local communities forming effective management institutions. In situations where wildlife had a high value, local peoples were prepared to form management institutions even when their proprietary rights were less than perfect. Where wildlife was of little economic value, people would not form management institutions unless a high degree of proprietorship had been conferred on them. The higher the economic value of wildlife and the greater the rights that local communities enjoyed over it, the greater the likelihood that effective management institutions would emerge (see diagram).



Natural justice suggests that ownership of land (including communally owned land) should confer *de facto* ownership of the biological diversity living on it. There is an inherent conflict between societies conceding *de facto* ownership of the wild resources to land owners or occupiers, but refusing *de jure* ownership. **For the system to function there clearly has to be a marriage between the two.**

Parker 1993, *The Natural Justice of Ownership*

The issue of ownership of wild resources is provocative to many States in the southern African region.^{21,22} The use of the word ‘proprietorship’ in the Bond diagram is strategic. Murphree (1996a) observes **ownership is seldom, if ever, absolute – rights are stronger the longer they have been in place and the fewer conditionalities are attached to them.**

The category **Communal Land** in the diagram on page 16 is intended to include only that land which is under some form of effective communal resource management. It would not include land occupied by rural peoples who have not formed properly constituted resource management associations. Such land is included as a subcategory of state land.

I remain of the opinion that state-run communal lands constitute one of the greatest drags on rural development in the sub-Continent. I am under no illusions that they can or will be abolished easily or swiftly and, indeed, they will probably be a necessary best option for those rural dwellers who for whatever reasons will not or cannot organize themselves to act collectively with all the authority and responsibility that a private communal regime requires for an indefinite future. But this kind of intractability should not be an excuse to withhold the full rights and responsibilities of a private regime from those in communal lands who are willing to grasp them. **A massive shift in this direction over the next few years would be one of the best things that could happen to rural southern Africa.**

(Murphree *pers. comm.*)

21. Under Roman Dutch law (which applies in most southern African countries), wildlife has the status of *res nullius*, i.e. things which cannot be owned. Nevertheless, some southern African countries (e.g. Botswana and Zambia) insist that the State owns all wildlife.
22. The Namibian Constitution maintains that all natural resources belong to the State if they are not otherwise lawfully owned. (**Article 100: Sovereign Ownership of Natural Resources**). The recent Human-Wildlife Conflict Policy is, however, adamant that the State will not pay compensation for losses inflicted by wildlife (MET 2009, paragraphs 2.3.5 and 2.4.1).

The State

The management regime of the State is far reaching. Not only do State environmental agencies have responsibility for significant tracts of land²³ and environmental safeguards but also the policies and laws of the State critically affect Private Resource regimes.

Enabling Policies

The highest priority for governments is to adopt policies which promote **innovation, adaptation and change** in State and Private Resource regimes. Such policies should create the conditions for emergence of adaptive co-management in and amongst these regimes. Conscious participation and adaptation through learning and experimentation are fundamental components of this process (Ruitenbeek & Cartier 2001). **SASUSG, in collaboration with governments, has a valid rôle in raising of awareness of the options and issues amongst stakeholders.**

To create the incentives for Private Resource regimes (particularly communal resource regimes) to achieve these ideals, **proper devolution in proprietorship is a 'cardinal input'**. Unfortunately, establishment incentives tend to resist such devolution. These incentives include the bureaucratic mind disposed to the centralization of authority and the technocratic mind which is inclined to see devolution as the surrender of professional management to the vagaries of cost/benefit decisions by unsophisticated peasants. They also include the appropriative incentives of central political elite and their private sector allies.

Whatever the specific configuration of incentive is, the result is commonly that "community-based" resource management initiatives turn out to be efforts to co-opt or bribe local peoples while authority still effectively remains firmly in state hands. **This is institutionally fatal, since authority and responsibility are separated** (Murphree 1997b).

Regulation based on incentives

Regulation of use is an essential component for sustainability in use. Prevailing regulatory structures consist largely of a proscriptive and legislative nature imposed by the centre on the periphery, and they have failed to stop negative trends. The profile of the incentive package for regulatory compliance is too often wrong. **Incentive is the fulcrum of regulation.**

Regulation usually requires an element of negative incentive proscriptions backed by powers to enforce them. But **any regulatory system which relies primarily on negative incentives is, in the long term, in trouble.** Enforcement costs are high and the legitimacy of the system in the eyes of the enforced is called into question. **History shows that such systems are unstable and that sustainable systems of regulation are those that rely primarily on positive incentives – economic, cultural and institutional – and which are affordable.** Hardin's (1985) comment is relevant here: "We must recognize that all control operations incur costs; excessive controls generate their own kind of poverty" (Murphree 1996b).

23. In most of the southern African countries, State Protected Areas exceed 10% of the country area.

Environmental Safeguards

An important rôle for the State is that of overseeing environmental impact assessment. Many of the benefits society gets from ecosystems are either unrecognized or considered "free" (e.g. pollination, water purification, nutrient cycling, and the many others identified by the Millennium Ecosystem Assessment 2005). These services are often the ones that change in a regime shift and are only recognized and appreciated when they are lost (Walker & Salt 2006). The State should include all the unpriced ecosystem services in development proposals and assessments

An essential rôle for government in EIA is to protect the rights of society by ensuring that developers include the costs of unpriced ecosystems services in development initiatives. A problem in Africa is that the government is often the developer (or in partnership with the developer) and so has a strong incentive not to include the full range of environmental costs. Economic efficiency (and expediency) is the order of the day to the detriment of sustainability.

State Land encompasses all land formally under State management including such gazetted areas as national parks, game reserves and forest reserves (**State Protected Areas**) and, in the representation shown in the diagram on page 16, would include communal land which is not under any collective resource management by the occupiers.

State Protected Areas are generally uncritically linked with State ownership and management. However the IUCN definition of a protected area makes no mention of State ownership. Murphree (2002) argues that Protected Areas are no more than another form of "commons" – areas set aside for a constituency which require protection through controls on their access and use. Seen as an area of "commons", a number of false perceptions need to disappear – protected areas do not have to be managed by the State, they are not about use versus non-use, and they are about regulated access rather than exclusion (Murphree 2004).

Protected areas address only a fraction of global biodiversity concerns and larger functional protected areas could be achieved by inclusive policies where local people, acting collectively, are provided with incentives to take responsibility for and benefit from the economic development which protected areas can provide.²⁴

In the diagram, provision is made for co-management across the land tenure categories of private land and communal land. The importance of developing **adaptive co-management regimes** at larger scales and across land tenure categories has been emphasised (page 12). **SASUSG sees such schemes as essential to address scale mismatches and to liberate the latent adaptive capacities of people in the face of global change.**

24. Mike Jones (comments on the first draft of this document) observes "Unfortunately Protected Areas are now being plundered by the private sector, or the government in partnership with the private sector, as well as displaced or disaffected local people who are trying to get back some of what was taken from them. PA management needs a complete transformation of governance regimes if PAs are to make a substantial contribution to biodiversity conservation. That transformation includes giving local people the status of full partners in a PA and reducing the role of government to one of maintaining the rule of law and protecting the rights of citizens."

The old notion of “fortress conservation” could be displaced by new ideas of sustainable development arising from co-management amongst the State, communal resource regimes and private land – each contributing land to the ‘park’ and each participating on the basis of proportional representation (Martin 2006a).

The ultimate and most fundamental reason why there are few successful examples of such co-management has been that the critical ingredient for project success, that of devolution of authority and responsibility, has been missing.

Governments (and NGO implementing agencies) have continued to —

- retain ultimate power to shape objectives and control benefits;
- see community involvement as the same thing as “compliance”;
- see participation as the same thing as “co-opting” communities; and
- be reluctant, as politicians and bureaucrats, to surrender the power and control of access to resources which is essential for robust devolution.

Hence most of the projects involving communities (and private land resource regimes) in natural resource management have simply become an exercise in “aborted devolution” (Murphree 2002). However, the importance of such projects should not be lost. Their successful implementation would indicate that within a nation various resource management regimes are capable of co-management. The portent of this for successful Trans-Frontier Conservation Areas (the next level up in the typology) should not be underestimated – when the resource regimes on disparate land tenure types within-country have demonstrated they can co-manage, only then might such countries be considered ready to engage in trans-frontier initiatives (Martin 2006a).²⁵

25. Mike Jones (comments on the first draft of this document) observes that few governments are willing to relinquish absolute power in order to facilitate co-management ventures. “ TFCAs being developed in southern Africa at the moment tend to serve the interests of all kinds of stakeholders except the people who live on the land where they are being established. This is a classic example of competitive exclusion, where those who have the power are expropriating the resource base of those who don’t. The rôle required of government is to protect the rights of its citizens and maintain the rule of law.”

Regional Resource Management Regimes

Effective management of certain resources across national borders (water, tourism, some wildlife species) requires the establishment of bi-lateral or higher order management regimes.²⁶ The SADC Wildlife Coordinating Unit is an example of such a regional body. The imperative of **Trans-Frontier Conservation Areas** has led to a further spawning of regional treaties.

Unfortunately, the vision of a TFCA being one large ‘national park’ straddling international boundaries still prevails amongst many of the participating governments and supporting NGOs (the first block in the TFCA row in the diagram on page 16). Indeed, many state bureaucracies see this as the only model for a TFCA.²⁷ **To achieve TFCAs which consist of a mosaic of tenure categories co-managed by States, communal resource regimes and private landholders will require a greater focus on the implications of scaling up in social-ecological systems (Appendix 3, page 43).** Already some SASUSG members are engaged in this process.²⁸

SASUSG would like to see Trans-Frontier Conservation Areas as rural landscapes where the residents are part and parcel of the landscape. They should be accorded secure rights of occupancy and use to the extent that their status is higher than government or the corporations who want to develop TFCA land. **They should not be removed from a TFCA in the interests of intangible conservation values.**

26. In the case of the ‘Four-Corners’ TFCA, the participation of Angola, Botswana, Namibia, Zambia and Zimbabwe is required..

