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Contents

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This report is the final output of a study financed by AFD and commissioned to AWF, IIED and UNEP-WCMC. It draws on and summarises a number of products generated during the course of this study including:

- an inventory of Kenyan Protected Areas coordinated by Siobhan Kenney and Elise Belle (UNEP-WCMC),
- a desk review of literature on the environmental complementarity of protected areas, compiled by Mxolisi Sibanda (for IIED) and Elise Belle (UNEP-WCMC),
- a summary report of a series of key informant interviews conducted by Tiphaine Leménager, Dephine Malleret-King, Philip Muruthi (AWF) and Per Karlsson (AWF), and
- two case study reports, one on the Ewaso ecosystem, compiled by Delphine Malleret-King, Anthony King and Tiphaine Lemenager, and one on the Mara ecosystem, compiled by Helen Gibbons and Dickson Kaelo. These two case studies are also available in full as separate reports.

The following individuals and organisations contributed significantly to the production of this report:

For the inventory of protected areas: Kenya Wildlife Services (KWS), the African Wildlife Foundation (AWF) GIS team, Space for Giants, and the Northern Rangelands Trust (NRT), all of whom provided data.

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This report is dedicated to Dr Anthony King, who tragically lost his life on Mount Kenya on 24 February 2013. Anthony left us too early. His interest and knowledge of the theme of this study, his motivation, enthusiasm, passion and curiosity have been critical to this research. We hope that, in line with Anthony's work and conviction, this study will be a building block towards greater understanding of the issues and process for making conservation a priority.

Executive summary

The current rate of loss of biodiversity has been described as a "crisis". According to the International Union for the Conservation of Nature (IUCN), we are witnessing the greatest extinction crisis since dinosaurs disappeared from our planet 65 million years ago (IUCN, 2010). Protected areas (PAs) which have long been–and remain–the cornerstone of biodiversity conservation are consequently expected to play a central role in addressing the global biodiversity crisis (Bruner et al., 2004).

According to IUCN, a protected area is "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural value," (Dudley, 2008). Protected areas are, however, by no means uniform. On the basis of ownership, we may for example differentiate three main categories of PAs, i.e. state PAs are those owned by government or its agencies, private PAs are those owned by individuals or companies with private land titles, and community PAs are those owned collectively by communities. In most large conservation landscapes, there is now a mixture of state, private and community PAs. This mix is not the result of a rational PA planning process but more often the result of a complex series of events over several decades.

Considerable work has been done to understand the effectiveness of these different types of PA. Each presents strengths and weaknesses and each has its own supporters and critics. But it appears that, until now, there has been only limited investigation of how a combination of different types of PAs within a system affects its overall environmental outcomes. How then could we try to improve the outputs of a network of protected areas?

In this context, this study was commissioned by AFD to AWF, IIED and UNEP-WCMC to analyse whether there is evidence (scientific and anecdotal) for the biodiversity benefits of having a network of PAs composed of a mix of state, private and community PAs. It aimed at defining and exploring the concept of environmental complementarity between PAs in terms of their enhanced ability to achieve positive environmental outcomes and testing the framework at landscape level.

We were interested in understanding whether, in the words of Aristotle, the whole (i.e. the PA system) is greater than the sum of its parts (i.e. the individual PAs that make up the system).

The study was conducted from the end of 2011 to mid-2013 by a team of Kenyan and international researchers bringing together a strong and complementary mix of skills and disciplinary expertise. Kenya was selected as the study's target country as it provides a good example of a spectrum of PA types, wildlife policies which are currently under revision, and it is a focal country for AFD's biodiversity efforts.

The methodology incorporated a mix of in-country stakeholder interviews, a review of Kenya's PA inventory, a desk review of the literature on "environmental complementarity", two landscape-level case studies of the Ewaso and Mara ecosystems in Kenya,[1] one expert workshop to design the study's conceptual framework, and one final discussion workshop with Kenyan stakeholders. The two case study reports are available separately and are summarised in this final report.

The study identified a total of 230 protected areas in Kenya that are managed primarily for biodiversity conservation purposes, according to the IUCN definition of a protected area. Of these, just over half had been formally recognised and listed on the World Database of Protected Areas (WDPA) at the beginning of this study (2011), and therefore the study identified more than 100 PAs in Kenya, mostly community PAs, that were not listed in the WDPA. One important and unanticipated outcome of the study has been the development of a formal process to update and maintain the Kenyan section of the WDPA under the leadership of the Kenya Wildlife Service.

The inventory analysis step of the study found that, although the majority of these PAs were established primarily for reasons other than to protect biodiversity, the current network does provide significant coverage of important biodiversity sites in Kenya with 48% of officially defined areas of biodiversity importance protected by state, community or private PAs.

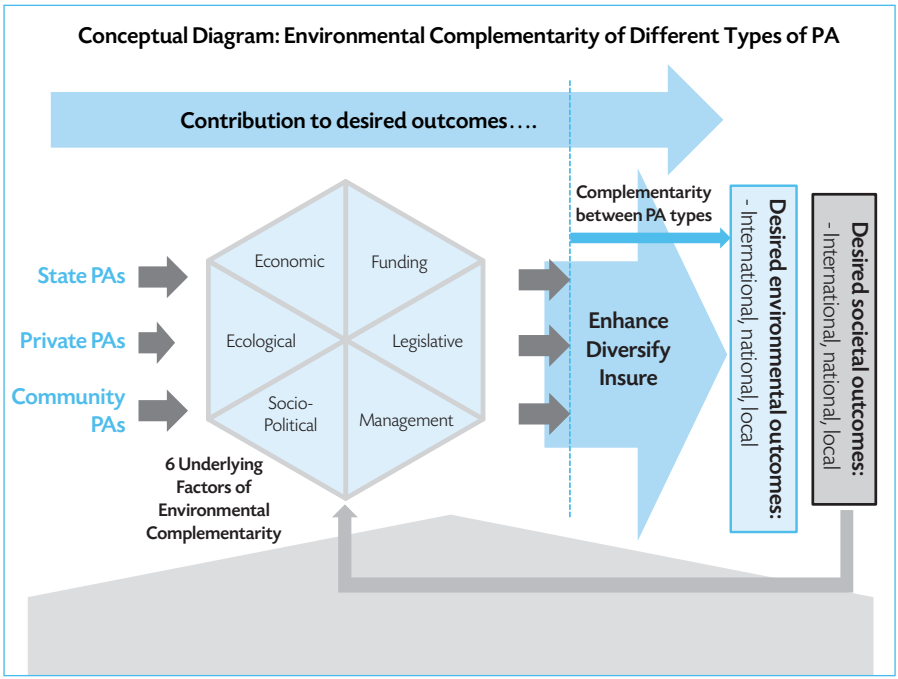
The study's literature review did not find any articles that specifically defined or discussed environmental complementarity between different types of PA or that provided any methodologies for analysing or measuring it. Consequently, together

[1] These specific cases were chosen both for the rich combination of protected areas they present and for the data available about them.

with an expert reference group, we conceptualised environmental complementarity as a term that ***describes the enhancement in progress towards achieving desirable environmental outcomes (as defined locally, nationally or internationally) as a result of the presence of community, private and state PAs alongside each other.***

Based on interviews and inputs from the literature, we propose a conceptual framework to enable an analysis of environmental complementarity (see Figure below). It takes as its starting point that the objective of a PA network (on the left of the diagram) is to deliver environmental outcomes (on the right of the diagram). The amount of progress made is determined by a mix of enabling/constraining factors indicated in the six dimensions of the hexagon in the middle of the diagram, which in turn are influenced by external drivers or shocks (e.g. global economic recession, climate change). This conceptual framework enables exploration of the ways in which private, community and state PAs may help each other progress towards desired environmental outcomes as a result of complementarity enhancing the

A Conceptual Framework to Analyse the Environmental Complementarity between Different Types of PAs



Source: Authors.

enabling factors and minimising or mitigating the constraining factors. It was used as the basis for the Ewaso and Mara case studies.

The case study teams undertook field-based stakeholder consultation to identify descriptions of the nature and extent of complementarity in each of the six dimensions of enabling/constraining factors and identify their contribution to desired environmental outcomes as expressed in national and international biodiversity targets.

Extensive complementarities were identified and improved environmental outcomes were attributed to these complementarities in both case study areas. Differences in management capacity, staff skills, social acceptability, access to financial resources, tourism products and ecological resources between PA types were found to drive additionality and synergistic complementarities in both case study areas. More broadly, the case studies highlight how the weaknesses of one type of PA may be compensated for by the strengths of another type. Thus, the case studies found that the total environmental outcomes of each PA network are better for having a mix of state, private and community PAs.

We conclude that the concept of environmental complementarity between different types of PAs is a potentially powerful one for the design, management and evaluation of PA networks as a tool for delivering desired conservation outcomes. We recommend this as an area for further research and highlight the need for good quality, comparable datasets over time and across sites to allow for deeper objective examination of the scale of complementarities and their impacts.

Introduction

Context and Objectives

The current rate of loss of biodiversity has been described as a "crisis". According to the International Union for the Conservation of Nature (IUCN), we are witnessing the greatest extinction crisis since dinosaurs disappeared from our planet 65 million years ago (IUCN, 2010). The Millennium Ecosystem Assessment (MA) clearly demonstrated that virtually all Earth's ecosystems have now been dramatically transformed through human actions, and the resulting biodiversity loss is undermining the provision of a wide range of ecosystem services on which humanity depends (MA, 2005).

Protected areas (PAs) have long been–and remain–the cornerstone of biodiversity conservation. Consequently, PAs are expected to play a central role in addressing the global biodiversity crisis (Bruner et al., 2004). Currently, some 14.6% of land and 9.7% of coastal waters are under some form of protection (UN, 2013). There is an ongoing global commitment to increasing protected area coverage, most recently through the Aichi Targets adopted by the Parties to the Convention on Biological Diversity (CBD), to ensure at least 17% of land and 10% of coastal and marine areas are conserved through protected areas and other effective area-based conservation measures by 2020 (SCBD, 2010).

Protected areas–as other conservation strategies–have their supporters and their critics. Various commentators have highlighted their multiple benefits (e.g. Scherl et al., 2004; Wilkie et al., 2006) including their potential to empower communities (Kothari et al., 2012) while others have documented the potential negative impact of protected areas on resident and neighbouring communities, particularly in terms of lost or reduced access to resources and involuntary displacements or evictions (e.g. Cernea and Schmitdt-Soltau, 2006; Colchester, 2003; West et al., 2006). However, PAs currently remain one of the key strategies to conserve biodiversity as every country in the world has a protected area system.

According to IUCN a protected area is "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services

and cultural value," (Dudley, 2008). Protected areas are, however, by no means uniform. Their ownership especially may be different. For the purpose of this report we differentiate three main categories of PAs on the basis of ownership, i.e. state PAs are those owned by government or its agencies, private PAs are those owned by individuals or companies with private land titles, and community PAs are those owned collectively by communities.

Historically governments have tended to designate PAs in remote areas marginal to farming and other commercial activities like mining and forestry (Leader-Williams et al., 1990). The size and location of state PAs is thus rarely determined on ecological and conservation grounds alone (Margules and Pressey, 2000). Moreover PA networks within a country are rarely joined up and do not necessarily result in complete coverage of important biodiversity or areas supplying critical ecosystem services (Brooks et al., 2004; Chape et al., 2005). Whole ecosystems are rarely fully protected, and the important corridors that link ecosystems and meta-populations are often left out.

Lately, there have been moves to expand PAs to other forms of land tenure besides state land, such as private and community lands (Woodley et al., 2012). Thus in most large conservation landscapes, there is now a mixture of state, private and community PAs. This mix is not the result of a rational PA planning process but more often the result of a complex series of events over several decades.

Considerable work has been done to understand the effectiveness of these different types of PA. Each presents strengths and weaknesses and each has its own supporters and critics. But it appears that, until now, there has been only limited investigation of how a combination of different types of PAs within a system affects its overall environmental outcomes.

This study was commissioned by AFD to develop a framework to explore the concept of environmental complementarity between PAs in terms of their enhanced ability to achieve positive environmental outcomes and test the framework at landscape level. We were interested in understanding whether, in the words of Aristotle, the whole (i.e. the PA system) is greater than the sum of its parts (i.e. the individual PAs that make up the system). The primary research question that we sought to address was: ***What is the evidence (scientific and anecdotal) for the biodiversity benefits of having different types of PAs in Kenya and the complementarities between them?***

The study focuses on Kenya because it provides a good example of the mix of PA types and because the wildlife policies there are currently under revision. Furthermore this is a focal country for AFD's biodiversity efforts.

Methodology

The study was awarded to a consortium of organisations led by AWF, who managed all logistical aspects of this study. It was conducted from the end of 2011 to mid-2013, and was undertaken by a team of Kenyan and international researchers bringing together a strong and complementary mix of skills and disciplinary expertise.

The methodology incorporated a mix of in-country stakeholder interviews, desk-based literature review, compiling and analysing multi-disciplinary contemporary and archival data, two landscape-level case studies in Kenya, and one expert workshop.

Key steps in the research process included:

- development of an inventory of protected areas in Kenya based on those PAs already included in the World Database on Protected Areas (WDPA) and then expanded to include more than a hundred PAs, mostly community PAs formed in the past two decades, using data provided by the African Wildlife Foundation (AWF), Kenya Wildlife Services (KWS), Space for Giants, and the Northern Rangelands Trust (NRT).

- a review of the academic literature to explore the meaning and application of the term "complementarity" within a PA context and identify existing methods for assessing and measuring complementarity.

- a series of 24 individual stakeholder interviews using a set questionnaire with representatives of government, donors, private sector, landowners, NGOs and communities to determine their perspectives on the nature of complementarity between different PAs, the origins and evolution of the Kenyan PA system and the current threats and opportunities faced by different PAs.

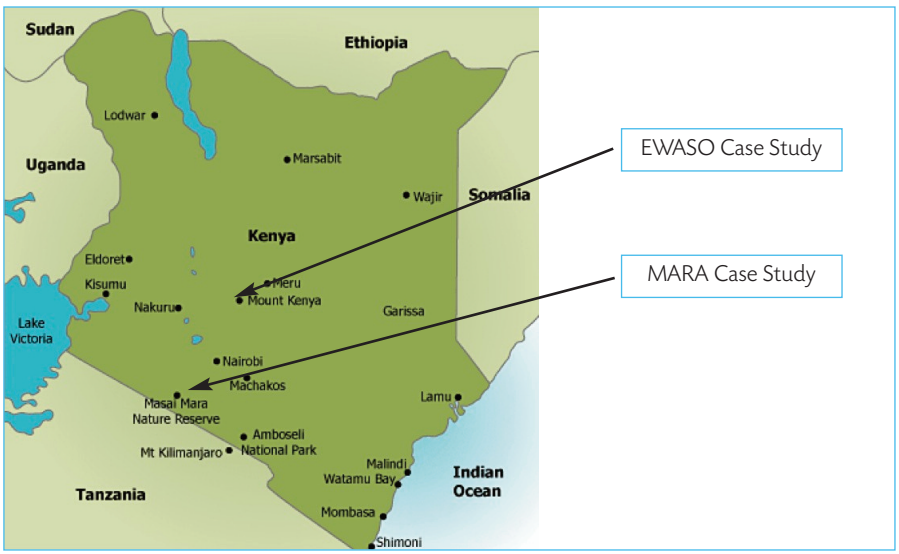
- the development of an analytical framework for assessing complementarity at the PA system level based on expert consultation, the stakeholder

interviews, the inventory analysis and the literature review; and the refinement of this framework at an expert workshop held in London.