27. The Kgalagadi TFCA between Botswana and South Africa fits this model.

28. Greater Limpopo Transfrontier Park (AHEAD project) and KAZA TFCA (AWF project).

International Regimes and Policies

This final category of natural resource regime includes international treaties such as CITES and the CBD but is also intended to capture the concept of any global body with an implementing rôle in the conservation of the earth's natural resources.²⁹ The emphasis in this section is on those conventions to which States are signatories since these create national commitments, often written into legislation,³⁰ which influence or interfere with local resource management regimes.

Part of the answer to the question as to why international environmentalism has failed to reverse negative trends in the earth's biological diversity ... lies in the inadequacies of its global conventions, its instruments of collective international husbandry and management of the resources themselves. Manifestly these have not adequately produced the effects for which they were created and their design, their implementation and the role we assign to them bear re-examination. **They are extremely costly in time, effort and money, and unless they can be made to work we should throw them out and start again.** Murphree (1997a)

Regime Congruence

The four subsections which follow are derived from Murphree (1997b)

***Globalization favors evasion.
Never globalize a problem if it can possibly be dealt with locally.***

Garrett Hardin (1985)

Generally, the smaller a regime is the more effective and efficient it will be. Most environmental management requirements lie at lower levels and can be most efficiently dealt with at these levels. Increases in scale complicate communication and decision-making and, beyond certain levels, regimes must bureaucratise with attendant costs. Compliance inducement shifts from low-cost modes of moral and peer pressure to the high cost methods of policing and formal coercion. Increase in scale erodes the sense of individual responsibility.

International conventions should be designed with these scale considerations in mind – place their priorities on issues requiring global action and refrain from intruding on the operations of smaller-scale regimes more suited to the management requirements of the resources they address.

If they do not, they can themselves become perverse incentives, resulting in the evasion of responsibility to achieve the results they advocate. **International treaties should limit their scope to global issues and trust local management to achieve lower level objectives.**

29. Thus the World Conservation Union (IUCN), the World-Wide Fund for Nature (WWF) and Conservation International (CI) might be included in the list.

30. For example, the CITES treaty, in its entirety including all the Appendices, is written into the primary wildlife legislation of Botswana (GoB 1992).

Incentive Compatibility

Through policy, legislation and fiscal controls governments and international agencies can deny local people the organizational conditions necessary for the attainment of their conservation incentives. Through their in-place location and *de facto* managerial status, local people can render external initiatives futile.

An example of this might be the current situation in Botswana where the State (urged by certain NGOs) has decreed that there should be no wildlife trophy hunting within a radius of 25km around the Okavango Swamps. This move is not supported by local communities because the income derived from non-hunting tourism away from the swamps will not match the income derivable from hunting. The likely outcome is that local people will turn to subsistence hunting to compensate them for the loss of income.

Without incentive compatibility stasis occurs, since each party has an operational veto over the other. **The central challenge is, therefore, to transform such initiatives into sets of congruent, although not necessarily identical, incentives.**

Values and Goals

Intrinsic and existence valuations of biodiversity tend to be accorded a higher status at the international level than local and instrumental conservation incentives – which are seen as lower level factors to be co-opted in the pursuit of the higher values. **This does not work.** Aside from their inherent merits, local incentives have a powerful veto dimension. Unless they are accommodated, international values and goals will be subverted by local responses ranging from defiance to covert non-compliance. **Local valuations of biodiversity should be recognised.**

Socio-Ecological Topography

Social topography suggests "small-scale" regimes while ecological considerations tend to mandate "large-scale" regimes. When international treaties impose large-scale ecologically-determined project domains on local situations, they may force together social units which have not negotiated between each other or, worse still, cut through existing social units. In so doing they concentrate on ecological sustainability at the cost of ignoring the institutional sustainability on which it depends.

The GBF and CBD should keep in mind that **social domains often have greater salience for ecological management than abstracted eco-regional constructs.**³¹

Global Conservation Areas may not yet be a reality (perhaps some marine conservation areas fit the type) but they would require some form of international regime for their management and administration. If we extend the conceptual thinking beyond a simple model of an area managed by an international body, a global conservation area could be realised through co-management involving transfrontier conservation regimes, State regimes, communal regimes and private property regimes.

31. being mindful that there may serious social-ecological scale mismatches involved that will need to be addressed through institutional reform at several levels and scales.

OPERATIONAL IMPLICATIONS

This final section draws on SASUSG's (1995) Issues and Principles for Sustainable Use, the more recent experience of SASUSG members and the lessons learned from complex systems to provide some guidelines for implementation of sustainable development projects. Elsewhere in this document, we have insisted that adaptation and innovation are essentially intrinsic attributes which cannot be imposed from outside. Therefore we are anxious that there should be nothing in this final section which is imbued with a 'command-and-control' tone such as appears in the operational guidelines of the Addis Ababa Principles for Sustainable Use (CBD 2004).

The question then arises "who is the target audience for these guidelines?" In the first instance, perhaps it is the SASUSG members themselves – this is intended to be a unifying conceptual framework which ensures that all members "are on the same page". It is also intended to be a "state-of-the art" document which will change as the SASUSG membership improves it and modifies it in the future.

A second audience is SASUSG's "core constituency" – small-scale rural farmers who have organised themselves collectively to manage their own resources. Since the inception of 'CBNRM' projects in the 1980s, the competence of individuals in this category has increased dramatically and the material in this document is well within their grasp. The aim here is two-fold: firstly, to reinforce their own self-confidence in what they are doing and, secondly, to raise their awareness of current ideas in the broad arena of sustainable development based on natural resources.

Governments are an obvious target for SASUSG's outputs. We have stressed that incomplete devolution of rights and responsibilities over natural resources remains the single biggest cause of failures to achieve sustainable resource management in rural areas. The failure of bureaucrats to envisage themselves in the situations of local people and to create the enabling conditions for an escape from poverty traps must continue to be a recurrent theme for SASUSG.

Finally, there is the large international gallery. At the outset of this conceptual framework it was stated that SASUSG would continue to maintain a southern African focus (page 3) and it is tempting to adopt a "take it or leave it" approach towards the global conservation community. However, SASUSG aims to be constructive. If anything in this document can persuade donors to move away from rigid models for development projects based on ideas of efficiency and optimisation, if international treaties can pay more attention to the incentives which motivate local people in social-ecological systems and if conservation agencies can place governance issues higher on their agendas, then perhaps SASUSG's advocacy will have achieved its aim.

Sustainable Use Revisited

Much of the original material in SASUSG's (1995) Issues and Principles for Sustainable Use remains relevant to SASUSG's 2008 sustainable development agenda. Some of the key definitions and principles are repeated here partly because they are original concepts and partly because they have a direct bearing on implementation.

Definitions

Use is the derivation of benefit from natural resources. **SUSTAINABLE USE is use which allows the continued derivation of benefits**, taking into account that —

- this will best be achieved through **adaptive management** and the choice of options which give the highest probability of success;
- our region's value systems may allow lower natural resource population thresholds while avoiding local extinctions;
- the highest probability of use being sustainable will be where the prime beneficiaries are the people living with and using the resources; and
- resource use decisions invariably require a trade-off of costs and benefits.

SASUSG does not consider there to be any valid distinction between CONSUMPTIVE and NON-CONSUMPTIVE use because this distinction depends upon the objectives for the system.

Many uses which are non-consumptive at the level of the individual are consumptive at the level of the ecosystem. By the same token, certain uses which are consumptive of individuals are non-consumptive at the ecosystem level. Our primary concern is that use be sustainable at the level of the ecosystem.

Similarly, **SASUSG does not consider there to be any valid distinction between COMMERCIAL and SUBSISTENCE USE of species.**

If anything, SASUSG is concerned that subsistence use of species may result in undervaluing of wild products and failure to secure their market value which would result in higher-valued land use and rural development.

A common perception is that unsustainable exploitation is the greatest threat to biological diversity. We argue that, in terrestrial situations, **the greater threat lies in natural systems being replaced with other land uses.**

Tenure Principles

Sustainable use is more likely when —

- The authority responsible for management and accountable for costs and benefits is the landholder in terrestrial systems and the stakeholder in marine systems
- Costs and benefits are internalised in the tenurial institution
- Transparent mechanisms to resolve conflicts have been developed or resurrected
- Tenurial institutions are legitimised and recognised at both the macro- and micro-levels in the political economy
- Rights of access are clearly defined and accepted

Economic Principles

Macro-economic policies (exchange rate, tax, subsidies to other sectors) should not differentially affect the value of industry based on wildlife, forests and fisheries.

Legislation which implicitly devalues natural resources should be critically reviewed. In particular, legislation which assigns priority to mining or agricultural land-uses is likely to have a greater impact on the disappearance of wild resources than any effects of overexploitation of those resources.

All species should have value. Attempts to destroy markets for species and species products seldom result in the correct incentives for conservation and run the risk of driving land into alternative uses.

Use is more likely to be sustainable when —

- the benefits derived from use are greater than the costs of conserving the resource
- short-term economic policies do not provide perverse incentives which mitigate against sustainable use
- there are well regulated legal markets with strong linkages to legal producers.

ECOLOGICAL PRINCIPLES

SASUSG believes that the present international focus on the distinction between consumptive and non-consumptive uses needs to be replaced by an emphasis on ecosystem conservation and the environmental impact of actions which mitigate against the persistence of wild ecosystems.

- Conservation of ecosystems is of a higher priority than the stability of individual species populations.
- All species populations can be used: there is no arbitrary population size threshold below which use should be prohibited if such use would be beneficial to the conservation of the species and the ecosystem.
- The ultimate criterion of sustainability is the persistence of the species. Species populations can be regarded as being sustainably used if there is no threat to their population viability. In ecosystems characterised by large environmental fluctuations this may be the only criterion of sustainability.

SASUSG places minimal weight on the notion that species are a global common heritage (with the possible exception of pelagic marine species). If such global heritages do exist, the best way to conserve them is through management by stakeholders where rights of access can be enforced.

Management Principles

The most suitable technical approach to sustainable use of species lies in **adaptive management** rather than in emphasis on *a priori* predictions. Adaptive management entails —

- a basic hypothesis about the workings of the system to be managed;
- a clear statement of management objectives;
- a monitoring system to provide the information needed to modify the management system or the objectives or the hypothesis if necessary.

In consumptive use systems, offtakes should generally be tailored to reduce biological risk. However, this general commonsense statement should not be an endorsement for misapplication of the "precautionary principle". In competitive land-use situations, injudicious use of the precautionary principle may result in disadvantages for biodiversity conservation.

Use may, and often does, **improve** the status of the used population. This is the argument for use as a conservation tool and the argument carries the corollary that non-use is a risky option. The precautionary principle should be applied in this sense: it is risky **not** to use resources — therefore we should use them.

Evolving approaches to implementation

Many new concepts relevant to sustainable development have emerged since SASUSG's (1995) principles and most of them have been incorporated into the main body of this conceptual framework. In this subsection, we examine some implementational aspects of adaptive management and communal resource regimes.

Adaptive Management

The concept of adaptive management (Holling 1976, Walters 1986) predates modern complex systems theory (Gunderson & Holling 2001). However, it has endured – its scope has been expanded from simple systems to complex social-ecological systems and it has been incorporated seamlessly into the toolkit of modern complex systems.

In all problems of managing the environment, we are faced with a complex of uncertainties – and these uncertainties increase as we progress to higher order systems. In managing a single species, it may be possible to limit the number of important variables for analysis to a few but, as we progress towards management at the ecosystem level, the number of unknowns multiplies exponentially. The problem will not be solved by collecting massive amounts of data on all the components of the ecosystem since it is the interrelated functioning of all the parts that defies synthesis. Adaptive management recognises the inevitability of management interventions in higher order systems characterised by inherent uncertainties and, accordingly, requires each act of management to be structured as an experiment (Martin 1998).

Managing complex systems requires confronting multiple uncertainties. It is necessary to distinguish the knowable from the unknowable and recognize the limits to knowledge and predictability. As much complexity exists in the social dimensions as in the ecological ones and that managers must juggle shifting objectives. In social-ecological systems slow variables, multistable behaviours and stochasticity cause active adaptive management to outperform optimisation approaches that seek stable targets. The three points in the box below enable the human component of an SES to transform – which is important if the SES undergoes a regime shift that renders it less hospitable to humans. Communal lands have undergone such a regime shift and are now in a poverty trap largely because the three conditions have not been met.

Therefore –

- Build flexible response systems – management must suit uncertainty**
- Explore alternative strategies even when current strategies seem to be working adequately (adaptive probing)**
- Protect and preserve the accumulated experience on which change will be based**

Levin (1999), Holling (2001)

Communal Resource Management Regimes

The principles listed below were written before 1995 yet they do not appear in SASUSG's (1995) *Sustainable Use Issues and Principles*. These are what many refer to as *Murphree's Laws*.

Murphree's Laws

1. **Effective management of natural resources is best achieved by giving it focussed value for those who live with them**
2. **Differential inputs must result in differential benefits**
3. **There must be a positive correlation between the quality of management and the magnitude of benefit**
4. **The level at which benefits accrue should be the level at which management occurs**
5. **The unit of proprietorship should be the unit of production, management and benefit**
6. **The unit of proprietorship should be as small as practicable within ecological and socio-political constraints**

Murphree (1991)

Although the issue of devolution has already been laboured throughout this document, the observations which Murphree (2000) makes below are historically significant and still relevant. In 2009 SASUSG is emphasizing that full devolution is needed to enable local communities to adapt to accelerated environmental and economic change – yet as long ago as 2000 Murphree had made the point that devolution was needed to develop 'self-sufficiency and resourcefulness' and that, for this to happen, local communities needed to be free to experiment.

Devolution

Many planners and bureaucrats see devolution of authority as a step-by-step process where communities are granted powers incrementally as they demonstrate the ability to manage. This is "Catch 22". Authority is a pre-requisite for responsible management and should not be held out as a reward for it. Devolution carries with it the responsibility for organisation, management, control, self-sufficiency and, above all, for developing resourcefulness. These attributes cannot be imposed, they must be developed experimentally in the local setting and, without authority, such experiments are defective. **The stimulus arises not from the anticipation of future entitlement but from the imperative of immediate empowerment.**

Murphree (2000)

Remaining sensitive to the imperative of avoiding ‘command-and-control’ prescriptions, there will nevertheless arise situations where decisions will be made by central authorities about the boundaries of community resource areas – perhaps without the community’s participation. The guidelines below would apply in such a situation.

The Design of Small Local Jurisdictions

The membership –

- **The fewer members the better**
- **The closer they live together the better**
- **The more they interact together on a daily basis the better**

The relationship of group size to the resource base is central –

- **Large groups with weak resource bases are unlikely to succeed**
- **Small dispersed groups with large valuable resource bases will have difficulty acting in cohesion**

Murphree (2000)

Subsidising Communal Resource Regimes

In systems which are not viable, recovery may require investment in forms of capital which enable people to self-organise. The dangers of such subsidies need to be recognised, however, and the investment should cease as soon as self-organisation becomes apparent because, ultimately, subsidisation will increase the vulnerability of the system as a whole. It will also be necessary to stop investing in the capitals which maintained the unviable regime in the first place. Many social-ecological systems remain maladapted to current conditions because of the political difficulties of doing this.

Cumming (*et al.* 2006)

This could also be seen as the restoration of social, ecological and financial capital to impoverished communal lands. The transformation is enabled by changing the power balance between government and repressed, dependent local communities. It requires skill and artistry on the part of the restorer to avoid getting sucked into perpetuating local dependency. Most aid projects don’t have the time or skills necessary, so they promote dependency by default.

Lessons learnt from complex systems

All of following are taken from Ruitenbeek & Cartier (2001)

- (1) **Lessons from complex systems may be directly transferable between systems.**
- (2) **A balance is needed between exploitation of existing ideas and exploration for new ideas.**
- (3) **Use social criteria to promote the spread of valued traits. Studies of incentives and disincentives in bio-economic systems tend to focus on monetary reward and often miss those criteria which are valued locally.**
- (4) **In assessing progress towards high-level goals, seek simple lower level criteria which tell the same story.**
- (5) **Do not sow failures in order to gain small efficiencies. Complex systems which escape failure are those with inbuilt redundancy.**
- (6) **Be slow to assign blame or attribute credit. Failure may appear to emanate from a small part of a system when in fact the whole system is to blame. In complex systems, it is common to attribute success to one set of factors when a different set is responsible.**
- (7) **Systems that mismatch the level of complexity to the management regime will fail whether they were evolving within the system or imposed externally.**
- (8) **Avoid rigid project designs that are unable to accommodate the changing preferences typical of complex systems.**
- (9) **Reduce externalities – externalities arise when individuals within a complex system do not bear all the costs or receive all the benefits from their decisions.**
- (10) **Leadership plays a critical rôle in successful complex systems. A single individual advocating a particular strategy is often copied – this is a powerful design and policy tool in any system.**

Ruitenbeek & Cartier (2001) assign three potential rôles to people in the panarchy of social-ecological systems – they can be **observers**, **designers** or **players**. This is the choice for the members of SASUSG – we are all part of the panarchy. Inevitably, everyone is a player in the system – so the choice reduces to that of being an observer or a designer. Observers will attempt to describe the panarchy whilst designers will attempt to influence it. Inevitably, there will be an element of both types amongst the SASUSG members. But would-be designers need to be aware that, in this rôle, they are no more than active agents within a larger system. Both rôles are valid: **there is a need for a greater understanding of social-ecological systems and there is a need for raising the awareness of the players who form SASUSG's core constituency. The scope of the designer's role in SASUSG should perhaps be limited to creating and protecting the conditions for the emergence of workable resource management regimes.**

DISCUSSION

What is happening in many parts of southern Africa is a bold experiment in wildlife management as a land use. For it to succeed, the primary concern of the stakeholders must lie in successful development. The use of land should be viable, should outcompete alternative land uses and must be ecologically sustainable. Conservation will be achieved as a byproduct of the quest for sustainability. The minimum of constraints need to be placed on these experimenters and risk-takers and a great deal more should be done to promote their efforts – be they local communities or private landholders.

Left to their own devices, it is probably axiomatic that landholders will pursue the highest-valued land uses, including irrigated agriculture and intensive livestock production in the limited areas where they are possible. It is unlikely that they would attempt to maintain large wildlife populations on land which is ecologically and economically more suited to other forms of production under competitive marketing and tax structures. However, the rapidly increasing costs of large scale intensive crop production may soon render this land use as unsustainable as subsistence farming.³² Developing potential intensive production areas in concert with wildlife and livestock development may offer the best prospects for sustainable development.

Because primary production in most of the southern African savannas is so greatly limited by rainfall, **the more wealth creation can be decoupled from a direct reliance on primary and secondary production, the less susceptible it will be to annual seasonal fluctuations in rainfall.** One means of achieving this end is to develop high-valued tourism ventures in which the value is derived from services instead of from crop and meat production (Cumming 2005).

None of the apparently rational decisions which might be made by farmers will occur without devolution of authority over natural resources. Both Rihoy and Nelson are critical of SASUSG's continued advocacy of devolution in the face of political realities –

Lamenting the failure of States to devolve authority is failing to address the **real** root cause of the problems – political incentives and context – whilst at the same time perpetuating one of the fundamental problems of CBNRM, that of the adoption of **'devolution' as a 'blue-print'** project prescription or, to use the document's terminology, a 'rigid project design'.