- pilot application of the complementarity assessment framework in two case study sites in Kenya (see Figure 1)–the Ewaso ecosystem and the Masai Mara ecosystem. Case study data were collected through desk research and key informant interviews. In the Ewaso ecosystem, 11 people were interviewed, representing the different types of PAs and support conservation NGOs. In the Mara case study, key informant interviews were undertaken with a wide selection of representatives across the PAs and other stakeholders in the form of six focus groups of 2- to 4-hour sessions of open discussion, one-to-one interviews and four online questionnaires. A total of 29 individuals were interviewed including 13 community representatives, seven state PA managers, six conservancy managers, three non-governmental organisations, and three tourism operators.

- several whole team or part-team telephone or video meetings in Kenya and the UK to enable development and interrogation of the methodology, framework and study findings.

Figure 1 *Location of the Two Case Studies*



Source: http://www.destination360.com/africa/kenya/map

- two final workshops co-hosted with the Kenya Wildlife Service in Nairobi, one with study stakeholders to ground truth concepts and findings, and one with Kenyan PA stakeholders to identify a process to strengthen and maintain the Kenyan section of the WDPA.

Structure of this Report

The final report is divided into four additional chapters.

- in Chapter 1, we introduce the Kenyan biodiversity sector and provide an overview of the PA system in Kenya.

- in Chapter 2, we draw from a critical review of literature and interviews to define what we mean by environmental complementarity and describe the conceptual assessment framework developed by the study team.

- in Chapter 3, we present the findings from the two landscape level case studies where the framework was applied. We illustrate how various types of PAs may complement each other and we articulate the ways in which this complementarity contributes to the specific environmental outcomes witnessed in the case studies.

- finally, we present our overall findings and conclusions.

Part One

1. An Overview of Kenya's Protected Area System

1.1. Overview of Kenya's Biodiversity Sector

1.1.1. Biodiversity in Kenya

Kenya (586,000 sq. km) is internationally recognised as a mega diverse country in terms of richness in biodiversity. Kenya straddles the equator and has tremendous topographical, climate and vegetation diversity. It is endowed with a wide diversity of habitats and ecological zones ranging from marine and coastal ecosystems, wooded and open savannahs and semi-arid scrublands to inland aquatic areas (rivers, alkaline and freshwater lakes, swamps, dams, mountain bogs). The vegetation zones in Kenya roughly cover the country's total land area as follows: Afro-alpine (1.2%), highland grassland (0.05%), fire-induced grasslands (3.1%, e.g. parts of the Masai Mara), flood-plain and delta grasslands (4.8%, e.g. the Tana River Delta), highland moist forest (2.0%), relict rainforest (0.1%, e.g. the Kakamega Forest), coastal forests (0.5%), thorn bush and woodland (41.7%), semi-desert (16.8%), barren land (0.4%), marine beaches and dunes (0.04%), wetlands (2.25%), mangroves and sandy shorelines (0.3%), and cropland (18%).

Kenya has one of the richest avifauna in Africa including endemic species and migrants. At least 1,000 bird, 7,000 plant, 100 amphibian, 300 fish, 200 reptile, 320 mammal and 20,000 insect species are found in Kenya. Biodiversity is, however, being lost at an unprecedented rate caused by land degradation, changing land use, climate change, pollution, unsustainable harvesting of natural resources, unsustainable consumption and production patterns, encroachment in forests and the introduction of invasive and alien species. Invasive species such as *Prosopsis juliflora*, *Eichornia crassipes*, and *Lantana camara* now constitute a major threat to biodiversity in Kenya. Climate change is expected to exacerbate loss of biodiversity if insufficient adaptation and mitigation measures are taken.

Most urgent is the need to address anthropogenic causes of unfavourable land use change. Incentives for conservation are often lacking, as are innovative approaches.

The Kenya Constitution of 2010 empowers Kenyans to conserve biodiversity but the challenge remains the means to do so.

1.1.2. Government Commitments and Organisation

The Government of Kenya is officially committed to biodiversity conservation both as signatory to various multilateral environmental agreements and in its own national legislation and policies. Kenya has signed and ratified the Convention on International Trade in Endangered Species of Wild Fauna (CITES) and the Convention on the Conservation of Migratory Species of Wild Animals, the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention), the United Nations Framework Convention on Climate Change (UNFCCC), the Vienna Convention for the Protection of the Ozone Layer, the United Nations Convention to Combat Desertification (UNCCD), and the United Nations Convention on Biological Diversity (CBD).

Kenya's fourth (and most recent) 2009 National Report to the CBD cites the following as some of the national institutions that have a role in managing Kenya's biodiversity:

i. National Environment Management Authority (NEMA)
ii. Kenya Forestry Research Institute (KEFRI)
iii. Kenya Agricultural Research Institute (KARI)
iv. Kenya National Bureau of Standard (KNBS)
v. Kenya Sugar Research Foundation (KESREF)
vi. Lake Victoria Environment Management Project
vii. Coast Development Authority
viii. Lake Basin Development Authority
ix. Ewaso Nyiro (N & S) Development Authorities
x. Tana River Development Authority
xi. Kerio Valley Development Authority
xii. National Universities with teaching and research activities at schools of Environment and Natural Resources Management (University of Nairobi, Kenyatta University, Moi University, Jomo Kenyatta University of Agriculture and Technology and Egerton University)

xiii. National Museums of Kenya

xiv. Kenya Forest Service

xv. Kenya Wildlife Service

As in most countries, the biodiversity sector in Kenya is highly fragmented. In the words of the National Biodiversity Strategy and Action Plan of 2000, "We have a number of sectoral strategies and programmes that normally operated independently of one another, while not necessarily addressing or responding to a clearly set list of national priorities," (Ministry of Environment and Natural Resources, 2000). This situation is largely the same in 2013 as it was in 2000, with the additional complexity of layering a Vision 2030 growth-driven agenda across all policy areas, including growth of the wildlife-based tourism industry as the main biodiversity-related initiative in the Vision.

Over the years, Kenya has built a large infrastructure of over 30 institutions with some responsibility for biodiversity conservation. While that is positive, it has often resulted in overlaps in responsibility and sometimes inaction. Kenya's biodiversity institutions have also experienced fluxes in their mandates and resources, including management capacities.

In the newly elected government of 2013, the number of Ministers has been cut from 44 to 18 and Ministries have been restructured. The new institutional structure for biodiversity management in Kenya is still not completely clear, however. The main Ministries sharing responsibility for natural resource management include:

- Ministry of Environment, Water and Natural Resources (MEWNR)
- Ministry of Land, Housing and Urban Development
- Ministry of Agriculture, Livestock and Fisheries
- Ministry of Commerce and Tourism

Most of the biodiversity-related departments are now housed in the MEWNR. The overarching law is the Environment Management and Coordination Act of 1999 (EMCA). Having these departments under one Ministry is important to ease coordination. However, the MEWNR will still need to coordinate with other Ministries. Moreover, the role of County Governments in biodiversity conservation is crucial under Kenya's new constitutional provisions.

An Inter-ministerial Committee on the Environment has responsibility for helping coordinate institutional roles. The National Environment Council under the EMCA also has a coordination role at a higher level. The various institutions formalise coordination by entering memoranda of understanding with one another (e.g. KWS and KFS, KWS and DRSRS). There is a draft environment policy which will help anchor EMCA more explicitly. Otherwise, Kenya's legislation is largely piecemeal, sectoral and in need of harmonisation to benefit long-term biodiversity conservation and sustainable development.

1.2. Key Actors in the Management of the Protected Area System

The Kenya Wildlife Service remains one of the relevant national institutions for this project given its mandate to conserve all wildlife across Kenya, both in and outside of state PAs. This parastatal organisation manages the terrestrial and marine national parks, marine reserves and some national sanctuaries. In addition to the state PAs, KWS manages 125 field stations outside protected areas. KWS also has a community wildlife programme which encourages biodiversity conservation by communities living on land essential to wildlife, such as wildlife corridors and dispersal lands outside parks and reserves. National reserves such as the Masai Mara National Reserve (MMNR) are the responsibility of local government.

The majority of national forest reserves are managed by KFS; some are managed specifically for biodiversity conservation rather than commercial forestry and these fall within the remit of KWS. Some forest reserves are co-managed with local communities through community forest associations (CFAs) but this co-management provision does not extend to other national parks or reserves (Nelson, 2012). One partial exception is the Kaya sacred coastal forests which are gazetted as National Monuments and so fall under the jurisdiction of the National Museum of Kenya but have some degree of community participation in their management, albeit not legal authority (Nelson, 2012).

Local community organisations are also involved in the management of locally-managed marine areas (LMMAs). Beach management units (BMUs)–associations of local boat owners and fisherfolk–collaborate with the Ministry of Fisheries to develop and enforce fishery management regulations (Murage et al., 2010). Community organisations and individual private landowners can also establish conservancies as a form of PA. These conservancies can take a number of different

forms and currently have no legal definition or fixed institutional structure. Debates regarding the conservancies concept have been particularly active in the Mara where stakeholders more precisely distinguish Community Conservancies from Group Conservancies as defined below:

- a Community Conservancy represents an area of land set aside by a community on defined community land (Group Ranch or Trust Land–see Box 1) for the purpose of conservation and management of wildlife on this land.

- a Group Conservancy represents an area of land created by the pooling of land by contiguous private land owners for conservation purposes.

Box 1 *An overview of the Land Tenure System in Kenya*

The land tenure system in Kenya is described in the 2009 National Land Policy. Land tenure is defined as the terms and conditions under which individuals, communities and other groups obtain rights and interests in land, and how they retain or transfer those interests and rights during their lifetime or as an inheritance when they die.

During colonial times and post-independence, the Kenyan tenure system emphasised individual ownership of land at the expense of communal or group rights. In the process, traditional systems and institutions of land management were weakened and their effectiveness undermined, leading to uncertainty about land rights especially among pastoral communities. Before the National Land Policy was enacted, the categories of land tenure in Kenya were "government land", "trust land", and "private land". The National Land Policy 2009 now categorises all land in Kenya as "public land", "community land" and "private land", and commits the government to enact a new law to govern all the categories of land. "Trust land" no longer exists as a category in Kenya, and has mostly reverted to community land.

Definitions:

Public land is all land that is not private or community land and any land declared by law to be public land. Public land is used by public institutions such as government departments, schools, etc. The National Land Policy recognises public land and commits the government to secure it.

Community land is land that a specific community holds, manages and uses but the ownership of which is placed with the community, while individuals have rights of use. Community land is governed by the customs and traditions of different communities. The National Land Policy recognises community land rights and commits the government to secure them. Group ranches fall under the community land category.

Private land is land owned and used by an individual or other legal body such as a company. The National Land Policy recognises private land rights and commits the government to secure them.

Rights of ownership refer to what a person legally entitled to land can do under the different tenure systems. The main rights of ownership are the right to use, the right to sell or otherwise dispose of, and the right to exclude others. There are two types of land ownership in Kenya, namely freehold and leasehold. Freehold gives the landowner unlimited powers over the land. The absolute proprietorship under the Registered Land Act also confers the same level of rights on a landowner. Both are nevertheless subject to the regulatory powers of the State. Leasehold on the other hand confers on a person the right to use land over a defined period of time subject to specified conditions.

1.3. The Origins and Evolution of Kenya's Protected Areas

The establishment of state PAs in Kenya dates back to British imperial rule in the 1890s, and was primarily motivated by the desire to maintain lands for big game hunting (Honey, 1999). Following the formal declaration of the British East Africa Protectorate in 1896, the colonial government issued a declaration to set up wildlife game reserves–the South Game Reserve (13,000 square miles) and North Game Reserve (13,800 square miles) (Chongwa, 2012). In 1945, the British Protectorate passed the National Parks Ordinance that paved the way for the establishment of more protected areas including National Parks–the first being Nairobi Royal Park in 1946 and shortly thereafter Aberdare Royal Park and Mount Kenya Royal Park (later renamed National Parks). Chongwa (2012) notes that protected areas were established "not only for protection of wildlife to also to offer exclusive recreation to the settlers".

Over time, the drivers for the establishment of state PAs in Kenya have changed. Following independence in 1963, the preservation of hunting grounds gave way to the preservation of areas of particular beauty or interest for economically important tourists (Chongwa, 2012), or nationally important ecosystem services (for example watersheds) or to protect endangered species (King, 2011).

Protection of Kenya's tourist attractions remains a primary motivation for protected area management. As Chongwa (2012) points out, "The tourism industry has been identified as one of the key pillars under the government's near-term blueprint for economic development–popularly known as Vision 2030." Chongwa notes that the annual gross revenue of the tourism industry is over US$1.5 billion, with still-unrealised potential remaining, accounting for 21 percent of total foreign exchange earnings and 12 percent of GDP. It is interesting to note that biodiversity is not specifically mentioned within the Kenyan Vision 2030 even though wildlife is the backbone of Kenya's tourism industry.

State PAs account for an estimated 90 percent of safari tourism and about 75 percent of total tourist earnings (Chongwa, 2012). KWS is identified as the key implementing agency for Vision 2030 flagship tourism projects, notably the Premier Parks Initiative which involves branding of the most popular parks with the aim of offering high quality experience at premium rates, and the Under-Utilised Parks Initiative where KWS continues to expand and rehabilitate facilities and infrastructure in less frequented parks.

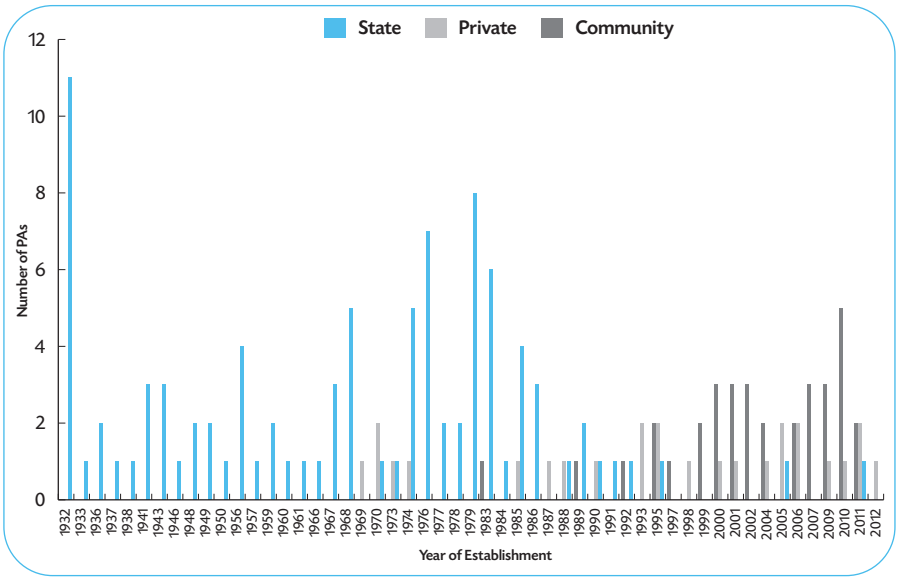
The expansion of the state PA system has been accompanied since the mid-1980s by a growing number of PAs established by individual land owners or groups of landowners (such as the group conservancies in the Mara) and, more recently, by communities (Western et al., 2009; King, 2011). Figure 2 documents this trend. It is important to note here that for the purpose of the inventory analysis stage of the study we decided to classify the "group conservancies" from the Mara as "private PAs" since their owners have individual private land titles. Yet, as subsequent chapters will show, for the complementarity analysis it remains important to differentiate them as they are neither "private" nor "community" in how they operate.