Rihoy (comments on the first draft of this document)

32. Mike Jones (comments on the first draft of this document) observes "Subsistence farming *per se* is not unsustainable: it may have become so through the influence of a global drive to build an industrial society based on fossil fuel. The industrialisation of agriculture is not sustainable because of the finite supply of fossil energy and the self-regenerative capacity of soil, two fundamentally slow variables that have largely been ignored as economies have grown. Tourism too, is a relatively short term solution to problems in communal lands because it depends on markets in the industrialised north. Furthermore, most of the benefit generated from tourism remains in the north, so tourism will ultimately be exploitative of communal lands, unless managed differently than it is today.

Suffice it to say that we see little point in telling States to devolve control over valuable resources when doing so is directly in conflict with the incentives which drive policy decisions (e.g. private capture of public resources, patronage networks, etc.). Such technocratic recommendations will not get us where we want to go. What is needed is rather to change the political formulations and power relations of those involved in these negotiations over resources – effectively to change the make-up of the 'state' so that people can demand rights and governance processes will be more accountable. In other words, we are highly unlikely to have devolution without more democracy, (Ruitebeeck & Cartier 2001).

Nelson (comments on the first draft of this document)

A valid point is made by both Rihoy and Nelson that SASUSG has failed to place enough weight on the political dimensions of natural resource management. Rihoy's averment that the *real root cause* of the problems lie in political incentives and context can be questioned. What Rihoy is referring to as a '*root cause*' may, in fact, be more of a symptom than a cause (see below). Describing devolution as a *blue-print project prescription* is much the same as describing the concept of 'freedom' as being too restrictive.

Nelson may be 'shooting for the moon' in advocating that what needs to be changed is the '*make-up of the State*'. It is easier for SASUSG to advocate devolution at the grass-roots level and hope that this will bring about incremental change at higher political levels than it is to propose direct confrontation on democratic issues at the level of the state. If the latter were easy, by now international peer pressures would have caused changes in many African governments.

In **Appendix 4** (page 45) some extracts from the *Origin of Wealth* (Beinhocker 2006) are presented. Beinhocker describes 'Big Man' economic and political systems (where power and wealth is centralised in the hands of an élite few) and notes that the societies in which they occur are characterised by low levels of trust, an inability to cooperate, a view of the world as a 'zero-sum' game and a low investment in innovation. In the natural selection process which operates on economic systems, theoretically such types of governance should become extinct fairly rapidly: in practice they are able to persist for long periods – albeit with their entire population held in a poverty trap.

The only workable antidote to them is a market-based society with strong reciprocity (i.e. where cooperation between individuals is high and there are strong penalties for cheaters). The rôle of the state in such societies is to create an institutional framework that supports the evolutionary workings of markets, strikes an effective balance between cooperation and competition and shapes the economic fitness function to best serve the needs of society. The transition from a Big Man economy to a market-based society is not easy.

Appendix 1

Resolution CGR4.MOT069 adopted by the World Conservation Congress held in Barcelona, Spain 5-14th October 2008

Empowering local communities to conserve and manage natural resources in Africa

RECOGNIZING that local people have been managing their natural resources for millennia as an essential part of their livelihoods;

OBSERVING that many natural resource policies of the last century undermined the rights of communities to manage and benefit from their environments;

ACKNOWLEDGING that independent African governments have gone some way towards redressing this situation through “Community-Based Natural Resource Management Programmes” which grant limited rights of access to local resources;

CONCERNED that these measures have not gone far enough to restore the essential rights needed to develop the adaptability and resilience of local communities in the face of new emerging threats such as climate change, food shortages and pan-African human and animal health pandemics;

NOTING that robust management institutions can only be realized, and that economic incentives for sustainable natural resource management are only likely to be optimized, when people have full authority and responsibility for their resources;

EMPHASISING that the strengthening of these rights is a pre-requisite for local peoples to adapt and survive the growing crisis affecting Africa; and

RECALLING Res 3.012 (*Governance of natural resources for conservation and sustainable development*) adopted by the 3rd Session of the World Conservation Congress, which “urges IUCN to serve in a leadership role in relation to governance of natural resources for conservation and sustainable development”;

The World Conservation Congress at its 4th Session in Barcelona, Spain, 5–14 October 2008:

1. CALLS on African governments to confer legal rights on local people to:
 - a. Establish institutions for communal conservation and management of natural resources; and
 - b. Define the structure and membership of such institutions;
2. CALLS on local communities or collectives in Africa to establish institutions to conserve and manage the natural resources on which they depend for their security;

3. URGES local institutions in Africa established to conserve and manage natural resources to be given the authority and responsibility, *inter alia*, to:
 - a. Take all necessary measures to protect their natural resources;
 - b. Take all decisions on use of local resources and collaborate with neighbouring institutions when issues of scale demand a wider consideration;
 - c. Retain all income and non-monetary benefits from their management; and
 - d. Decide on the distribution of all income and benefits from their management; and
4. URGES all interested IUCN members to:
 - a. Advocate the case for such rights to be granted to local peoples and to assist governments with the legal basis for conferring such rights; and
 - b. When requested by local communities, to advise and assist them to establish institutions to manage and conserve the natural resources on which they depend for their security;

In addition, the World Conservation Congress, at its 4th Session in Barcelona, Spain, 5–14 October 2008, provides the following guidance in the implementation of the Programme 2009–2012:

1. CALLS on the Director General, where practicable and within the parameters of the programme, to advise and assist communities wishing assistance to establish institutions to conserve and manage natural resources; and
2. URGES all IUCN Commission members to advise and assist communities wishing assistance to establish institutions to conserve and manage natural resources.

Sponsors:

Resource Africa
Namibia Nature Foundation
CAMPFIRE Association
Society for the Protection of Nature in Lebanon
East African Wildlife Society

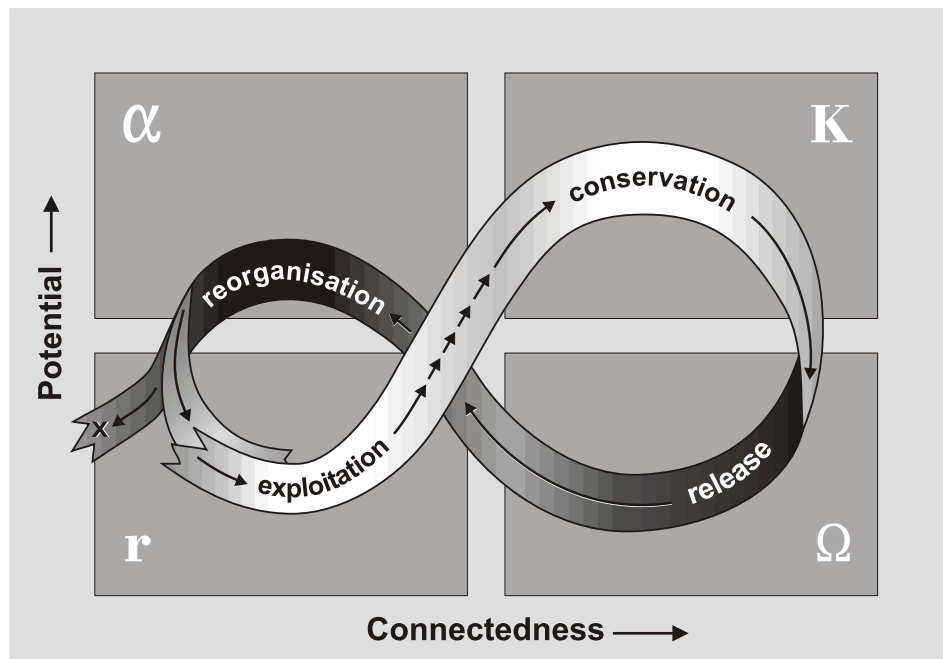
Appendix 2

COMPLEX SYSTEMS

The Adaptive Cycle

Underpinning much of complex system theory is the concept of variables which exhibit cyclical behaviour both in space and time. A large mammal population may increase in numbers to the point where it is unable to increase any further because of a limited food supply. Even if it is capable of regulating its own population size to live in balance with the available food, it is in a vulnerable situation where some other environmental factor (e.g. a drought) may cause a sudden reduction in the food supply, precipitating a population crash. Depending on the severity of the crash, the population may cause considerable damage to its own environment at the time of the crash. When and if the factor which caused the crash is removed (e.g. the rainfall improves), the system may not be able to recover immediately. Not only are major adjustments within the population likely but it may have to find new ways to cope with a much-modified environment. In the worst case, the population might find itself caught in a 'poverty trap' where recovery to its original status is impossible because the food supply is prevented from recovering. However, with some time lags in the system, the cycle may repeat itself.

The description of the adaptive cycle which follows is based on Holling (2001).



The Adaptive Cycle: A stylized representation of the four ecosystem functions (r , K , Ω , α) and the flow of events among them. The arrows show the speed of the flow in the cycle. Short, closely spaced arrows indicate a slowly changing situation; long arrows indicate a rapidly changing situation. The cycle reflects changes in two properties: the y axis (the potential that is inherent in the accumulated resources of biomass and nutrients) and the x axis (the degree of connectedness among controlling variables). The exit from the cycle indicated at the left of the figure suggests, in a stylized way, the stage where the potential can leak away and where a flip into a less productive and less organized system is most likely (Holling 1986).

Three properties shape the adaptive cycle and the future state of a system –

1. The inherent potential of a system that is available for change, since that potential determines the range of future options possible. This property can be thought of, loosely, as the "wealth" of a system.
2. The internal controllability of a system; that is, the degree of connectedness between internal controlling variables and processes, a measure that reflects the degree of flexibility or rigidity of such controls and their sensitivity to perturbation.
3. The adaptive capacity; that is, the resilience of the system, is a measure of its vulnerability to unexpected or unpredictable shocks. This property can be thought of as the opposite of the vulnerability of the system.

These three properties – wealth, controllability, and adaptive capacity – are general ones, whether at the scale of the cell or the biosphere, the individual or the culture. They are the properties that shape the responses of ecosystems, agencies and people to crisis. The ‘figure-of-eight’ in the diagram should be taken as indicative only – different adaptive cycles will have different shapes.

Four key features characterise an adaptive cycle, with its properties of growth and accumulation on the one hand and of novelty and renewal on the other.

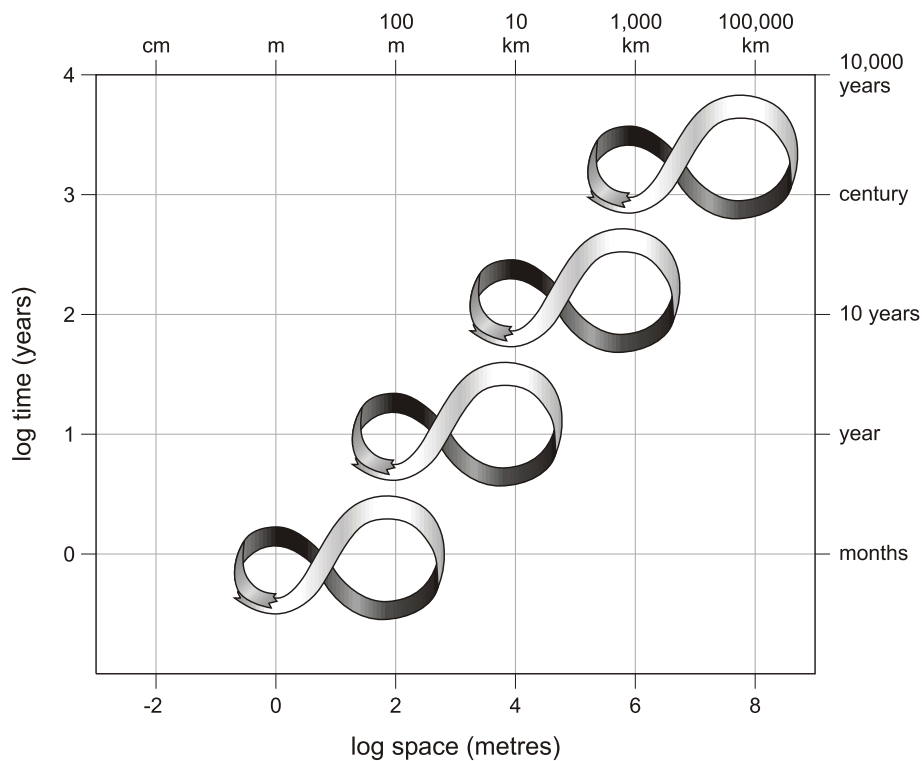
- (1) Potential or wealth increases incrementally in conjunction with increased efficiency but, in the process, an increasing rigidity develops.
- (2) This results in an increasing vulnerability (decreased resilience) to external threats. The system becomes an accident waiting to happen. A break can trigger the release of accumulated potential and the system then moves abruptly into a phase of reorganization.
- (3) Innovation then occurs in pulses or surges when uncertainty is great, potential is high and controls are weak, so that novel recombinations can form. This is where low connectedness allows unexpected combinations of previously isolated or constrained innovations that can blossom into new opportunities.
- (4) Those innovations are then tested. Some fail, but others survive and adapt in a succeeding phase of growth.

It is as if two separate objectives are functioning in sequence. The first maximises production and accumulation; the second maximizes invention and reassortment. The two objectives cannot be maximized simultaneously but only occur sequentially. And the success in achieving one inexorably sets the stage for its opposite. The adaptive cycle therefore embraces two opposites: growth and stability on the one hand, change and variety on the other.

This description applies to what might be a single variable within a complex system. In any system there is a need to envisage a **hierarchy** with many such cycles operating at different spatial and temporal scales (see figure on the next page). Depending on the degree of connectedness between the different variables, events in one cycle may trigger changes within another. This characteristic of complex systems gives rise to surprises which are almost impossible to predict.

In the sense used here, **hierarchies** are not a top-down sequence of authoritative control. Rather, they are a system of semi-autonomous levels formed from the interactions among a set of variables that share similar speeds and other attributes. Each level communicates a small set of information or quantity of material to the next higher (slower and coarser) level. As long as the transfer from one level to the other is maintained, the interactions within the levels themselves can be transformed, or the variables changed, without the whole system losing its integrity. There is wide latitude for experimentation within levels, thereby greatly increasing the speed of evolution.

A dynamic hierarchy serves two functions. One is to conserve and stabilize conditions for the faster and smaller levels; the other is to generate and test innovations by experiments occurring within a level. Each level is allowed to operate at its own pace, protected from above by slower, larger levels but invigorated from below by faster, smaller cycles of innovation. The whole panarchy is therefore both creative and conserving. The interactions between cycles in a panarchy combine learning with continuity.



Understanding hierarchies shifts attention away from the small-scale view that has characterised much of biological ecology to a multi-scale and landscape view that recognizes that biotic and abiotic processes can develop mutually re-enforcing relationships over distinct ranges of scale. A dynamic hierarchy serves two functions. One is to conserve and stabilize conditions for the faster and smaller levels: the other is to generate and test innovations by experiments occurring within a level. The adaptive cycle is a heuristic model – a fundamental unit that contributes to the understanding of the dynamics of complex systems from cells, to ecosystems, to societies, to cultures.

If we can understand adaptive cycles and their scales, it may be possible to evaluate their contribution to sustainability and to identify the points at which a system is capable of accepting positive change and the points where it is vulnerable. It then becomes possible to use those leverage points to foster resilience and sustainability within a system.

Holling 2001

Expect surprise

Because of multiple cycles, internal interactions and feedback mechanisms, **complex systems generate surprises** which cannot be predicted by reductionist science. Complex systems which have persisted for a long time show a remarkable degree of resilience – they tend to self-correct. The key point in a complex system is that causality disappears and **it may be impossible to tell whether any particular policy intervention has produced the expected result** (Ruitenbeek & Cartier 2001).

Panarchy

Panarchy is a concept that explains the evolving nature of complex adaptive systems (Holling 2001). It is the hierarchical structure in which social-ecological systems are interlinked in never-ending adaptive cycles of growth, accumulation, restructuring and renewal (see figure on previous page). These cycles take place in nested sets at scales ranging from a leaf to the biosphere over periods from days to geologic epochs and from the scales of a family to a socio-political region over periods from years to centuries. The functioning of these cycles and the communication between them determines the sustainability of a system.

Human systems exhibit at least three unique features that can dramatically enhance the potential of panarchies. These three features are **foresight, communication, and technology**.

Resilience

The **resilience** of any social-ecological system is a measure of that system's ability to withstand perturbations and unexpected disturbances whilst maintaining its essential functioning.

A system's ecological resilience expands and contracts over the phases of the adaptive cycle. The conditions that occasionally foster novelty and experiment occur during periods when connectedness (controllability) is low and resilience is high. The low connectedness, or weak control, permits novel re-assortments of elements that were previously tightly connected to others in isolated sets of interactions. The high resilience allows tests of the new combinations because the system-wide costs of failure are low. **This is the condition for creative experimentation.** This recognition of resilience varying within a cycle adds an element that can reconcile the paradoxes of conservative nature versus creative nature – sustaining the *status quo* versus creative change (Holling 2001).

Transformability

... is the capacity to create a fundamentally new system when ecological, economic, or social (including political) conditions make the existing system untenable (Walker *et al.* 2004).

The Rôle of Slow Variables

Social-ecological systems are usually configured by certain key slow variables. Embodied in these variables is the accumulated social or ecological capital which provides the resilience of the system and, hence, its sustainability. A maxim for managing complex systems might be “look after the slow variables and the fast variables will take care of themselves”. Changes which take place in slow variables result in transformations to the system itself and are indicative of societal development. Ostrom (2007) gives an analytic approach to complex systems which reduces the multiplicity of variables involved in any SES by identifying the key slow variables.

Diversity and Variability

The resilience of any complex adaptive system is embodied in its diversity in all forms – biological, landscape, social, and economic. Diversity increases the capacity for adaptive change among system components. Management efforts to reduce diversity and disturbance weaken the capacity of the system to respond (Levin 1999, Walker & Salt 2006).

Over-connected Systems

Over-connected systems are susceptible to shocks which may be rapidly transmitted throughout the system. The most resilient systems are those where connectivity amongst variables is fairly low and high degree of modularity is in place. In modular structures there is buffering against cascades of disaster.³³ Modular structures can apply to management at any scale – individuals, corporations or the biosphere (Levin 1999, Walker & Salt 2006).

Ecological and institutional redundancy

Resilient social-ecological systems have many overlapping ways of responding to a changing world. Redundancy in institutions increases the response diversity and flexibility of a system (Ostrom 1999, Ruitenbeek & Cartier 2001). Totally top-down governance structures with no redundancy in roles may be efficient (in the short term) but they tend to fail when the circumstances under which they were developed suddenly change. More "messy" structures perform better during such times of change (Walker & Salt 2006).

Feedback loops

Tight reward and punishment loops are essential for adaptive change. This applies to cost-benefit loops and **implies a return to local control**. Tightening feedback loops leads to empowerment and getting prices right (Levin 1999).

Resilient social-ecological systems rely on the strength of feedbacks. They allow detection of thresholds before crossing them. Globalization is leading to delayed feedbacks that were once tighter; the people of the developed world receive weak feedback signals about the consequences of their consumption of developing world products. Feedbacks are loosening at all scales including the within-scale systems (Walker & Salt 2006).

33. The interconnectedness of international financial markets and the mergence and re-emergence of global pandemics of disease (such as AIDS) are examples of a breakdown of modularity – with potentially disastrous outcomes (Levin 1999).

Social Capital

Building trust and environmental security is not an easy task, but it provides the only path to sustaining our fragile dominion over the Earth's resources.

Levin (1999)

Resilience in social-ecological systems is very strongly connected to the capacity of the people in that system to respond collectively and effectively to disturbances.³⁴ Trust, strong networks, and leadership are all important factors in making sure this can happen. So, too, is the existence of an institution that has strong penalties for cheaters (Ostrom 1999). Individually these attributes contribute to what is generally termed **social capital** but they need to act in concert to affect adaptability (Walker & Salt 2006).