According to the stakeholders interviewed for the study, the motivations behind the establishment of many of the private PAs have included passion, the willingness to conserve wildlife, the opportunity to make money from nature-based businesses–particularly tourism–and the desire to secure land tenure. Typically, private PA owners highly value the presence of wildlife, particularly "big game", and scenic

beauty. Many private PAs are held under long-term private ownership and most have tourism ventures to provide revenues. The group conservancies in the Mara are the post-subdivision "regrouping" of individual Maasai landowners who recognise the value of the land managed jointly for tourism benefits and increasingly managed livestock grazing.

The addition of community PAs to the national PA estate has largely occurred in the past decade, with a few exceptions such as Il Ngwesi in Laikipia (founded in 1995), although this built on a long history of group ranches around key wildlife areas (notably the Mara and Amboseli) engaging in wildlife tourism and tolerating wildlife on their lands. The earliest community PAs were promoted by non-government organisations (NGOs) and founded primarily in the Taita and Kajiado areas of south-central Kenya, often through programmes of donor support (such as the USAID COBRA and CORE programmes in the early-mid 1990s). The main drivers have been the growing availability of grant funding for community PAs and the communities themselves becoming more aware of the potential security and economic gains from community PAs–often brought home to them by mediating organisations and

Figure 2 *Trends in the Establishment of Different Types of PAs in Kenya*



Source: WCMC using data from WDPA, AWF, KWS, NRT and Space for Giants.

individuals, including NGOs such as the African Wildlife Foundation and Northern Rangelands Trust, and neighbouring private PAs such as Lewa Downs. The motivation of the mediating organisations is generally to bring more land under conservation, reduce human-wildlife conflicts and increase security for wildlife, as well as to encourage "good conservation neighbours". Political drivers may also be important when supporting community PAs' appeals to the popular vote. Local people see the formation of community PAs as a mechanism to increase their voice in local decision-making processes.

1.4. The Current Extent of Kenya's Protected Area System

This study identified a total of 230 protected areas in Kenya that are managed primarily for biodiversity conservation purposes, according to the IUCN definition of a protected area[2] (i.e. not including forest reserves managed by KFS for commercial purposes). Of these, just over half had been formally recognised and listed on the World Database of Protected Areas (WDPA) at the beginning of this study (2011). The study identified more than 100 protected areas that were not listed in the WDPA and concluded that there were many more community and private protected areas still to be listed. A number of PAs listed were found to have been sold, sub-divided or dysfunctional and thus needed to be removed from the database.[3] One important and unanticipated outcome of the study was the development of a formal process to update and maintain the Kenyan section of the WDPA, under the leadership of Kenya Wildlife Service.

Almost half of the 230 protected areas identified by the study are located on state land (including 70 national parks and forest reserves managed by KWS, 15 national reserves managed by county councils, and 35 managed by other agencies); just over a quarter are on communal land; and just under a quarter are on private land.[4] In some cases the boundaries between categories were more blurred–for example, the sacred Kaya forests are managed by the National Museum of Kenya in collaboration with local communities, but the Kayas are designated as national monuments and

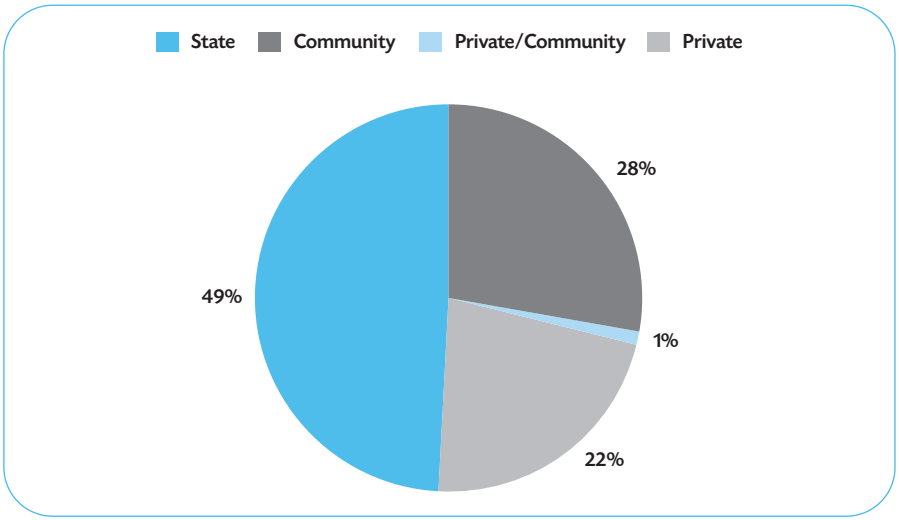
[2] "A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural value" (Dudly, 2008).

[3] A workshop held in Nairobi in September 2013 identified a number of protected areas that, in line with the IUCN definition of a PA, need to be added/updated/removed from the list of PAs in Kenya. This work is currently on-going to compile a definitive list of PAs in Kenya by the end of 2014..

[4] Remember that for this chapter we classified the Group Conservancies from the Mara as "private PAs".

are located on state land. Figure 3 summarises the distribution of the 230 protected areas across different tenure regimes.

Figure 3 *Number of Protected Areas under Different Tenure Types*



Source: WCMC based on input from WDPA, AWF, NRT, Space for Giants and other Kenyan experts.

The different types of PAs vary significantly in terms of size. Private PAs tend to be medium size at between 10 and 100 sq. km,[5] whereas community PAs and state PAs have a broader range of sizes (Figure 4). The smallest protected area for which spatial data were available is Kaya Kambeat at 0.31 sq. km, and the largest one is Tsavo East National Park at 13,157 sq. km. The average size of protected areas is 509.6 sq. km, while the median size is 142.1 sq. km. The majority of protected areas are relatively small in size with a few very large sites. Overall, our analysis showed that protected areas cover officially 14.4% of Kenya's land area and 10.4% of the marine area (only taking into account Kenya's territorial seas out to 12 nautical miles) of which the majority is state land, but a significant and growing minority (currently 24%) is communal land with private land accounting for a further 6% (Table 1). Given that the list of PAs is incomplete and that spatial data were not available for some of those listed, mainly community and private protected areas, the percentages for private and community areas are undoubtedly underestimated.

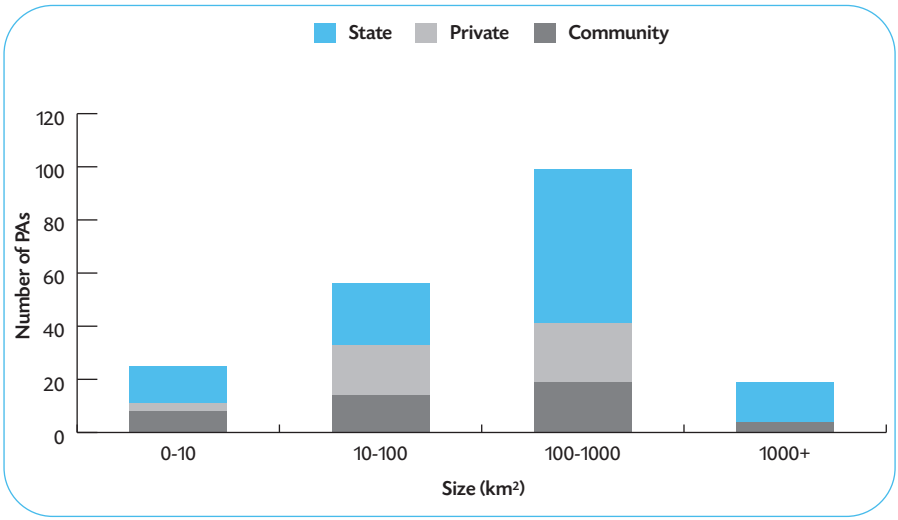
[5] Note here that, for the group conservancies in the Mara, we used an average size of land owned by individual private owners. For instance the group conservancy of Mara North spreads over 310 sq. km but with 750 owners, which makes an average of 0.4 sq. km for each.

Table 1 *Protected Areas under Different Land Ownership Types in Kenya*[6]

	Kenya (sq. km)	Area Protected		Percentage of Area Protected under different types of land ownership[7]		
		sq. km	%			
Terrestrial Area	586,769	84,546	14.4	White	White	White
Marine Area (territorial seas)	13,337	1,382	14.4			
Total Area	600,107	85,928	14.3	24.0	5.8	73.2

Source: Authors.

Figure 4 *Average Size (in sq. km) of Different Protected Area Tenure Types*



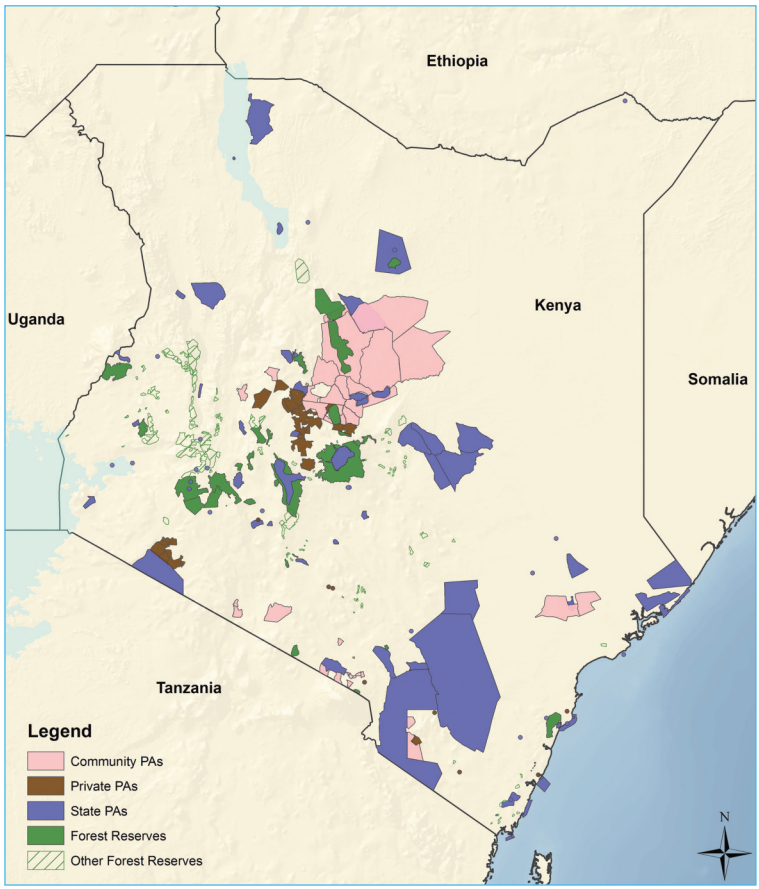
Source: WCMC based on input from WDPA, AWF, NRT, Space for Giants and other Kenyan experts.

[6] Note that the group conservancies from the Mara are classified as "private PAs" for this analysis.

[7] Note that the % of different land types does not equal 100% due to some overlap between state and community areas. The % calculated is the area of each type of PA divided by the total area protected.

Figure 5 provides details of the locations of the 83 percent of the PAs for which spatial data were available. The majority of protected areas are in the centre and south of Kenya with relatively few in the north and north-east of the country. It should be noted that the map is not intended to indicate the extent to which these PAs are effectively managed beyond their official gazettement.

Figure 5 *Map Showing the Location of Protected Areas in Kenya*



Source: WCMC based on data from WDPA, AWF, KWS, NRT and Space for Giants.

Although the majority of PAs were originally established primarily for reasons other than to protect biodiversity, the current network does provide significant coverage of important biodiversity sites in Kenya. There are a total of 80 areas of biodiversity importance in Kenya that are either identified as Key Biodiversity Areas (KBAs),[8] Important Bird Areas (IBAs)[9] or Alliance for Zero Extinction (AZE)[10] sites: 22 are classified as KBAs, 19 as IBAs, 34 as both KBAs and IBAs, and 5 as AZE sites. According to our analysis, four out of the five AZE sites are protected to a certain extent–both the Mount Kenya and Shimba Hills are fully covered by protected areas, Mount Elgon is 75% protected and the Tana River forests are 40% protected. All these AZE sites overlap with state PAs, with the Tana River site also overlapping the Ndera communal conservancy. Of the remaining 75 KBA sites, 47 receive some protection by overlapping with protected areas–21 of these have more than 80% overlap, 10 have between 50-80%, seven between 10-49%, and the remaining nine less than 10%.

Overall 28,273 sq. km or 48% of these defined areas of biodiversity importance are protected by the State, community and private protected areas included in this inventory (Figure 6), with community areas protecting 8.5% of important biodiversity areas. Private areas represent 3.6% of protected important biodiversity areas.[11]

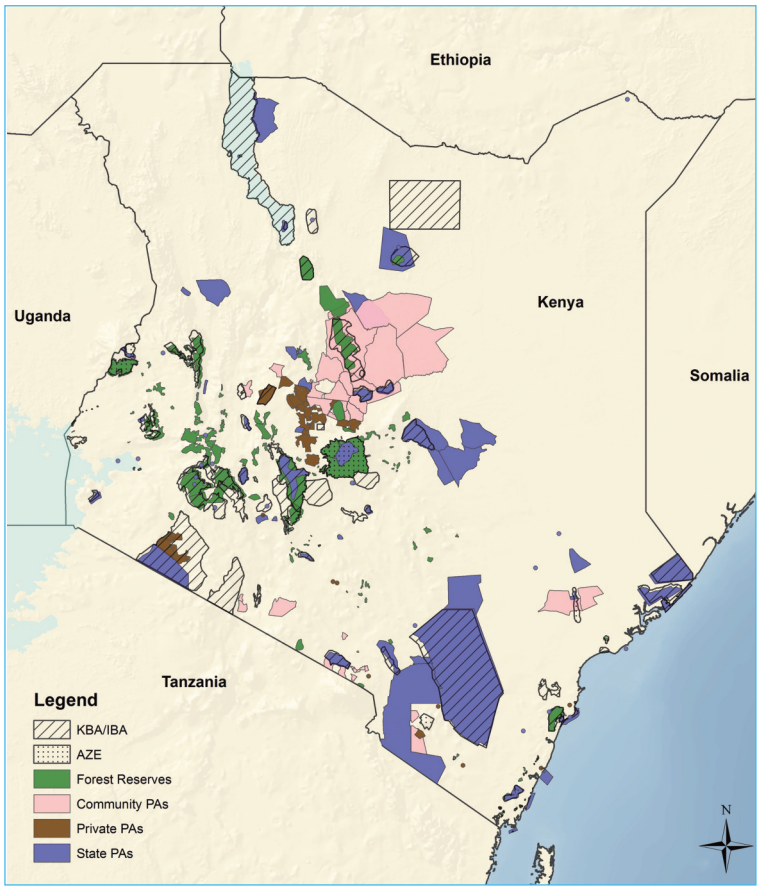
[8] Langhammer, P.F. et al. (2007).

[9] www.birdlife.org/action/science/sites/

[10] www.zeroextinction.org

[11] Please note that for the purpose of the inventory analysis summarised in this chapter we classified the Group Conservancies from the Mara as "private PAs".

Figure 6 *Protected Areas and Areas of Biodiversity Importance in Kenya*



Source: WCMC using data from WDPA, AWF, KWS, NRT and Space for Giants, and KBAs from BirdLife International.

1.5. Threats and Challenges to Kenya's Biodiversity

Kiringe and Okello (2007) identify ten different types of threats to biodiversity in protected areas, particularly human encroachment and killing of wildlife (for bushmeat, poaching, and as a result of human-wildlife conflict). They note that a majority of Kenya's protected areas are under some kind of threat and that this has

been exacerbated by increasing human population–and hence demand for land–in rural areas, especially in marginal lands.

Shortages of and growing competition for access to water are another area of growing threat to biodiversity in Kenya. Moreover, climate change threatens to further exacerbate ongoing drought cycles that severely threaten lives and livelihoods in the arid and semi-arid areas of Kenya.

An estimated 10% of Kenya's wildlife is found in national parks, and a further 25% in national reserves, predominantly the MMNR (Western et al., 2009). The remaining 65% is found primarily in the arid and semi-arid lands (ASAL)–or rangelands–which are also home to an estimated 20% of Kenya's human population and 80% of the national livestock herd. Over time, these rangelands have witnessed significant declines in wildlife populations (estimated at 38% to 55% between the 1970s and late 1990s[12]), as have the parks and reserves. In the greater Amboseli landscape between 2007-2010, declines were 83% for wildebeest, 71% for zebra, and 61% for buffalo (KWS/TAWIRI, 2010). In the Masai Mara, there was an overall decline of 70% between 1976 and 1996 (Lamprey and Reid, 2004). For species such as elephant (an 88% decline from 1973-1990, Litoroh et al., 2010) and eastern black rhinoceros (a 98% decline from 1970-1990, Okita-Ouma et al., 2007), dramatic declines occurred between the early 1970s and late 1980s, and then the population figures for these two species stabilised and increased until 2009,[13] reaching approximately 597 rhino[14] and 35,000 elephant (Litoroh, 2009) although they are now once again under significant threat from poachers.

In some areas wildlife populations are stable or increasing (Mutu, 2005, in Western et al., 2009). Laikipia District, for example, has shown a 15% wildlife population increase from 1981-2010 and has become one of Kenya's most important wildlife areas. Yet, many private and community landholders benefit little from wildlife, with all consumptive use, such as trophy hunting, prohibited. Ongoing conservation is dependent on tourism revenues and on the goodwill extended to wildlife by private individuals and communities for reasons other than direct financial benefits.

[12] Wargute et al. (2006) 55% decline, 1970-2000; Grunblatt et al. (1996) decline 33%, 1977-1994; for the same period Norton-Griffiths (2000) 44% decline, with 48% outside formal protected areas and 31% inside formal protected areas; and de Leeuw et al. (1998) 38% decline 1977-1997.

[13] Note that since 2009 there has been an upsurge of illegal hunting (poaching) of both elephant and rhino for ivory and horn (KWS presentation to the Kenya Wildlife Conservation Forum April 2011).

[14] Population at the end of 2010, KWS presentation to the Association of Private Landowner Rhino Sanctuaries, April 2011.

To conclude, the Kenyan PA system does appear to provide reasonable coverage (48%) of important biodiversity areas. Kenya's Vision 2030 lays out a national development strategy that emphasises the prospects for tourism-based growth underpinned by an effective protected area system. The catastrophic cycle of drought in northern Kenya adds to the need to fully understand the role and complementarity of protected areas in safeguarding Kenya's wildlife and other natural resources.

FOCALES

Part Two

2. Understanding Environmental Complementarity

2.1. Inputs from the Academic Literature

This study was commissioned to explore the concept of "environmental complementarity" between different PA types. As a first step in this exploration a review was undertaken of the academic literature to determine if this concept was in common use. The literature review did not find any articles that specifically defined or discussed environmental complementarity between different types of PAs (in the sense of a PA system being "greater than the sum of its parts") or that provided any methodologies for analysing or measuring it. The literature review did, however, highlight a number of related concepts.

Margules and Sarkar (2007) for example, argue that complementarity is a central concept in systematic conservation planning. The systematic conservation planning approach was developed to generate tools for improved planning of protected area networks in order to overcome some of their recognised limitations in terms of representation and persistence into the future (Leader-Williams et al., 1990; Pressey, 1994; Margules et al., 2002). This has included the development of computer-based software to help managers and planners design PAs in appropriate locations in relation to natural and biological patterns (i.e. the size, connectivity, replication and alignment of boundaries of protected areas). Margules and Pressey (2000) summarise the process into six stages: (i) measurement and mapping of biodiversity; (ii) development of conservation goals for the planning region; (iii) review of the existing PA network; (iv) selection of additional reserves; (v) implementation of conservation actions; and (vi) monitoring of the PA network.

Complementarity is one of the principles on which the fourth stage of the process, selecting additional reserves, is based, the objective being to add new areas with unrepresented features into the existing PA system in the most efficient way. In this sense, complementarity is a measure of the extent to which an area, or set of areas,

contributes to adding unrepresented features to an existing area or set of areas (Vane-Wright et al., 1991; Margules and Pressey, 2000).

However, Faith et al. (2003) point out the difficulties associated with finding the true number of additional species represented. As an alternative, they propose using the concept of biodiversity viability analysis (BVA) to estimate and map "inferred" biodiversity that takes into account viability factors such as connectivity, habitat fragmentation and proximity to threats.

Moilanen (2008) identifies a number of other variations on this "additional species/features" approach to complementarity. Cabeza and Moilanen (2006) use the term "complementarity" as a measure of differences in the natural features of two sites (or sets of sites). When (sets of) sites are highly complementary, they contain almost non-overlapping representation of natural features. On the other hand, (Margules and Sarkar, 2007) use the term as a measure of the contribution a particular area makes to the full complement of biodiversity for a particular location.

Recognising these different interpretations of complementarity, Moilanen (2008) proposes a new generalised definition which he calls the "conservation interactions principle": "Conservation benefits of all conservation actions across the landscape should be evaluated jointly and account for long-term consequences of interactions between actions." Moilanen's concept of complementarity includes cost effectiveness, multiple conservation actions (protection, maintenance and restoration) and ecological interaction among sites (e.g. connectivity, immigration, emigration). He concludes that this approach to complementarity provides a useful basis for evaluating conservation outcomes. However, one of the challenges faced by such assessments is the lack of existing quantitative measures such as PA ecological effectiveness or indeed complementarity (Craigie et al., 2010).

The literature on systematic conservation planning therefore contributes to assessing the ecological complementarity between different *sites* but does not explicitly focus on complementarity between different *types* of PA. Beyond the systematic conservation planning literature, other studies document some evidence of enhanced environmental benefit as a result of the existence of a mix of PA types.

2.1.1. Increased Coverage and Connectivity

According to the literature, private and community PAs can play a crucial role in maintaining or enhancing connectivity, notably through wildlife corridors and

dispersal areas. For instance, White and Martin's (2002) global analysis found that at least 100 million hectares of the global forest estate are managed by local communities in landscapes compatible with biodiversity conservation. These community-managed areas provide wildlife corridors in the fragmented landscape and contribute to the ecological health of the whole system. Similarly, in their study of the effectiveness of community PAs to protect biodiversity, Shahabuddin and Rao (2010) suggest that community PAs enhance the effectiveness of state PAs by providing corridors allowing wildlife movements, and providing a buffer against extractive pressures as well as resources for local populations.

In India, community conserved areas–particularly sacred groves in agricultural landscapes–have also been shown to provide habitats and corridors and allow the movement of species (Bhagwat and Rutte, 2006). The authors conclude that as a network, these sites can protect an important portion of the local biodiversity in areas where it would not have been possible to maintain large protected forests and where nature reserves would have been unlikely to receive local support.

Finally, Fitzsimons and Wescott (2008) studied the role of multi-tenure reserve networks in improving reserve design and connectivity in south-eastern Australia. They showed that private PAs enhanced larger state PAs by providing linkages in the surrounding landscape. In South Africa, Gallo et al. (2009) investigated the role of private PAs in biodiversity representation in a large semi-arid region and showed that not only do private PAs increase the total area of land conserved but the addition of private PAs to state PAs nearly triples the number of conservation targets achieved.

2.1.2. Increased Range of Habitat Types and Diversity of Species Protected

Fitzsimons and Wescott (2004) looked at the total area covered by different vegetation types in several Australian PAs and found that several vegetation types were exclusively found in private PAs. Similarly, in South Africa, the analyses of Gallo et al. (2009) also suggested that private PAs complement state PAs in the type of biomes/habitats represented.

In central Tanzania, Mgumia and Oba (2003) inventoried eight sacred forests and found that their species richness and taxonomic diversity was greater than those of forest plots in a state managed forest reserve despite the fact that they covered a much smaller area.

Furthermore, several authors have suggested that different types of PA management could play a particularly important role in protecting threatened species. For example, Bhagwat and Rutte (2006) found that the sacred forests of the Kodagu District in Karnataka State (India) have relict populations of a number of threatened tree species not found in formal protected areas.

In Kenya itself, the high biodiversity found in the Kaya forests was recognised in the 1980s and constitute a very important part of Kenya's increasingly threatened natural vegetation (Kibet and Nyamweru, 2008). Thanks to traditional beliefs, many threatened plant species are protected, including the baobab. Disproportionately large numbers of rare plants have been recorded in the Kayas compared to other areas, which is partly due to the fact that the Kayas cover a very broad diversity of habitat and micro-climatic conditions. As a result, the number of species likely to be present in these areas is higher than in more homogenous landscapes.

Kenya's network of private and community PAs is also a clear complement to the state PA system as an estimated 65% of all wildlife is found outside state PAs (Western et al., 2009). Nelson (2012) highlights how a number of private and community PAs protect significant populations of highly endangered species including Grevy's zebra, which is endemic to northern Kenya and southern Ethiopia, wild dog, cheetah, and elephant.

To conclude, the academic literature on complementarity is limited and predominantly focused on the ecological attributes of different PAs and on achieving optimal biodiversity representation or coverage. While many of the ecological benefits of having different kinds of PAs are highlighted, the existing literature provides few insights into the underlying factors that enable the delivery of those benefits. The study seeks to understand the "added value" that different PA types bring to the PA system as a whole–and the facilitating and constraining factors that bring about that added value–which appears to be a previously untested lens through which to understand PA interactions. In this sense, we are following Moilean's (2008) call: "Conservation benefits of all conservation actions across the landscape should be evaluated jointly and account for long-term consequences of interactions between actions."

2.2. Inputs from Stakeholder Interviews

To further enhance our understanding of complementarity, we conducted a series of stakeholder interviews with representatives of government, landowners and civil society organisations in Kenya.

The views expressed in these interviews were largely aligned. Wildlife diversity and numbers were considered to be stronger in landscapes with multiple types of PAs (especially where only small areas have been designated as state PAs), and habitat types/diversity increases. Amboseli was the most frequently cited example–where it was considered that the state PA would not exist without surrounding group ranches and their designated conservation areas acting as corridors for dispersal. Factors that determine the strength of biodiversity complementarity were thought to include: the extent to which private and community PAs act as corridors and dispersal areas adjacent for state PAs; the connectivity of different areas; and the types of species present–for example whether they are wide ranging or not.

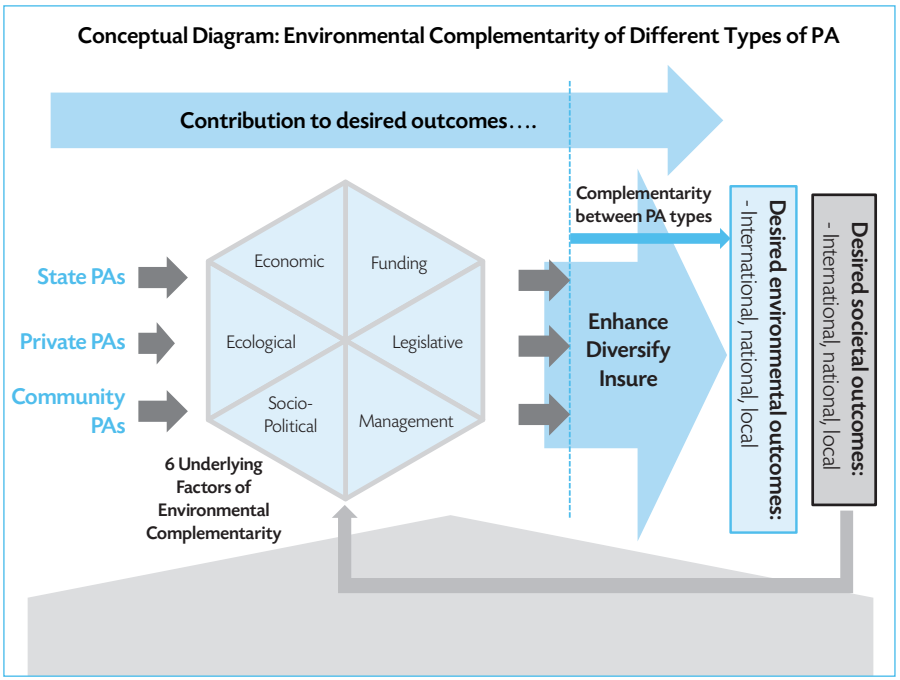
In addition to this description of complementarity, the interviews also identified a number of other dimensions not addressed in the literature. The insights from the interviews, together with the findings from a consultative expert workshop, enabled us to develop a conceptual and analytical framework for assessing PA complementarity in these various different dimensions, as presented in the next section.

2.3. Developing an Analytical Framework for Assessing Environmental Complementarity between Types of PAs

For the purposes of this study, our conceptualisation of environmental complementarity is as a term that ***describes the enhancement of progress towards achieving desirable environmental outcomes (as defined locally, nationally or internationally) as a result of the presence of community, private and state PAs alongside each other.***

Our conceptual framework (Figure 7) thus takes as its starting point that the objective of a PA network (on the left of the diagram) is to deliver environmental outcomes (on the right of the diagram).

Figure 7 *A Conceptual Framework to Analyse the Environmental Complementarity between Different Types of PAs*



Source: Authors.

Each type of PA can make a certain level of progress towards the desirable environmental outcomes (as indicated by the arrow along the top of the diagram). The amount of progress made is determined by a mix of enabling/constraining factors, indicated in the six components of the hexagon in the middle of the diagram, which are in turn influenced by external drivers or shocks (e.g. global economic recession, climate change).

The conceptual framework enables exploration of the ways in which private, community and state PAs may help each other progress towards desired environmental outcomes as a result of complementarity enhancing the enabling factors and minimising or mitigating the constraining factors. Assessing the extent of complementarity then requires assessing how much further along the scale towards achieving the environmental outcome the PA system as a whole gets and how

precisely this progress is influenced by underlying factors that enable the delivery of those benefits.

We identified six types of enabling and constraining factors–or "dimensions"–of complementarity:

The ecological dimension. Having different types of PAs may increase the area under conservation, the connectivity between areas under conservation, and the types of habitat and/or the diversity of species covered by the network.