Policies should contribute to the consciousness of individuals within a complex system. Individuals must be aware that they are capable of learning, they are capable of adapting; and they are part of a complex system – therefore simple cause-effect relationships may not apply. **A part of this consciousness is the feeling that, as individuals in a complex system, they are not powerless.**

Ruitenbeek & Cartier (2001)

Levels of trust vary widely across cultures. **There is an important correlation between trust and economic success.** High trust leads to economic cooperation, which leads to prosperity, which further enhances trust in a virtuous circle. But the circle can be vicious as well, with low trust leading to low cooperation, leading to poverty and further eroding trust.

Beinhocker (2006)

34. Mike Jones (comments on the first draft of this document) is critical of a statement by Walker & Salt (2006) that poor people have no choice but to overexploit their environment: “To claim that they have no choice is to cast them permanently in the role of victim and dependent. Governments, donors and NGOs may want poor communities to stay poor for all kinds of self-serving reasons, but if we are to build a resilient world we have to get out of the habitat of perpetuating the victimization cycle that is a symptom of the poverty trap.”

Appendix 3

MATCHING SCALES IN SOCIAL ECOLOGICAL SYSTEMS

Scale Mismatches

[This section is drawn from the abstract of Cumming (*et al* 2006) with minor modifications]

Scale is a concept that transcends disciplinary boundaries. In ecology and geography, scale is usually defined in terms of spatial and temporal dimensions. Sociological scale also incorporates space and time but includes dimensions of representation and organization. Murphree (2000) defines scale in social-ecological systems as a graduated, cumulative order encompassing jurisdictional, functional, spatial, ecological and temporal relationships.

Many of the problems encountered by societies in managing natural resources arise because of a mismatch between the scale of management and the scales of the ecological processes being managed. Scale mismatches occur when the scale of environmental variation and the scale of social organization in which the responsibility for management resides are aligned in such a way that one or more functions of the social-ecological system are disrupted, inefficiencies occur, and/or important components of the system are lost. They are generated by a wide range of social, ecological, and linked social-ecological processes.

Social-ecological interactions can create dynamic feedback loops in which humans both influence and are influenced by ecosystem processes. Mismatches between the scales of ecological processes and the institutions that are responsible for managing them can contribute to a decrease in social-ecological resilience, including the mismanagement of natural resources and a decrease in human well-being.

Centralized prescriptions over land use, tenure, and resource access rights effectively stifle innovation and the development of adaptive co-management regimes at larger scales and across land tenure categories. In arid areas, livestock and wildlife production systems generally require large areas over which to exploit temporal and spatial variations in the availability of key resources. Fragmentation of large landscapes by fencing and inappropriate land tenure systems and systems of resource access rights militate against adaptive strategies that may be more productive and sustainable in arid areas. The development of large-scale wildlife co-management schemes involving the effective amalgamation of former cattle ranches into large-scale wildlife tourism areas is a case in point (Cumming 2005).

Solutions to scale mismatches usually require institutional changes at more than one hierarchical level. Long-term solutions to scale mismatch problems will depend on social learning and the development of flexible institutions that can adjust and reorganize in response to changes in ecosystems. Releasing the creative capacities of farmers, resource managers, and communities may go a long way towards solving food and environmental security problems.

A valid rôle for SASUSG is to diagnose, understand and help governments and local constituencies to resolve scale mismatches in linked social-ecological systems.

Scaling Up

There is real danger that solutions to scale mismatches can result in small local institutions being disempowered in the re-organisation process. In SASUSG's (1995) principles for sustainable use a major emphasis was placed on devolution of rights and responsibilities for natural resources to the smallest accountable social units. SASUSG's position on this has not changed. However, Murphree (2000) recognised the requirement for matching functional and ecological scales with jurisdictional requirements beyond the level of small local institutions. One stimulus for Murphree's *Boundaries and Borders* paper may have been the inception of a wave of trans-boundary conservation area initiatives in southern Africa which threatened to engulf and dispossess local communities.

Murphree (2000) identifies two contrasting policy thrusts – **BIG GOVERNMENT** and **SMALL IS BEAUTIFUL** (Schumacher 1973). **BIG GOVERNMENT** policy seeks to centralise controls at the national level and may even yield up large parts of its sovereignty to global jurisdictions.

Notwithstanding the requirement to plan over larger scales, the foundation for **SMALL IS BEAUTIFUL** rests upon a mosaic of communities each with extensive rights over their individual parcels of land and resources. The critical insight in Murphree (2000) is that this is not an exercise in isolationism. **Rather it is a search for local regime independence within the larger setting of interdependence at many scales.**

“Scaling Down” to be sustainable involves “Scaling Up”. Three themes emerge as **principles** for linking and matching functional, ecological and jurisdictional scales –

The Principle of Jurisdictional Parsimony

Management institutions (“jurisdictions”) need to be matched to the specific requirements of resources to be managed and should be no larger than is necessary.

The Principle of Delegated Aggregation

To meet the ecological imperatives of larger scales, management institutions need to be expanded – this must be done through a process of aggregation rather than expropriation

The Principle of Constituent Accountability

To reach the desirable situation where local groups influence the allocations of entitlements through the political process, local jurisdictions must become a significant political constituency of the state and one to which the state is accountable

Murphree (2000)

This suite of principles allows hierarchical linkages to be established amongst the various natural resource management regimes detailed in the previous section. It also provides a framework for co-management amongst regimes, including State Protected Areas and Trans-Frontier Conservation Areas, whereby the process of addressing scale mismatches can occur without the loss of autonomy of the local constituencies.

Appendix 4

THE ORIGIN OF WEALTH

The Radical Remaking of Economics and What it Means for Business and Society

Extracts from Eric D. Beinhocker (2006)

Part III How Evolution Creates Wealth

13. Economic Evolution

FROM BIG MEN TO MARKETS

Selection: Big Men versus Markets

Over its history, humankind has evolved two methods of economic selection: Big Men and markets. ... In the early days of the economy, the selection process was fairly straightforward – survival. ... As society and the economy grew more complicated, however, the feedback loop of selection became less direct, with intermediate socially-driven selection cropping up. ... Political meddling in economic affairs is as old as both politics and economics themselves. (p287)

If a tribe is generally surviving and the Big Man's graft, corruption or incompetence isn't life threatening, then relatively few people may even be aware of the additional wealth their tribe is giving up. ... Competition puts some checks and balances on this: eventually another Big Man might come along promising to do better and topple the old one, or the poorly performing tribe might be violently taken over by a better-organised one. But there is nothing to guarantee that the new Big Man or tribe will turn out any better than the old one. Thus the main impact of political interference in the process of selection is to slow evolution's clock-speed. In extreme cases, chiefs, kings, dictators and other Big Men can actually stop evolution in its tracks and, as long as people are merely close to starving as opposed to actually starving, such evolutionary dead ends can last for very long periods. (p288)

In a Big Man system, the fitness function maximised is the wealth and power of the Big Man (and his cronies), rather than the overall economic wealth of the society. (p288)

The only alternative selection system to Big Men that humans have thus far devised is markets. ... The fitness function that markets attempt to satisfy is the overall welfare of the people participating in them. In a Big Man economy, a business lives or dies by political favour. In a market-based economy, a business lives or dies by whether its customers like and are willing to pay for its products and services. (p288)

In Praise of Markets – for Different Reasons

Markets provide incentives for the deductive-tinkering process of differentiation. They then critically provide a fitness function and selection process that represents the broad needs of the population (and not just the needs of a few Big Men). The reason markets work so well is because of Orgel's Second Rule "Evolution is cleverer than you are". Even a highly rational, intelligent, benevolent Big Man would not be able to beat an evolutionary algorithm in finding the peaks in the economic fitness landscape. (p294)

None of this is to say that market-oriented societies are perfect. ... The societies of the rich capitalist world have critical problems with inequality, environmental destruction and health crises ... and there is strong evidence that the rampant materialism of these societies does not necessarily make people happier. Impoverished Big Man societies have these same problems as well – but usually to a worse degree with fewer resources to address them and a lower likelihood that new innovative approaches will solve them. Finally, the evolutionary view of markets does not diminish the difficulties that many countries have had in making the transition from Big Man to market economies – transitions that inevitably involve wrenching social change. The bottom line is that people vote with their feet and the record of worldwide immigration flows, particularly in the modern era, has consistently been from Big Man economies to market-oriented economies. The Complexity view of markets leads to an appreciation of the strength of markets in enabling innovation and growth. (p295)

Part IV What it Means for Business and Society

18. Politics and Policy

THE END OF LEFT VERSUS RIGHT

A Framework Past Its Time

Politics has been viewed on a spectrum from Left to Right for well over two hundred years. ... From its earliest days, the term *Left* has connotations of fighting for social progress, defending the less privileged and remaking society for the better – but the term also had the whiff of Utopianism. Likewise the term *Right* had connotations of emphasizing individual freedom and responsibility, protecting social stability and a belief in natural, incremental progress – but also had a subtext of defending the privileged and the powerful. The economic dimensions of the Left-Right dichotomy were crystallised in the 1900s by the epic battle between socialism and capitalism. By the early twentieth century the Left had become associated with policies advocating strong government intervention in the economy ranging from outright ownership of economic assets in communist economies to partial ownership and a regulatory role in social democracies, while the Right had become the haven of free-market advocates. (p416)

The divide between Left and Right may have narrowed after the collapse of the Berlin Wall in 1989 but it did not go away. ... To the extent that a Third Way was developed in the 1990s, it was based more on practical politics than on new economic theories. Both sides had learnt the hard way that extreme or purist implementations of their models simply did not work. State-run Utopias turn into bureaucratic nightmares and free-market paradises lead to dysfunctional societies. It is this intellectual vacuum that Complexity Economics has the potential to fill. The fundamental question isn't Left versus Right – it is how best to evolve. (p417-418)