The economic dimension. The existence of different types of PAs may generate additional economic benefits at different levels, or/and increase economic efficiency (e.g. by reducing costs). The greater the economic success of the system, the more likely sustainability becomes and therefore the more likely the achievement of the desired environmental outcomes.

The funding dimension. The existence of different types of PA may increase the diversity and volume of funding available and reduce perceived investment risks.

The legislative dimension. The existence of different types of PAs in a network may improve the development of legislative frameworks that indirectly and directly support conservation of biodiversity.

The management dimension. The existence of different types of PAs may strengthen overall management of individual PAs and the network as a whole through improvements in skills and expertise, as well as in the effectiveness of management systems.

The socio-political dimension. The existence of different types of PAs may increase the social and/or political support for the PA system as a whole by different groups of stakeholders.

Within these different dimensions our study reveals that complementarity may be achieved in two main ways:

- "Additionality" [i.e. the sum of the parts] happens when the presence of different kinds of PAs in a network creates "more" of something useful for biodiversity conservation. The result of their interaction is then the sum of their individual effects.

- "Synergy" [i.e. greater than the sum of the parts] happens when the interactions between the different kinds of PAs increases those impacts to levels over and above the levels from "additional" benefits through, for instance, cost sharing and economies of scale or providing expert services to one another. In this case, the result of their interaction is greater than the sum of their individual effects.

Finally, we describe our findings from the application of this framework in two case study sites in Kenya–the Ewaso and Mara ecosystems.[15]

[15] The two case study reports are available on request.

Part Three

3. Environmental Complementarity in Operation: Applying the Framework in the Ewaso and Mara Ecosystems

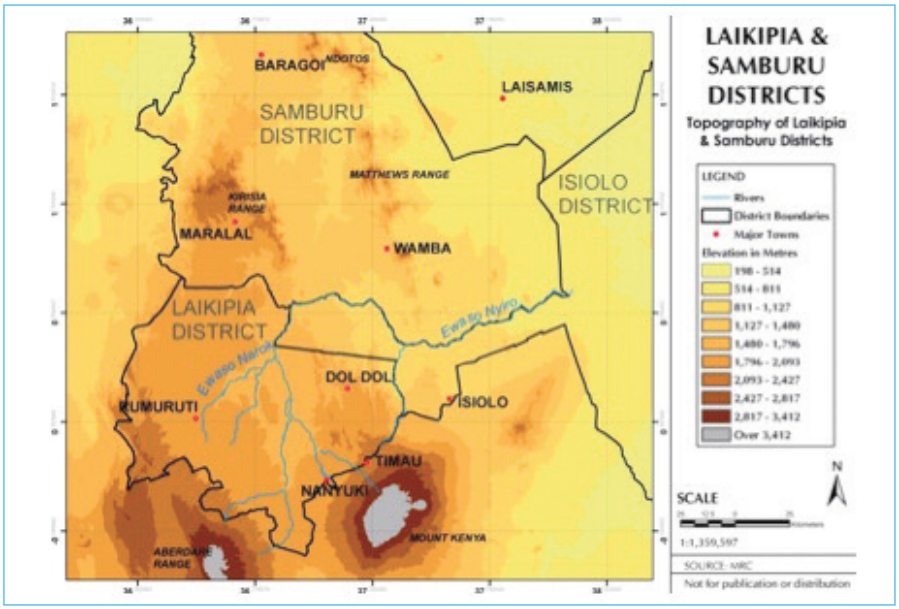
3.1. PA Networks in the Ewaso and Mara Ecosystems

3.1.1. PAs in the Ewaso Ecosystem

The greater Ewaso ecosystem ranges from the lower slopes of Mt Kenya and the Aberdare mountain range, across the Laikipia plateau to the edges of Samburu and Isiolo Counties to the north, and to the edge of the Great Rift Valley escarpment and East Pokot to the west (Figure 8). It comprises two main hydrological systems rising in the Mount Kenya and the Aberdares ranges and important forest areas in the Kirisia-Loroghi-Matthews ranges.

An estimated 50% of the Ewaso system is now covered by a diverse network of PAs, notably the rapidly growing area under community conservancies. The first PAs in the landscape were gazetted by the government with the objective of preserving areas of particular beauty and interest, nationally important ecosystem services–particularly water towers and forests–and biodiversity, including state PAs around Mount Kenya and the Aberdares. The establishment of a network of private PAs in the 1980s and 1990s across Laikipia District greatly increased the area under conservation management and provided a foundation for the push to establish a network of community PAs. The Ewaso network includes some of the first community PAs in Kenya (Il Ngwesi, Namunyak). It has become a central hub for conservation in Kenya and regionally. The drivers underlying the development of the Ewaso PA network are many and range from individual passions, which led to the creation of the first private wildlife sanctuary in Kenya (Solio, in 1970), to the collapse of the ranching sector and the perceived socio-economic opportunities provided by wildlife-based tourism. The establishment of private and community PAs has been

Figure 8 *The Greater Ewaso Ecosystem*



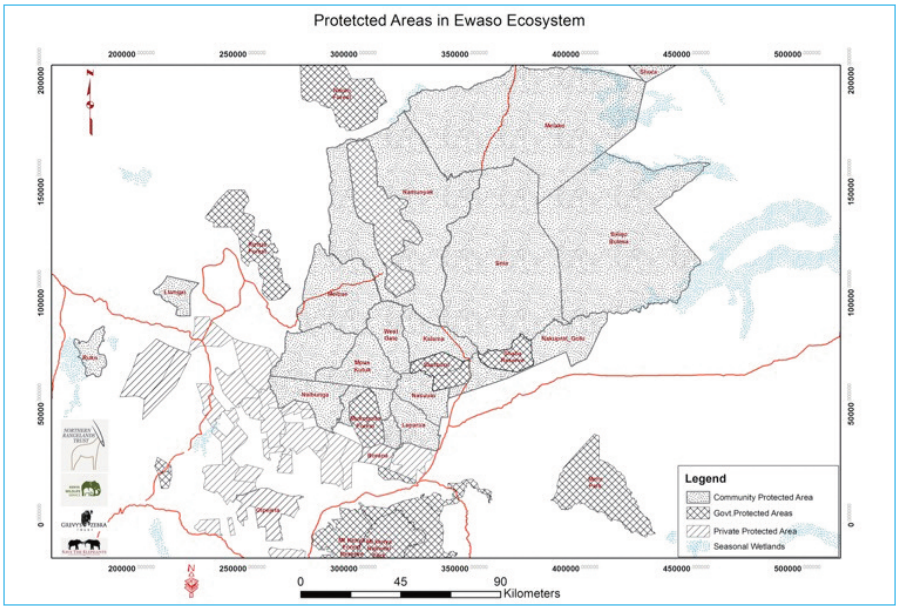
Source : Mpala Research Centre, taken from LWF (2006) King, J., and D. Malleret-King (eds.)

supported by NGOs such as the African Wildlife Foundation (AWF) and the Northern Rangelands Trust (NRT).

The Ewaso network currently includes (Figure 9):

- at least 15 National Reserves (including forest reserves) a number of which are not at this time actively managed (Kirimon National Reserve, Losai Reserve), predominantly established between the 1930s and 1980s.
- three national parks (Mount Kenya, Aberdares and the proposed Laikipia National Park), one of which (Laikipia) has only recently been declared and is not yet functional. These were established between the 1930s and 1950s with Laikipia proposed by KWS in 2011.
- at least 16 individually or family-owned private PAs established between the 1970s and the present day.
- twenty-two community PAs, mainly established in the last 10 years, with more on the drawing board.

Figure 9 *Map of the Ewaso PA Network*



Source: NRT, 2013.

3.1.2. PAs in the Masai Mara System

The greater Kenyan Mara region and the adjoining Loita Plains, an area of approximately 6,000 sq. km, form the northern part of the greater Serengeti-Mara landscape of 25,000 sq. km that straddles the international Kenya-Tanzania border (see Figure 10).

The Masai Mara National Reserve (MMNR) was created in 1948 through negotiation between the colonial government wardens and the Maasai leaders. Expansion of the reserve to cover the entire ecosystem was resisted by the Maasai. Only the west of the Mara river–avoided by the Maasai due to insecurity and prevalence of malaria and tsetse fly–was included as part of the reserve. The MMNR is a relatively small PA at 1,510 sq. km and represents 26% of the Mara ecosystem.

Between 1961 and 2001, the MMNR was managed by the local authority, Narok County Council (NCC). After 2001, following the subdivision of Narok into two districts, the eastern part of the Reserve was managed by NCC while the western

Figure 10 *Map of the Kenyan Mara System*

Source: http://www.imagineafrica.co.uk

part was managed on behalf of the Transmara County Council (TCC) by a non-profit company, Mara Conservancy. Since March 2013, the enactment of the 2010 Kenyan Constitution and particularly the devolved government structure folds the two county councils into the larger Narok County again, and consequently the MMNR may be managed once again as a single entity by the Narok County Government.

In addition to the MMNR, the Kenyan Mara ecosystem contains a number of non-state PAs, differentiated locally into "community conservancies" and "group conservancies" as identified in Chapter 1. Prior to 1999, land around the MMNR was designated as communal group ranches; between 1999 and 2009 land was sub-divided and individual land titles were issued to group ranch members. Consequently the main driver leading to the establishment of the group

conservancies in the Masai Mara was the recent land subdivision combined with the desire of the new landowners to benefit from tourism. Furthermore, the subdivision of land was seen as a threat to the established tourism business in the group ranches due to the potential fragmentation of the land into different land uses. Consequently, a consortium of tourism operators negotiated with the Maasai land owners to create new conservancies through registration of land owners' companies, leasing of land and signing of management agreements with selected tourism investors. These group conservancies are managed through partnerships between land owners and investors by either employed staff (e.g. Olare Orok) or contracted management companies (e.g. Naboisho and Mara North conservancies).

Table 2 *Protected Area Land Coverage and Percentage for State, Community and Group Conservancies in Masai Mara Ecosystem*

Protected Area Type	Description	Area (sq. km)	Coverage (%)
State PA	national reserve	1,51	54
Community Conservancies (community PAs)	conservancy on group ranch or trust land	144	6
Group Conservancies	conservancy on private consolidated land	1,155	41
TOTAL		**2,809**	**100**

Source: Authors.

Although variations in the governance models exist between conservancies, the process involves setting aside community land (community conservancy) or areas of contiguous private lands (group conservancy) and allowing tourism investors exclusive use of the land for viewing purposes. In return, land owners receive guaranteed payment based on an agreed rate per hectare and amount of land owned. This payment is currently structured as a fixed monthly payment of between US$37 and US$50 per hectare per year for a renewable 5- to 15-year lease term. Decision making processes are designed to bring together tourism investors and land owner representatives. As per Figure 10, the majority of the non-state PAs are located north-east of the MMNR. At the time of the study three new conservancies were being proposed, two were at their early stages of development, and nine were

operational with legal registration, functional management units and tourism businesses (see Table 3).

Clearly the study's classification of PAs into just three categories (state, private and community) is an over-simplification, with the case studies confirming a rich diversity of PAs within each category. For the purposes of the study, the group conservancies in the Mara were classified as private PAs as their owners each have title deeds to a piece of the land within the defined PA. The Mara case study

Table 3 *Operational Conservancies and Conservancies under Development in the Masai Mara Ecosystem*

No	Conservancy	Conservancy Type	Status	Size (ha)	Year	Landowners	
						Private	Group
1.	Lemek	group	operational	7,285	1995	200	
2.	Olchorro Oirowua	group	operational	6,88	1993	196	
3.	Mara North	group	operational	31	2008	750	
4.	Olare-Orok	group	operational	8,903	2006	154	
5.	Naboisho	group	operational	20,63	2010	518	
6.	Olkinyei	group	operational	7, 125	2004	200	
7.	Siana	community	partly established	11,736	2009	-	3,5
8.	Olarro	group	operational	2,572	2012	152	
9.	Olderkesi	community	advanced formation	2,625	2012	-	3,957
10.	Enonkishu	group	advanced formation	5,665	2011	96	
11.	Motorogi	group	operational	5,261	2007	127	
12.	Oloolollo	private	operational	954	2001	2	
13.	Oloisukut	group	operational	20,234	2011	109	
14.	Maasai Moran	mix of community and group	under formation	648	2012	26	
	TOTAL			**126,257**		**2,53**	**7,457**

Source: Authors.

analysed a number of non-state PAs including group conservancies in the north of the MMNR (Mara-North, Mara-Naboisho, Olare-Orok) and the Olderkessi community conservancy, east of the reserve, as representative of community PAs, where the land has not been subdivided.

3.2. Describing the Dimensions of Environmental Complementarity

The case study interviews provide extensive anecdotal evidence of the ways in which different kinds of PAs may complement each other to enhance environmental outcomes. The opinions and perceptions summarised below draw from the case studies to illustrate the ways in which the conceptual framework, and particularly the six underlying dimensions it identifies, illuminates the discussion of environmental complementarity.

As defined in Chapter 2, environmental complementarity may be achieved through "additionality" or "synergy".

3.2.1. Ecological Dimension

Additionality

In both the Ewaso and Mara landscapes, the bulk of land is owned privately or communally. In these landscapes the presence of non-state PAs enables additional types of habitat, more wildlife representation and more connecting areas to be protected than would be possible through only state PAs. For example, in the Mara, the mix of state and non-state protected areas increases the size of the protected area landscape from 26% of the ecosystem to 43%. This increased space and greater range of habitats and natural resources largely ensure a continuous landscape to protect a greater range of biodiversity.

Synergy

Those interviewed for the case studies, whether more closely aligned to state or non-state PAs, perceive state PAs as very important for conservation in Kenya. State PAs are seen as significant refuges for wildlife, including in times of crisis such as conflict or drought, and a means of protecting nationally important assets such as water towers and genetic diversity. State PAs are thus seen as hubs for conservation

on which others build. Some private PAs in the Ewaso system and increasingly in the Mara also act as refuges, albeit at a much smaller scale. In the Mara, it was also acknowledged that without the state reserve, private PAs would be isolated and most likely not ecologically viable.

Informants suggest that, where there is low human disturbance as is the case in many state and private PAs, predators often thrive thereby threatening populations of endangered prey species. Community PAs, which are highly populated compared to state PAs, do not favour the presence of predators and may provide prey species with refuge; for example, in the Ewaso, the Grevy's zebra is mainly found in community PAs. Wildebeest, zebra and impala show preference for breeding in community PAs (Ogutu, 2005; Franks, 2011). Informants give other examples of ecological synergies: in the Mara, for example, browsing animals and those requiring short nutritious grass (elephants, gazelles, eland, impala, giraffe, zebra and wildebeest) graze on the plains mainly within the community and group conservancies where livestock grazing occurs.

3.2.2. Economic Dimension

Additionality

Different types of PAs provide different and yet complementary tourism products, which is a form of economic "additionality". More tourists visit both the Ewaso and Mara systems because of the variety of tourism product on offer, from high-end exclusive private lodges to community and cultural experiences. In the Mara, the non-state PAs can provide an even wider range of alternative products (e.g. walking safaris and night drives) as they are not governed by the same rules and regulations.

Synergy

Some tourism products demonstrate an economic "synergy" and more specifically a form of "co-dependence", such as private PAs working with their community PA neighbours to add a cultural experience (e.g. "star beds" in the Ewaso) to their client packages.

The Kenyan government has invested heavily in the Kenya brand and image as a primary tourist destination, as have the Mara and Ewaso regions. This creates opportunities for better cost effectiveness (or "economies of scale") in marketing and advertising to develop these regions as prime destinations for international

tourists. Both in the Ewaso and the Mara, the non-state PAs benefit from the brand and in turn provide more space so that tourists and lodges/camps are more spread out over a larger area.

There was wide agreement that the State in general (and indirectly state PAs) benefit from the taxes paid by private PAs, and that this synergistically lowers the overall costs of conservation to Kenya. However, questions about whether private PAs should be exempt from taxes in return for their protection of the national biodiversity asset have been raised.

In summary, the economic dimension of complementarity offers fertile ground for additionalities and synergies by increasing potential benefits from tourism and through cost sharing across the network. As tourism is considered to be one of the main drivers to stimulate conservation initiatives, strong tourism potential may contribute directly and indirectly to improved environmental outcomes in the long term.

3.2.3. Funding Dimension

Additionality

The different types of PAs have very different funding sources, thus the co-existence of different types of PAs generates additional funding for conservation in a landscape. Private PAs in the Ewaso tend to have good access to the business sector and to extensive personal networks through which they can generate funding. NGOs work with both private (in the Mara) and community PAs (in Ewaso) to access grant and "soft" funding and strengthen their own internal revenue–generating capacity for future financial sustainability.

Synergy

The presence of different types of PAs enables a better "story" to be told by each for fund raising. In the Ewaso for example, managers of private and community PAs indicate that they successfully fundraise by arguing that they support state PAs' conservation efforts by reducing pressure and increasing connectivity for the state PAs that act as refuges; thus they benefit from the fact that state PAs are recognised as an effective conservation tool. Informants in the Mara have found that an extensive PA ecosystem is perceived as more sustainable and therefore more attractive to donors than autonomous, discrete systems. A large and diverse PA

network provides justification for higher levels of donor funding due to the potential for increased impact achieved by interventions on the scale of the ecosystem rather than individual conservancies or reserves.

In the Ewaso, private PAs have done much to support the fundraising efforts of community PAs, and have found that this then helps them fundraise for themselves, especially when targeting development funds.

Non-state PAs benefit from state PA funding where it is spent on the development of the sector as a whole. For example, informants identify state PA investment in the development of skills that will be used by other PAs, e.g. strategic planning and ecological monitoring. The whole sector benefits from KWS investment in training its officers who work across all PA types. So as KWS becomes better resourced, the framework in which the non-state PAs operate also becomes stronger if funds are invested appropriately.

In summary, the presence of different types of PAs enables the whole conservation sector to have access to more funding and a more diverse funding portfolio (philanthropy, NGOs, public funds, business-based), which increases financial resilience.

3.2.4. Legislative Dimension

Additionality

The presence of different kinds of PAs in a landscape enables more people to be involved in biodiversity conservation. This form of "additionality" results in improved support for PAs and more engaged debate, which in turn helps strengthen the legal and regulatory framework for wildlife and PAs.

Synergy

"Synergies" are also found in the legislative dimension. Informants confirm that non-state PAs rely on state PA staff to enforce the law. The presence of a state PA in a landscape means that national policing bodies are actively present, which is a deterrent to illegal activities across the network. As a public entity, KWS is authorised and then better able to deal with fundamental and sensitive issues such as land encroachment and problem animal control; and non-state PAs depend on state PAs to provide access to government tools and power.

In return, state PAs can benefit from local activism and voices in support of sound biodiversity and conservation policies. The presence of non-state PAs provides the state PA authority with the local perspectives needed to ground national policy and decision-making processes in local realities. Furthermore, non-state PAs can use state PAs to get "the ear" of the government.

In summary, the presence of different types of PAs within a landscape increases the volume and variety of "voices" to push for legislative change and legitimises the sector overall.

3.2.5. Management Dimension

Additionality

The presence of different types of PAs in a network creates additional opportunities for jobs, training and career development. For example, community PAs (in the Ewaso) and group conservancies (in the Mara) provide opportunities for local people who are committed to conservation, speak the language required and have good local knowledge. Those with several years' experience and specific applied skills can seek work with private PAs. State PAs tend to offer more secure career paths and broader reaching work. The presence of multiple types of PAs in an area can therefore make conservation a more secure career choice.

Synergy

The case studies find that management synergies created by the presence of different types of PAs are particularly significant. For example, the different types of PAs have complementary intelligence and security networks. In both the Ewaso and Mara PA networks, the combination of effective state and non-state rangers leads to greater security for both biodiversity and local people generally. Unarmed community rangers managing community PAs rely on armed official rangers to counter and, if necessary, arrest dangerous criminals.

The presence of private PAs in the Ewaso system is cited by other PAs as enabling a more rapid and flexible response to problems (e.g. security, problem animals) because of their complementary resources, technical skills and operating systems.

Further, the presence of different types of PAs also appears to be increasing the overall quality of research undertaken with benefits across PA types.

Case study informants indicate that having different types of PAs across a network allows for a more effective mix of skills and personalities to deal with local issues. For example, in the Ewaso, patrols in community PAs are better accepted when a community representative is part of the patrol team. A mixed patrol enables KWS personnel to better tackle enforcement issues at the community level where enforcement might otherwise have been a source of conflict.

In summary, the case studies find very significant management synergies between types of PAs. The existence of different types of PAs in a network appears to offer significant opportunities to develop more efficient and effective overall management practices.

3.2.6. Socio-Political Dimension

Additionality

PAs require social and political support to exist over the long term. The case studies find that the presence of different kinds of PAs results in "additionality" by increasing the number of people involved and thereby creating a wider network of support, relationships and influence for PAs, which can increase overall acceptability and legitimacy.

Synergy

Both case studies find that the existence of community PAs (and private ones in the Mara) within a network helps to secure greater political support for PAs in general. In the Ewaso case study, informants suggest that private PAs are potentially more politically vulnerable than other types but are generally well regarded by international stakeholders who recognise them as usually efficient and well managed. The case studies find that state PAs can be unpopular locally as they impose state priorities over local preferences for land use and limit local access to and use of resources. State PAs may in turn enhance support for conservation at both national and international levels through strong government relationships and national policy setting processes and through national efforts to reach local stakeholders, such as awareness-raising in schools and through radio and TV programmes. Similarly in the Mara, at the community level, owing to citizen involvement and benefit sharing, communities are generally supportive of non-state PAs, and support for one conservancy can aid the support for all conservancies with representatives then advocating on behalf of all conservancies and the PA network.

In summary, the presence of different types of PAs in a network can create strong socio-political synergies resulting in stronger support for PAs locally, nationally and internationally.

3.3. Describing Complementarity Across the Dimensions

While the findings described above show that there is complementarity *within* each of the six dimensions described in our framework amongst PAs in the Ewaso and Mara ecosystems, the case studies also revealed interesting complementarity *across* these dimensions. The case studies highlighted particular advantages of each of the different types of PA and why it was therefore important to include them within the overall PA estate.

Community PAs and group conservancies are considered to be important because of their social legitimacy. While their degree of professional management may vary, the fact that they have the broad support of their involved constituency means that when need arises, they have the potential to better withstand external shocks and pressures. Furthermore, the fact that they generate some level of economic benefits for the local community–in the form of jobs and incomes–means they have the potential and access to raise awareness about the value of biodiversity and the importance of conservation.

Community PAs and group conservancies are not, however, sufficient on their own. While the economic benefits of conservation are welcomed, if another more fruitful economic opportunity were to appear there is no guarantee that conservation would be perceived as an optimal land use. The problems that these PAs have in obtaining legal recognition is a further threat to their stability and longevity, as is their limited access to sustainable sources of funding. Because of the nature of community institutions, community PAs can also have protracted decision-making processes making them potentially slow to react to critical situations or events.

Individual private PAs, as in the Ewaso system, by contrast are particularly valued for their flexibility and ability to react to new situations quickly. They have demonstrated success in wildlife conservation and are perceived as being efficiently managed in a business-like style. Like many successful businesses, they tend to be innovative with good market connections and a willingness to take risks. Individual private PAs are seen as effective at securing sustainable funding–often owing to extensive personal and business networks and the personal commitment and

passion of their owners. Not only do they generate funds for conservation in this way, but they also pay taxes to the government thus generating an additional revenue stream for the State. Individual private PAs are also seen as good neighbours to surrounding local communities where they have outreach programmes, generate opportunities for local community spin-off enterprises and add to local security.

As with community PAs and group conservancies, however, individual private PAs are also not considered sufficient on their own, partly because there are not enough of them of sufficient scale to be sustainable and partly because of the nature of private ownership. As they are individually owned, they are not seen as part of the local populace thus do not command the political support that community PAs or group conservancies do. There is also a perception that the objectives of the PA may change on the whim of the owner or with a change in ownership.

State PAs are not going to have a sudden change in objectives given their conservation mandate–and the conservation mandate of KWS. Thus, they ensure continued, long-term security for conservation objectives at the national level–at least in policy terms, political commitment on the ground may not always appear to be as strong. State PAs also provide the backbone for Kenya's tourism industry which generates jobs and enterprise opportunities as well as contributing significantly to GDP and export earnings. State PAs are thus critical for Kenya's long-term economic development.

Disadvantages of state PAs were also mentioned, however. These include, in a number of cases, their lack of popular support–although reserves (rather than national parks) do allow some level of local use and thus generate more local support. A further limitation is the insufficient level of resources allocated to their management and hence the poor conservation performance of many of them.

Above, we have drawn from the Ewaso and Mara case studies to explore the factors that drive the extent of environmental complementarity between different types of PAs within a network. The following section draws from the two case studies to explore the impacts of complementarity on desired biodiversity conservation outcomes.

3.4. Exploring Environmental Outcomes Arising from a Mix of PA Types

The case studies explore the ways in which the co-existence of different types of PAs are associated with the delivery of positive "environmental complementarity" impacts on biodiversity conservation in the Ewaso and the Mara networks in Kenya using relevant national and international targets to guide the discussions and drawing from both anecdotal and quantitative data as available. Causality between complementarity and positive biodiversity impacts is explored anecdotally.

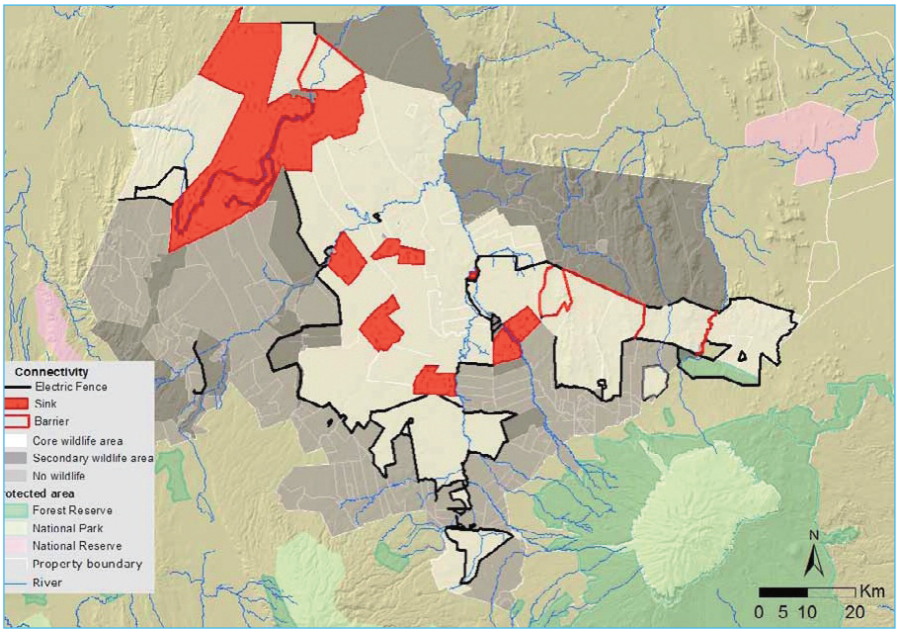
3.4.1. Ecological Outcomes Associated with PA Diversity in the Ewaso Ecosystem

The Ewaso landscape straddles several agro-ecological zones and is highly diverse in terms of habitat and wildlife, boasting one of the largest contiguous network of PAs (more than 25,000 sq. km) in East Africa.

The Ewaso PA network hosts an abundance of biodiversity including a high density of large mammals of global importance including half of Kenya's population of black rhinos (approx. 650), the second largest elephant population in Kenya (7,500), 15% of Kenya's lion population (250) and Kenya's largest population of wild dogs (200 individuals). It also hosts 80% of the world's population of Grevy's zebra (King, 2011), and comprises two of the three remaining forest habitats for the remaining wild mountain bongo population (Bongo Foundation website). Case study informants indicate that the Ewaso private PAs are the key primary sources of wildlife for the ecosystem while the community and state PAs are secondary sources (Figure 11, the core wildlife area identified is largely made up of the private PAs in Laikipia District). The case study also identified those factors that threaten the achievement of desired environmental outcomes in the Ewaso system (see Table 4).

In Figure 11, the red areas are largely abandoned land and act as "sinks" where people threaten wildlife populations (LWF, 2012). The red lines are barriers where the movement of specific wildlife species is constrained due to the presence of electric fences.

Figure 11 *Map of Constraints to Wildlife Movement in Laikipia*



Source: produced by Space for Giants and taken from the Laikipia County Wildlife Conservation Strategy developed by LWF in 2012.

Table 4 *Threats to Ewaso Biodiversity.*

Types of Threats	Description
Social/Cultural	**Increasing human populations:** Wildlife declines are highest in densely populated areas, with reduced space for wildlife and increased unsustainable extractive use of resources such as illegal charcoal burning, logging and over-grazing. **Negative experiences of wildlife locally**: Lack of perceived economic value of wildlife in some community PAs, high levels of human/wildlife conflict across the ecosystem and negative perception of livestock by the conservation and tourism actors creating tense relations in some cases between PAs and communities. **Further land fragmentation:** Pressure for land subdivision, loss of community cohesion, threatens corridors in particular. **Availability of guns**, threatening wildlife security as well as human safety. **Perception** that land under conservation is unproductive.