Human Nature and Strong Reciprocity

There are two conflicting views of human nature. On the Left is the view that human beings are inherently altruistic; that greed and selfishness stem not from human nature but from the construction of social order; and that humans can be made better through a more just society. On the Right is the view that human beings are inherently self-regarding and that the pursuit of self-interest is an inalienable right. The most effective system of government is one that accommodates rather than attempts to change this aspect of human nature. (p418)

Human beings are neither inherently altruistic nor selfish: instead they are what researchers call *conditional cooperators* and *altruistic punishers*. This behaviour is referred to as *strong reciprocity* – a predisposition to cooperate with others and to punish (even at personal cost) those who violate the norms of cooperation. ... The universality of strong reciprocity is staggering: it has been found in groups of people ranging from modern industrial societies to remote hunter-gatherer tribes. ... The evolutionary logic for strong reciprocity is simple – in a world of non-zero sum games conditional cooperators perform better than those following either purely selfish or purely altruistic strategies. (p419)

Complexity Economics has shown that it is the combination of individual behaviour and institutional structures that creates the emergent behaviour of the system. (p421)

Left-Wing Utopias and Free Market Fantasies

The Critique of the Left

The real economy is simply too complex for the central planning required by a pure socialist economy to work effectively. Market mechanisms provide the feedback on what are good business plans versus bad business plans. In the absence of actual knowledge of what society wants and with no mechanism for enforcing a selection of those things, the Big Man hierarchy of the state will simply produce whatever it decides to produce. The natural tendencies of Big Man power hierarchies is to do things that serve the interests of the Big Men. Thus the fitness function in pure planned economies inevitably reflects the interests of the power hierarchies and not those of society more broadly. (p422-423)

The Critique of the Right

The tendency of some on the right to assume that markets are the answer to all problems in society is misguided. ... Economies don't exist in isolation. The economic evolutionary system is constructed out of a vast array of social technologies many of which rely on government. Market-based evolution requires a careful balance between cooperation and competition and governments play a vital role in enabling their societies to strike this balance.

One merely has to travel to developing countries with weak government institutions to see what life is like without these interventions. An economy can end up in a low cooperation, low competition dead end when government fails to play this role. (p424-425)

Government as Fitness Function Shaper

The economic role of the state is to create an institutional framework that supports the evolutionary workings of markets, strikes an effective balance between cooperation and competition and shapes the economic fitness function to best serve the needs of society. Consistent with the norms of strong reciprocity, the state also has an obligation to ensure that all its citizens have an equal opportunity to participate in the economic system and to provide a basic level of support for those who do not succeed in that system. ... The question is not states versus markets – it is how to combine states *and* markets to create an effective evolutionary system. (p426-427)

“Culture Matters”

Culture is the emergent product of the micro-rules of behaviour of individuals. Culture plays a major role in the performance of organisations and nations. In the case of nations, the rules or norms of behaviour aren't merely acted out by thousands but are acted out by millions. ... The norms of one culture might be more supportive of economic development than those of another but, at the same time, it must be recognised that there is no one cultural formula for economic success. Which norms support economic development and which norms don't?

At the individual level, norms that include a strong work ethic, individual accountability and a belief that you are the protagonist of your own life and not at the whim of gods or Big Men will favour economic development.

At a higher level, norms related to cooperative behaviour influence economic performance. One is the belief that life is a non-zero-sum game and that there are payoffs for cooperation. Societies that believe in a fixed pie of wealth have a difficult time engendering cooperation and tend to be low in mutual trust. Cultural norms which value strong reciprocity generally lead to the generation of wealth.

Cultures which look to rational scientific explanations for the world rather than religious or magical explanations tend to be more innovative. Similarly a culture needs to be tolerant of heresy and experimentation: strict orthodoxy stifles innovation. Cultures which have norms supporting competition and celebrating achievement do better than overly egalitarian cultures which do not take risks.

A final norm important to all of the above is how people view time. Cultures that live for today (or are mired in the past) have problems across the board ranging from low work ethics, an inability to engage in complex cooperation and to low levels of investment in innovation. Why work hard and invest in cooperation and innovation if tomorrow doesn't matter? Cultures which have an ethic of investing for tomorrow tend to value work, have high intergenerational savings rates, demonstrate willingness to sacrifice short-term pleasure for long-term gain and enjoy high levels of cooperation.

At a Harvard conference held in 1999 entitled “ Cultural Values and Human Progress”, an African business executive (Daniel Etounga-Manguelle) noted that despite the diversity of african cultures there is “a foundation of shared values, attitudes and institutions that binds together nations south of the Sahara”. He argued that too many of their common norms are on the wrong side of the cultural typology and highlighted two factors in African culture that he believes have particularly negative economic impacts – excessive concentrations of authority in individual Big Men (who often claim magical powers) and a view of time that focuses on the past and present but not the future. “Without a dynamic perception of the future, there is no planning, no foresight, no scenario building and no policy to affect the course of events”. (p428-431)

If your beliefs are biased to seeing the world as a zero-sum game, then your objective will be to get your slice of the pie. You will view someone else’s gain as your loss and your proclivity to cooperate will be low. Rather than searching for new, more complex and wealth-creating cooperative activities, people will invest their energies in finding ways to capture a greater share of existing wealth. It is not hard to imagine that thievery, dishonesty and corruption will be higher in such a zero-sum society.

Now, imagine a population in which some agents think the economic pie is fixed while others have a non-zero-sum view. Over time as the non-zero-sum agents find ways to cooperate and create new wealth they will be attacked by zero-sum agents trying to get their share. The conflict will lower the returns to cooperation and, eventually, the non-zero-sum agents will learn that cooperation doesn’t pay and become zero-sum agents themselves. In a low-cooperation society non-zero-sum attitudes are essentially beaten out of the agents over time and they eventually learn to become zero-sum agents. Once a society is past a threshold ratio of non-cooperators versus cooperators in a population it becomes very hard maintain large scale cooperation – resulting in a ‘poverty trap’. (p428-432)

REFERENCES

- Abel N, D.H.M. Cumming & J.M. Anderies (2006). **Collapse and Reorganisation in Social-Ecological Systems: Questions, Some Ideas and Policy Implications**. *Ecology and Society* 11(1):17 [online]
URL: <http://www.ecologyandsociety.org/Vol11/iss1/art17/>
- Anstey, Simon & Liz Rihoy (2009). **Beacon & Barometer: CBNRM & Evolutions in Local Democracy in Southern Africa**. In: *Beyond Proprietorship: Murphree's Laws on Community-Based Natural Resource Management in Southern Africa*. Eds.(Mukamuri, Manjengwa & Anstey). Weaver Press, Harare: 41-57
- Barnes J.I. and J.L.V. de Jager (1996). **Economic and financial incentives for wildlife use on private land in Namibia and the implications for policy**. *SA J.Wildl.Res.* 26(2): 37-46
- Fikret Berkes (2007). **Community-based conservation in a globalized world**. *PNAS*, 104 (39): 15188-15193.
- Bond I. (1993). **The economics of wildlife and land use in Zimbabwe: an examination of current knowledge and issues**. WWF Multispecies Project Paper No.36, WWF-SARPO, Harare, Zimbabwe.
- Bond I. (1999). **CAMPFIRE as a Vehicle for Sustainable Rural Development in the Semi-Arid Communal Lands of Zimbabwe: Incentives for Institutional Change**. PhD Thesis, Department of Agricultural Economics and Extension, Faculty of Agriculture, University of Zimbabwe, Harare.
- CBD (2003). **Sustainable Use within an Ecosystem Approach**. Document prepared by the IUCN Sustainable Use Specialist Group and submitted by the Executive Secretary of the CBD to the Fifth meeting of the CBD Subsidiary Body for Scientific, Technical and Technological Advice on 24 January 2003 (UNEP/CBD/WS-Sustainable Use/4/4) and the Fourth Workshop on Sustainable Use of Biodiversity held in Addis Ababa, Ethiopia, 6-8 May 2003 (UNEP/CBD/WS-Sustainable Use/4/INF/2).
- CBD (2004). **Sustainable Use (Article 10)**. Decision VII/12 of the Seventh Conference of the Parties, Kuala Lumpur, Malaysia, 9-20 February 2004 under which the Addis Ababa Principles were adopted.
- Child B. (1989). **The Role of Wildlife in the Development of Semi-Arid Rangelands in Zimbabwe**. D.Phil Thesis, University of Oxford. In: Child G.F.T (1995).
- Child G.F.T. (1995). **Wildlife and People: A Zimbabwean Success**. *Wisdom Foundation*, Harare and New York. pp267
- Cumming D.H.M. (2005). **Wildlife, Livestock and Food Security in the South East Lowveld of Zimbabwe**. In: *Conservation and Development Interventions at the Wildlife/Livestock Interface: Implications for Wildlife, Livestock and Human Health*. Eds. S.A. Osofsky, S. Cleveland, W.B. Karesh., M.D. Kock, P.J. Nyhus, L. Starr & A. Yang. Occasional Paper No.30 of the IUCN Species Survival Commission, IUCN, Gland, Switzerland and Cambridge, UK.
- Cumming G, D. Cumming & C. Redman (2006). **Scale mismatches in social-ecological systems: causes, consequences, and solutions**. *Ecology and Society* 11(1): 14.
- Frost P.G.H & I. Bond (2008). **The CAMPFIRE programme in Zimbabwe: Payments for Wildlife Services**. *Ecological Economics* 65: 776-787