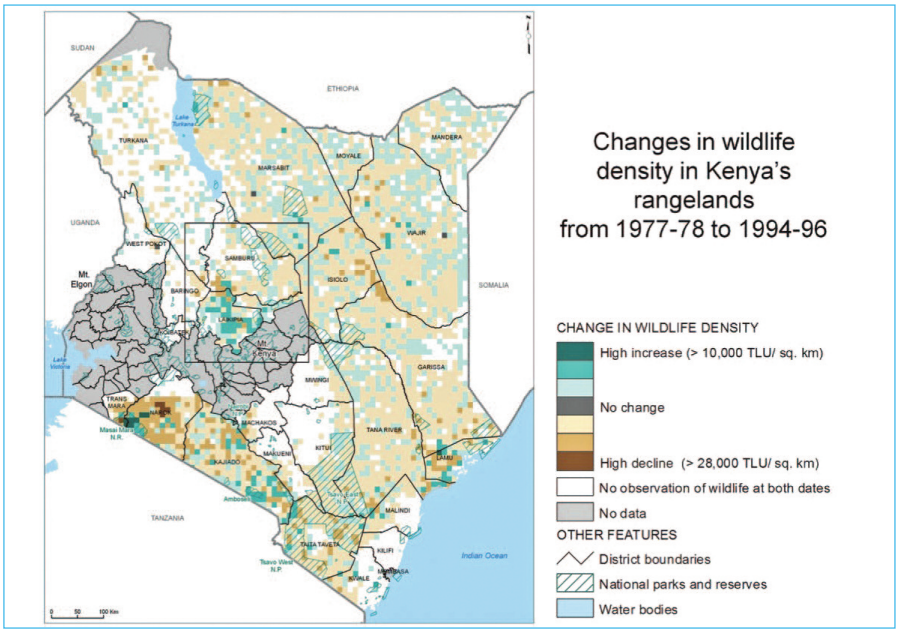
Types of Threats	Description
Economic	**Returns on land use:** Conservation threatened where higher economic returns possible through other land use, especially in community PAs. **Lack of infrastructure/poorly planned infrastructure:** Constraining development of tourism sector. **Increased small stock population:** Competition with small-to-medium herbivores. **Land use change:** Conversion of marginal lands and wetlands to agriculture. **Increasing costs of conservation:** e.g. high poaching pressure, tax hikes.
Management	**Corruption/lack of law enforcement:** Weakens the PA system.
Ecological	**Unsustainable resource use:** Practices that lead to habitat degradation and species loss, reduced water availability, as well as conflict over resources. **Growing scarcity of water:** Significant decrease in water availability across the system and increase in threat of severe periodic droughts. **Poaching:** Now one of the most significant threats to wildlife. **Land degradation:** Outside PAs, which increases pressure on PAs. **Loss of connectivity** due to increased settlements and fencing in some cases. **Climate change:** Exacerbates habitat degradation.
Political/legislative	**Inadequate policies and laws:** Constraints on the wildlife sector. **Lack of incentives** for wildlife conservation, e.g. in the tax system particularly at county level. **Environment and wildlife not a political priority**. **Uncertainty of land tenure,** e.g. debate over the legitimacy of large ranches.

Source: Case study authors.

Complementarity Gains for Private PAs in the Ewaso System

Private PAs in Laikipia have witnessed the greatest increase in wildlife density since the end of the 1970s (Figure 12). As a result, Laikipia alone has become one of the most important areas for conservation in East Africa (LWF, 2012), notably for predator conservation (KWS, 2008). Contrary to the steep nationwide wildlife population decline, the case study confirms previous findings that Laikipia's wildlife population has been relatively stable over the last 30 years (Kinnaird et al., 2008.)

Figure 12 *Changes in Wildlife Density in Kenya from 1977-1996*

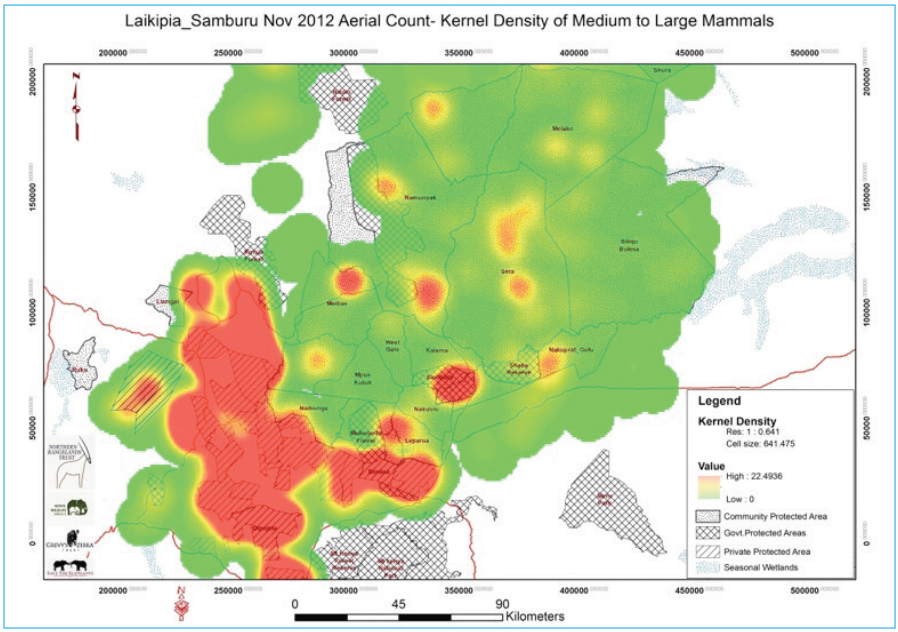


Source: taken from Giogiadis, 2011.

Informants note that despite a steady increase in overall wildlife populations across the Ewaso network since 1981, a decline has been detected in the last ten years especially in prey species. This may be the result of conservation success where predator density has increased significantly and now affects prey species. Indeed, for Franks (2011), Laikipia District now has one of the most stable lion populations in Kenya thanks to the presence of private PAs. Informants report that the most recent elephant count shows that the majority of the Ewaso elephant population is now hosted in Laikipia where private PAs offer refuge. Figure 13 highlights the role of private PAs as wildlife refuges (Ngene et al., 2013).

The capacity of private PAs to provide a haven for wildlife has been enhanced by the presence of community PAs whose guards provide intelligence to minimise incidents of poaching and which act as dispersal areas for the protected wildlife. Complementarity between community PAs and private PAs has thus resulted in stronger security for wildlife. Informants also recognise the complementarity value contributed by state PAs to environmental outcomes in private PAs through support

Figure 13 *Wildlife Densities in the Ewaso Ecosystem (NRT, 2012)*



Source: Produced by NRT specifically for this study using the 2012 Laikipia/Samburu aerial count survey (Ngene et al., *forthcoming).*

for an effective national conservation framework and the national branding and marketing of Kenyan wildlife tourism.

Complementarity Gains for Community PAs in the Ewaso System

NRT has identified an increasing abundance of some species, including giraffes and elephants, across Ewaso's community PAs (Dr J. King, pers. comm.). Similarly, signs of increased diversity have been detected in some community PAs where species not seen for decades have been sighted, for example wild dogs in the West Gate PA and elephants in the Malako and Sera conservancies. Community PAs provide refuge for some endangered species, and currently host 50% of Kenya's remaining population of Grevy's zebras (King, 2011). NRT monitoring has also highlighted increased vegetation cover where investments have been made in grazing planning (e.g. West Gate conservancy). The case study concludes that recent successes in environmental outcomes in community PAs in the Ewaso system have partly been the result of the

strong managerial and technical back-up provided by local private and state PAs in support of enforcement and fundraising.

Complementarity Gains for State PAs in the Ewaso System

The state PAs in the Ewaso ecosystem include forest reserves managed by the Kenya Forest Service, forest reserves and parks managed by KWS, and national wildlife reserves managed at county level.

Forest cover in the KFS forest reserves in Ewaso has declined steeply over the last few decades. For example, the Marmanet forest cluster in southwest Laikipia has declined by 80% since 1976 due to uncontrolled human exploitation (LWF, 2012). Informants report that the cultural importance of Mukogodo and Kirisia forests has helped keep them relatively well protected, although threats have increased significantly in the last years.

National Parks, often established to protect water towers, have been more successful than the reserves. Indeed, informants conclude that these forests would have disappeared if not gazetted as state PAs due to the high population pressure in the surrounding areas. In contrast, the Buffalo Springs and Samburu National Reserves provide refuges for wildlife and have been very successful in terms of maintaining or increasing wildlife abundance; both support and are supported by a network of community PAs, although Shaba Reserve has been less successful.

In summary, the Ewaso case study found that state PAs have provided refuges for wildlife and have been vital for protecting important ecosystem services, particularly where surrounded by community and private PAs that have provided dispersal areas and enhanced levels of awareness of the value of conservation.

Contribution to Achieving Nationally and Internationally Desired Outcomes

Table 5 summarises some of the ways in which the diversity of the Ewaso PA network has contributed to national and international environmental outcome targets, set at the national level by KWS's strategic objectives (SOs) and Vision 2030, and at the international level by the Aichi Targets.

Table 5 *Contributions of the Ewaso Diverse PA Network to Internationally and Nationally Desired Biodiversity Targets*

Desirable Environmental Outcomes	How Complementarity Between PAs Enhances Achievement of these Targets
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); ***Internationally Desirable Outcome: rate of loss of natural habitat halved (Aichi Target 5)***	Threats to natural habitats are many, especially to forests and rangelands because of unsustainable and uncontrolled resource use (LWF, 2012). The network of PAs in the Ewaso has prevented loss of habitat in the following ways: • some state PAs have been successful in preventing the loss of forests in the ecosystem, protecting water towers. The cultural importance of some forest reserves has also supported successful protection. • private PAs conserve rangelands, enhancing grass productivity, and are increasingly focused on how to increase grass productivity. An emphasis on grazing management in community PAs can reduce degradation of grasslands.
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); ***Internationally Desirable Outcome: 17% terrestrial and inland water covered by PAs (Aichi Target 11)***	State PAs cover approximately 5,910 sq. km in the Ewaso. Community PAs add 19,503 sq. km to this area, and private PAs a further 2,946 sq. km. Collectively PAs cover more than 50% of the Ewaso ecosystem.
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); ***Internationally Desirable Outcome: prevent extinction of known threatened species (Aichi Target 12)***	The case study found that the presence of private and community PAs alongside state PAs enhances protection of endangered species. Half of the national population of black rhinos is in private PAs in Laikipia as well as most of the population of Jacksons' hartebeest, and 15% of the population of Kenya's lions (Franks, 2011). Private PAs provide migration corridors within Laikipia and from Laikipia to Samburu. Community PAs provide the connectivity and necessary dispersal areas for populations of wild dogs, lions and elephants, and are home to 50% of the remaining Grevy's zebra population.

Desirable Environmental Outcomes	How Complementarity Between PAs Enhances Achievement of these Targets
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); Internationally Desirable Outcome: maintain genetic diversity of agriculturally and culturally valuable species (Aichi target 13)	Forests are hot spots for biological diversity in the Ewaso and are mainly protected by state PAs. State PAs protect more than 100 endemic species of plants in the Ewaso forests (UNEP, 2003; KWS, 1999). Private PAs are believed to contribute to preserving genetic diversity in grass and rangelands (King, pers. comm.). Medicinal plants are heavily used locally in the Ewaso, and are thought to be best conserved through community PAs, although there is no scientific evidence available as yet to back this up.
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); restoration of Kenya's key water towers (Vision 2030); Internationally Desirable Outcome: ecosystems providing essential services are restored or safeguarded (Aichi Target 14)	The mixture of PAs in Ewaso has resulted in a wider range of ecosystem services being protected than by state PAs alone. For example, state PAs have prioritised protection of water towers, and conserve carbon stocks through their focus on forests. Private PAs, predominantly focused on rangelands, contribute to both water and grass conservation, which in turn supports local pastoralist livelihood systems (LWF, 2013).
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); Internationally Desirable Outcome: degraded ecosystems are restored (Aichi Target 15)	Rangelands are particularly degraded in the Ewaso, and private and community PAs are working together on various rangeland restoration projects.

Source: authors

3.4.2. Ecological Outcomes Associated with PA Diversity in the Mara Ecosystem

The Masai Mara system is one of the most rich and bio-diverse landscapes in Africa. It hosts more than 95 species of mammals, over 550 species of birds and thousands of insect species. Its spectacular herds of ungulates are swelled in the dry season by hundreds of thousands of wildebeest, zebra and several gazelles, whose annual movements through the landscape are known as the great migration. The million plus migrating wildebeest make the Mara a touristic spectacle (Reid, 2012). The group conservancies and community PAs cover an area of 1,065 sq. km or 41% of the total protected area, increasing the total area of the ecosystem protected from 26% to 43%.

Despite this extensive PA network, a number of factors threaten biodiversity in the Mara ecosystem. Several studies have investigated the status and 30-year trends of wildlife in the Mara and compared population size and distribution patterns. Said (2003), Ottichilo et al. (2001), Ogutu et al. (2005) found population declines of between 58% and 63% over the previous 30 years for large and medium-sized ungulates that are easily counted by aerial surveys. Ogutu et al. (2011), reported substantial declines of many wildlife species with only a few exceptions. The case study informants confirm these findings, with continuous range contractions, recurrent droughts and the expansion of large-scale cultivation outside the MMNR cited as primary contributing factors. Additional factors include: growing human settlements (Lamprey and Reid, 2004), illegal hunting (Loibooki et al., 2002), and livestock incursion into the Reserve MMNR (Ogutu et al., 2009). Continued heavy poaching on the west border of the MMNR, with anti-poaching activities netting 278 poachers, 1,202 snares and 1,200 kg of game meat over a 30-month period between 2007 and 2009,[16] is also a contributing factor. Table 6 summarises the main threats to wildlife and habitats based on case study interviews and literature.

[16] According to the most recent survey data available for the Mara.

Table 6 *Threats to Mara Biodiversity*

Types of Threats	Description
Management	• Inadequate reinvestment of tourism revenues into eastern MMNR. • Variable level of technical skills to carry out reserve management and ecological monitoring on the eastern side. • Political interference, especially in staff recruitment, deployment, discipline and rewards ('the godfather attitude') combined with issues relating to poor staff housing and morale in the eastern side of MMNR management.
Economics	• Unknown degree of corruption in revenue collection and management. • Pressure for increasing economic returns particularly in the conservancies. • Lack of law enforcement. • Competing land-use returns, e.g. agriculture vs. tourism and conservation.
Funding	• Declining water quality and quantity in the Mara and Talek Rivers due to catchment destruction, water abstraction, pollution from human settlement and tourism facilities, cultivation along the rivers upstream and flooding during the wet season. • Overgrazing by livestock mainly at the edges and outskirts of MMNR, particularly during the dry season. • Changing and unpredictable climate, which is yet to be incorporated into planning or decision-making in the face of more immediate threats and challenges.
Biodiversity	• Degradation of woodlands due to fire and elephants. • Continued wildlife harassment by tourist vehicles–particularly harassment of cheetah. • Tourism overcrowding during the peak season, on predator sightings and at wildebeest river crossing. • Expansion of invasive species, e.g. Parthenium along the Keekorok-Mara Bridge-Serena Road and in the Fig Tree camp area. • Demand for wildlife parts e.g. elephant ivory, rhino horn, cat skins.
Economic	• Unplanned development of tourism facilities and unmanaged tourism activities including off-road driving, high balloon density and camps located in key wildlife habitats particularly along rivers. • Deplorable state of the main Narok-Sekenani road and other access roads.

Types of Threats	Description
Social	• Growing population pressure. • Discontent between those landowners receiving lease payments and the wider community not benefitting in this way. • Perception that land under conservation is "unproductive". • Growing interest in alternative land uses. • Human-wildlife conflict resulting in the poisoning of predators and birds of prey and the consequent destruction of tourism products.
Legislative	• Inadequate policy and legislation to support different types of PAs. • Amended Wildlife Bill has been pending approval for over two years, although it did recently receive cabinet approval at the tail end of this study.

Source: authors.