- GoB (1992). **Wildlife Conservation and National Parks Act, 1992**. Republic of Botswana Act No. 28 of 1992. Government Printer, Gaborone, 117pp
- Gunderson L. & C.S. Holling (2001). **Panarchy: Understanding transformations in human and natural systems**. Island Press, Washington D.C.
- Hardin, Garrett (1985). **Filters against Folly**. Penguin Books, New York. 144pp
- Holling C.S. (1976). **Adaptive Environmental Assessment and Management**. John Wiley, New York.
- Holling C.S. (1986). **Resilience of ecosystems; local surprise and global change**. In: *Sustainable development of the biosphere*, Eds. W.C. Clark & R.E. Munn, Cambridge (UK): Cambridge University Press. 292-317. Reprinted in: *The development of ecological economics*, C. Cleveland, R. Costanza, C. Perrings, Eds. 1997. Brookfields: Edward Elgar Publishing.
- Holling C.S. (2001). **Understanding the Complexity of Economic, Ecological, and Social Systems**. *Ecosystems* 4: 390-405
- Levin, S.A. (1999). **The Eight Commandments of Environmental Management**. Concluding chapter of *Fragile Dominion: Complexity and the Commons*, Perseus Publishing, Cambridge, Massachusetts. 250pp.
- Martin R.B. (1977). **Wildlife Industry's New Development For All (WINDFALL)**. Project developed in the Sebungwe region of Zimbabwe to for local communities to benefit from wildlife. Unpublished document of the Department of National Parks and Wild Life, Zimbabwe.
- Martin R.B. (1986). **Communal Areas Management Programme for Indigenous Resources (CAMPFIRE)**. (Revised Edition April 1986). Branch of Terrestrial Ecology, Department of National Parks and Wild Life, Zimbabwe. 86pp
- Martin R.B. (1998). **Environmental methodologies: why isn't the use of adaptive management more general?** Commissioned paper submitted to the Journal of Environment and Development, April 1998. 12pp
- Martin R.B. (2006a). **Wildlife co-management in the Mudumu North Complex, Caprivi, Namibia**. Consultancy for the Ministry of Environment and Tourism and the management Committee of the the Mudumu North Complex, facilitated by the Namibia Nature Foundation (NNF) and Integrated Community-based Ecosystem Management (ICEMA). 116pp + 20 maps
- Martin R.B. (2006b). **Elephant Management Plan for the Savé River Conservancy, South-East Lowveld, Zimbabwe**. Plan prepared for the 24 landholders in the conservancy, funded by the US Fish and Wildlife Service [72pp].
- Martin R.B. (2009). **Murphree's Laws**. In: *Beyond Proprietorship: Murphree's Laws on Community-Based Natural Resource Management in Southern Africa*. Eds.(Mukamuri, Manjengwa & Anstey). Weaver Press, Harare: 7-22
- MET (2009). **National Policy on Human-Wildlife Conflict Management**. Directorate of Parks and Wildlife Management, Windhoek. 34pp

- Murphree M.W. (1991). **Communities as Institutions for Resource Management.** Paper presented to the *National Conference on Environment & Development*, Maputo, Mozambique, 7-11 October, 1991 and re-published in 1993 under the Gatekeeper Series N. SA36, IIED Publications, London. 13pp
- Murphree M.W. (1995). **Optimal Principles and Pragmatic Strategies: Creating an enabling politico-legal environment for community-based natural resource management.** Keynote address to the *Conference of the National Resources Management Programme*, SADCC Technical Coordination Unit, Malawi, USAID-NRMP Regional, Chobe, Botswana, 3 April 1995.
- Murphree M.W. (1996a). **Wildlife in Sustainable Development: Approaches to Community Participation.** Presentation to the ODA, *African Wildlife policy Consultation*, Sunningdale, UK. 18-19 April 1996. 28pp
- Murphree M.W. (1996b). **Strategic Roots and Implementational Evolution.** Address delivered to the workshop on *Enhancing Sustainability: Resources for our Future*. World Conservation Congress, Montreal, 17th October 1996.
- Murphree M.W. (1997a). **In Search of Pragmatism: Efficiency in Coalitional Global Environmental Management.** Introductory Overview Address to the 7th Session of the Global Biodiversity Forum, Harare, 6th June 1997. 7pp
- Murphree M.W. (1997b). **Synergising Conservation Incentives: Sociological and Anthropological Dimensions of Sustainable Use.** Paper presented to the *STAP Expert Workshop on the Sustainable use of Biodiversity*, Kuala Lumpur, Malaysia, 24-26 November 1997
- Murphree M.W. (2000). **Boundaries and Borders: The Question of Scale in the Theory and Practice of Common Property Management.** Paper presented at the Eighth Biennial Conference of the International Association for the Study of Common Property (IASCP), Bloomington, Indiana, USA 31May-4 June 2000.
- Murphree M.W. (2001). **Experiments with the Future.** A Prologue to a Seminar on *An interdisciplinary, longitudinal and interactive methodology to explore environmental and institutional sustainability in the human use of nature*. UCB Botanic Garden, Berkeley, 20th October 2001. 6pp
- Murphree M.W. (2002). **Protected Areas and the Commons.** Common Property Resource Digest No.60:1-3
- Murphree M.W. (2004). **Who and What are Parks for in Transitional Societies?** In: *Parks in Transition: Biodiversity, Rural Development and the Bottom Line*. Ed: Brian Child. Published by Earthscan, UK: 217-231
- Murphree M.W. & Edmund Barrow (2001). **Community Conservation: From Concept to Practice.** In: *African Wildlife & Livelihoods: The Promise and Performance of Community Conservation*. Eds: Marshall Murphree & David Hulme, James Currey Ltd. Oxford. p24-37
- Murphree M.W. & David Hulme (2001). **Community Conservation as Policy: Promise and Performance.** In: *African Wildlife & Livelihoods: The Promise and Performance of Community Conservation*. Eds: Marshall Murphree & David Hulme, James Currey Ltd. Oxford. p280-297

- Murphree M.W. & David Mazambani (2002). **Policy Implications of Common Pool Resource Knowledge: A Background Paper on Zimbabwe.** Study carried out as part of a larger initiative titled *Policy Implications of Common Pool Resource Knowledge in India, Tanzania and Zimbabwe* under the UK Department for International Development's Natural Resources Programme: Semi-Arid Production Systems (Project R7973). 127pp.
- Nelson F. (Ed. 2009). **Politics of Natural Resource Governance in Africa.** Publication of the SASUSG Working Group on Governance, in press with Earthscan in November 2009.
- Ostrom E. (1999). **Coping with the tragedies of the commons.** Annual review of Political Science 2: 493-535
- Ostrom E. (2007). **A diagnostic approach for going beyond panaceas.** PNAS 104 (39): 15181–15187
- Parker I.S.C. (1993). **Essays: Conservation for Development, A Pernicious Creed, The Natural Justice of Ownership and Natural Justice, Ownership and the CAMPFIRE Programme.** Work commissioned by the Norwegian Government as comment on plans for the Serengeti ecosystem in Tanzania and Kenya.
- Rihoy, Liz (2007). **Civil Society Engagement with Climate Change Adaptation in Africa.** Project proposal of Resource Africa for CBNRM networking and coordination in Africa. 5pp
- Ruitenbeek, Jack & Cynthia Cartier (2001). **The Invisible Wand: Adaptive Co-management as an Emergent Strategy in Complex Bio-Economic Systems.** Occasional Paper No.34, Centre for International Forestry Research, Bogor, Indonesia. 47pp
- SASUSG (1995). **Sustainable Use.** Part II of the Proceedings of the First Meeting of the Southern Africa Sustainable Use Specialist Group, Pilanesburg, South Africa, 2-6 October 1995.
- SASUSG (1996). **Sustainable Use Issues and Principles.** Booklet prepared for the First World Conservation Congress, Montreal, Canada, October 1996.
- SASUSG (2002). **Principles for Sustainable Use.** Booklet based on SASUSG (1996) designed and produced by the Namibia Nature Foundation for the World Summit on Sustainable Development, Johannesburg, South Africa, September 2002.
- SASUSG (2006). **Sustainable Development, Sustainable Use and Conservation of Biological Diversity in Africa: the Development of New Principles for Sustainability.** First draft of a document prepared on behalf of the Specialist Group by Rowan B. Martin, October 2006. 52pp
- SASUSG (2007). **Sustainable Development based on Natural Resource Management: The Development of New Principles for Sustainability.** Second draft of a document prepared on behalf of the Specialist Group by Rowan B. Martin, October 2006. 52pp
- SASUSG (2008). **From Sustainable Use to Sustainable Development: Evolving Concepts of Natural Resource Management.** First draft of a Conceptual Framework which arose from a meeting of the SASUSG Working Group on Sustainability held in Xai Xai, Mozambique 7-10th July 2008, prepared on behalf of the Group by Rowan B. Martin, August 2008. 47pp
- Schumacher E. (1973). **Small is Beautiful: Economics as if people mattered.** Bland & Briggs, London.

- SUI (1996). **Factors Influencing Sustainability**. A report of the IUCN Sustainable Use Initiative to IUCN members in compliance with Recommendation 19.54, First World Conservation Congress, Montreal, Canada, 14-23 October 1996. 14pp.
- SUI (1998). **Policy Statement on Sustainable Use of Wild Living Resources**. Third draft, Fifth SUSG Meeting, Guatemala, 12 June 1998. With amendments, this became IUCN Policy after Second World Conservation Congress.
- Taylor R.D.& M.W. Murphree (2007). **Case Studies on successful southern African NRM initiatives and their impacts on poverty and governance – Zimbabwe: Masoka and Gairezi**. Study funded by USAID and facilitated by International Resources Group (IRG), World Conservation Union (IUCN) and the FRAME programme. 80pp
- Walker, B, C.S. Holling, S.R. Carpenter & A. Kinzig. (2004). **Resilience, adaptability and transformability in social–ecological systems**. Ecology and Society 9(2): 5. [online] URL: <http://www.ecologyandsociety.org/vol9/iss2/art5>
- Walker, Brian & David Salt (2006). **Resilience Thinking: Sustaining Ecosystems and People in a Changing World**. Island Press, Washington D.C. 175pp
- Walker B.H. & A.R.E. Sinclair (1990). **Problems of development aid**. Nature 343. p587
- Walters, C.J. (1986). **Adaptive Management of Renewable Resources**. McGraw-Hill, New York.
-