Complementarity Gains from the Mix of PA Types in the Mara Ecosystem

The Mara ecosystem accounts for about 20% to 30% of Kenya's wildlife and supports Kenya's greatest densities of both domestic and wild herbivores. The case study concludes that having a mix of different PA types improves environmental outcomes in three key ways:

Extended Coverage

Conservancy lands of open and wooded savannah covering some 1,064 sq. km of land owned by approximately 2,500 landowners add significantly to the 1,530 sq. km protected by the MMNR. The group and community conservancies enhance connectivity to the Lemek dry land forest, Nyakweri Forest, Pardmat Hills, Loita Plains and the Siana Hills. These areas form an important dispersal area for seasonally migrating wildlife and provide habitat to resident species, particularly during the wet season.

The conservancies enhance the effectiveness of the MMNR by providing corridors to key resources such as pasturelands, water points, saltlicks, forests and breeding areas such as Leopard Gorge, part of the Musiara Marsh and the rocky escarpment running east to west along the central Koiyaki. Such critical areas protect breeding areas for threatened and rare species such as leopard, hyena, jackals, rock hyrax and species of snakes and lizards.

The conservancies further buffer the state PA from human settlements, livestock grazing and small-scale cultivation because human activities–such as motorised transport, extraction of wood and grass, and the movement of people and livestock–are all controlled within the conservancies. Consequently, pressure on the boundaries of the MMNR has eased since their establishment.

Nevertheless, a significant and growing portion of the ecosystem has undergone conversion to incompatible land uses and the threat of conversion continues to hang over additional areas. Further opportunities exist to extend the conservancy model to cover critical parts of this highly threatened ecosystem (Courtney, 2009).

Habitat Diversification

A few studies have assessed habitat differences between the MMNR and community PAs. Dublin (1995) and Walpole et al. (2004) found that the woodland cover and species distribution between the Reserve and the conservancies differ significantly. Fire and elephants have acted to reduce the tree cover in the Reserve thereby creating an open savannah. The low population of elephants and lower fire frequency within conservancies allow higher tree cover and plant species diversity compared to the Reserve. This dichotomy of vegetation composition between the different PA types supports differentiation in species distribution with browsers concentrating on community lands and grazers occupying the grasslands in the Reserve. The community PAs are particularly important in the wet season for supporting the large number of resident wildebeest and zebra and a higher population of elephants.

Refuge for Threatened Species

In the Mara, rhino, cheetah, duiker, waterbuck, hartebeest and reedbuck all show higher preference for the MMNR compared to giraffe, wild dog, leopard, eland and nocturnal animals such as aardvarks, springhares and several species of mongoose, which are more populous in community areas (Reid et al., 2003).

However, most studies of the ecosystem document the maintenance of wildlife density through alternate movements of wildlife between the MMNR and the community conservancies during the dry and wet season. The Reserve and conservancies complement each other by acting as ecologically differentiated landscapes, allowing wildlife use to vary with seasonal resource availability.

Contribution to Achieving Nationally and Internationally Desired Outcomes

Informants from the Mara case study perceived that the complementarity between different PA types enhances progress towards national and international environmental outcome targets. Table 7 below summarises some of the identified impacts.

Table 7 *Contributions of the Mara PA Network to Internationally and Nationally Desired Biodiversity Targets*

Desirable Environmental Outcomes	How the Complementarity between PAs Enhances Achieving these Targets:
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); Internationally Desirable Outcome: rate of loss of natural habitat halved (Aichi Target 5)	Threats to the Mara ecosystem are numerous and intense, increasing over the past ten years with the privatisation of communal lands. Serious wildlife declines were reported between the 1970s and 1990s but some slight recoveries of some wildlife species have been noted since then. The location of the Mara adjacent to the larger Serengeti ecosystem and the network of private and community PAs has jointly prevented the continued loss of wildlife in the Mara and provided potential to halt recent reported wildlife declines and changes in vegetation cover. The threats to the Mara Reserve have provided justification for national and international attention and action focus on the conservation of the Mau forest. The state PA conserves grasslands that support high density of wildlife, particularly migrating herds and ungulates. Private and community PAs protect more heterogeneous landscapes and short grass plains, and maintain a significant population of small-bodied ungulates and browsers. These areas provide opportunities for managed livestock grazing thereby preventing grassland degradation and loss of grass species and cultural activities.
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); ***Internationally Desirable Outcome: 17% terrestrial and inland water covered by PAs (Aichi Target 11)***	The network of state and private/community PAs cover an area of more than 2,500 sq. km, almost half of the entire Mara ecosystem: • state PAs cover 1,520 sq. km, • private PAs and community PAs cover 1,025 sq. km.

Desirable Environmental Outcomes	How the Complementarity between PAs Enhances Achieving these Targets:
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); Internationally Desirable Outcome: prevent extinction of known threatened species (Aichi Target 12)	Long-term research and monitoring in the Mara ecosystem show that although the Mara has suffered serious wildlife losses and major vegetation changes, the establishment of private and community PAs alongside the state PA enables protection of wildlife, a halt of the decline of some species and notable increases of key wildlife species. The state PA has contributed to securing of Kenya's only indigenous black rhino population and protects sensitive species such as cheetah, lion and other predators including vultures that are threatened by poisoning. Private and community PAs allow corridors and migratory routes for the wildlife, particularly migratory species such as elephants, wildebeest and gazelles.
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); Internationally Desirable Outcome: maintain genetic diversity of agriculturally and culturally valuable species (Aichi target 13)	The PAs maintain plant genetic diversity that is culturally significant to the Maasai community for traditional practices and ceremonies. They also enable cultural interactions between people and wildlife and connections to the land and natural resources that people, wildlife and livestock rely upon.
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); restoration of Kenya's key water towers (Vision 2030); Internationally Desirable Outcome: ecosystems providing essential services are restored or safeguarded (Aichi Target 14)	The presence of the MMNR and the private and community PAs has provided incentives and international recognition for the conservation of the Mau forest, Kenya's largest water tower. The Mau forest provides water to the ecosystem and other areas of Kenya including several rift valley lakes.

Desirable Environmental Outcomes	How the Complementarity between PAs Enhances Achieving these Targets:
Nationally Desirable Outcome: enhance wildlife conservation (KWS SO1); Internationally Desirable Outcome: degraded ecosystems are restored (Aichi Target 15)	The establishment of private and community PAs provides a management approach that is contributing to improved land and pasture management, including restoration of grasslands that have suffered excessive grazing over the years, by allowing the grasses to rest and reseed, with additional grass cover now being reported in several areas.

Source: authors.

Conclusion

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Conclusion

Key Findings from the Study

This study has explored the concept of "environmental complementarity" between different kinds of protected area, attempting to define the concept and analyse it in the context of Kenya's complex mix of state and non-state protected areas. Through a process of literature review, key informant interviews, expert workshops and landscape-level case studies we developed a definition of environmental complementarity as: ***the enhancement in progress towards achieving desirable environmental outcomes (as defined locally, nationally or internationally) as a result of the presence of community and private PAs alongside state PAs.*** We further identified six different types of enabling and constraining underlying factors–or the "dimensions" of environmental complementarity–that influence that enhancement in progress: ecological, economic, funding, management, legislative and socio-political. Within these different dimensions, we recognised that complementarity may be achieved in two different ways: "additionality" and "synergy".

Our two case studies illustrate the ways in which PAs may complement each other to enhance associated environmental outcomes. They highlight perceptions amongst key informants of the existence of complementarity in each of the six underlying yet inter-linked dimensions of complementarity. A summary illustration of the case study findings is presented in Table 8.

Table 8 *Illustrating the Dimensions of Complementarity from the Ewaso and Mara Case Studies*

Dimension	Case Study Illustrations of "Additional" PA Complementarities
Ecological	• More space, more habitat, more species, more connectivity. • Improved wildlife reproduction opportunities and higher numbers of young maturing to adults.
Economic	• Greater tourism opportunities given additional facilities and more diversity in tourism products.
Funding	• Different PA types bring access to different and additional funding sources. • Additional tourists bring access to additional support.
Legislative	• Different PAs bring complementary voices to national, regional and local debates and pressure to strengthen legislative processes. • The increased breadth brings a broader and more diverse constituency and helps to make policy and legislative change more legitimate.
Management	• More PAs within a system and more types of PAs means a greater volume and variety of conservation information collected and research undertaken. More people employed as conservation professionals giving more career opportunities, greater volume and range of skills.
Socio-Political	• Diversity of PA types increases the number and variety of conservation stakeholders and the acceptability and legitimacy of PAs. • The addition of community PAs reflects a growing focus on conservation as a driver of local livelihood gains, and thus a means of more social support for the PA network.

Dimension	Case Study Illustrations of "Synergistic" Complementarities
Ecological	• State PAs and some private PAs act as refuges in times of crisis, community PAs and group conservancies allow dispersal in areas which might otherwise be sinks. • Different species appear to prefer different types of PAs, sometimes at different times of year and/or in different seasons.
Economic	• The presence of community PAs and group conservancies can reduce management costs for state and individual private PAs through enhanced security, reduced poaching and less pressure on habitats. • Non-state PAs capitalise on state PA branding for tourism development with resulting economies of scale. • Adding additional PA types to a network enables provision of more diverse tourism products.
Funding	• Multiple PA types in a system makes it more credible and attractive to a wider range of investors and donors. Fundraising skills differ between PAs, with private PAs in particular showing themselves willing and able to help community PAs access funding. • State PAs fund the development of conservation infrastructures (capacity, standards, systems, marketing) that in turn benefit non-state PAs.
Management	• Security synergies from a mix of PA types, including joint patrols and monitoring, bring broad benefits to both wildlife and local people. • Joint patrols also result in a more diverse mix of people involved in enforcement and therefore increase acceptability and compliance rates. • Problem solving is faster and more effective when there is a mix of PA types, with community PAs enhancing on-the-ground intelligence, state PAs providing the authority and legitimacy of response, and private PAs often able to supply flexible resources and additional skill sets.
Legislative	• A mix of PA types creates co-dependence with regards to legislative change; state PAs rely on activists in non-state PAs to push for change, while state PAs have the mandate to push for change processes within government.
Socio-Political	• Local support for conservation by state and private PAs is enhanced in areas with growing and strong community PA sectors.

It is clear that there can be complementarity within each of the six dimensions (as illustrated in Table 8 above), as well as across them. More broadly, the case studies highlight how the weaknesses of one type of PA may be compensated for by the strengths of another type. Table 9 summarises some of the main strengths and weaknesses identified by informants to the two case studies.

Table 9 *Cross-Dimension Complementarity: Some Generic Strengths and Weaknesses of Different Types of PAs in the Ewaso and the Mara Systems*

Type of PA		Possible Strengths for Environmental Outcomes	Possible Weaknesses for Environmental Outcomes
Community PAs		• Seen as having local legitimacy. • Can be a useful source of local monitoring "intelligence" to add to PA information systems. • Are often spaces where wildlife and livestock share grazing and water resources and offer specific value to some wildlife species as refuges, for breeding or for grazing. • Allow creation of PAs on community land. • Decisions are taken slowly after extensive consultation, which can safeguard PA status.	• Mixed views as to how successful they have been in terms of direct impact on biodiversity conservation. • Governance can be challenging in terms of managing different interest groups and transparency/fairness of decision-making mechanisms. • Often have low level of financial resources but high hopes and expectations of economic gains from PA status. • Generally have inexperienced management teams in need of capacity building support.
Private PA	**Group Conservancies (in the MARA system)**	• Innovative governance models, e.g. joint decision-making platform. • Focused on improving tourism experience and diversifying tourism products, thereby creating economic opportunities. • Buffer the MMNR from changing land use. • Wildlife and livestock share the land, which benefits some species, e.g. incorporating limited managed cattle grazing. • Provide income and jobs to land owners and their families. • Hire professional management and ensure reasonable staff conditions and remuneration. • Invest in infrastructure and security. • Attract significant philanthropic funding. • Can incorporate cultural norms and practices of the surrounding communities.	• Group conservancies are expensive to establish, operate and manage. • Boundaries are not defined solely on conservation or biodiversity value, so may exclude key areas. • They can act as a magnet to population growth and rural development, which can potentially cause conflict with conservation. • They do not directly benefit the larger community, only primarily the conservancy members. • Boundaries create shrinking space for cultivation and grazing areas, which can fuel conflict. • Individual land owners within group conservancy may have different ambitions, which can create tension.

	Individually- or Family-Owned Private PAs (in the Ewaso system)	• Often regarded as flexible and quick to react to emerging challenges. • Are generally regarded as successful in terms of wildlife conservation. • Able to access skills for effective business management. • Access to broad range of conservation skills and financial resources through personal networks. • Invest in good security. • Have the potential to support their community neighbours in the form of outreach, shared opportunities and added security. • Pay taxes to the government.	• May be perceived as not part of the community and therefore struggle to gain local support. • Face challenges that all family-owned businesses face in terms of succession, possible intra-family conflict over priorities, and the need to extract value from land for other purposes, e.g. retirement.
State PAs		• Are focused on the delivery of government objectives for the PA sector, including the mandate of attaining Kenya's biodiversity and tourism development objectives. • Provide refuges for wildlife. • Provide state-level legitimacy to the sector. • Have control and power over wildlife policy and enforcement nationally. • Have political support at the central government level. • Are part of a nationally respected institution (KWS). • Ensure and safeguard the national interest in wildlife conservation, though more locally managed Reserves appear to win more local support than National Parks. • Underwrite the growth of Kenya's tourism industry, which drives the financial and economic case for the biodiversity sector.	• Can be inflexible and slow to react. • National Parks in particular suffer from a lack of local support. • Often perceived as not efficiently managed, given the size and complexity of government institutions.

Source: authors.

Possible Limits to Environmental Complementarity

The case studies also reveal two factors that potentially undermine complementarity between PA types, each of which is discussed below. First, PAs within a network may compete with each other for both economic and funding benefits; and second, the predominance of economic drivers for PAs risks weakening the PA system by diluting the focus on biodiversity conservation.

Does Competition between PAs Limit Complementarities and Environmental Outcomes?

In the case studies, competition between PAs was identified for:

Funding: competition for funds tends to occur within one type of PA rather than between PA types, given the limits to total funding available for some PA types, e.g. philanthropic funding for community PAs (group conservancies in the Mara) and state funding for state PAs). Within community PAs (group conservancies in the Mara) for example, the case studies found that different PAs can find themselves competing for similar philanthropic funds.

Tourism: for the case study informants, there is little competition for tourists between the different types of PAs as different products are being sold in the different PAs, e.g. more mass tourism "safaris" in state PAs and more exclusive or "niche" products in private and community PAs. Consequently, most competition is among PAs of the same type. This may, however, also be seen as a positive factor because it forces operators to improve their products and become more competitive thus benefiting the PA system as a whole.

Peer pressure between private PAs: private PAs as in the Ewaso system are vulnerable to political pressure and some feel their land tenure may not be secure. Private PAs therefore put pressure directly or indirectly on one another to ensure that they all adopt best practices and collaborative approaches. In the Ewaso ecosystem, the Laikipia Wildlife Forum is one of the media through which peer pressure is exercised. This is seen in pressure for individual private PAs to be relevant and effective, which makes the individual PAs and thus the whole Ewaso PA network stronger. In the Mara, this situation is more subtle, perhaps as there is not yet an official forum, or perhaps due to the different nature of the existing private PAs in the Mara network.

Are Economic Drivers Leading to a Loss of Focus on Biodiversity Conservation in the PA Sector?

A potential weakness of having non-state PAs alongside state PAs could be to lose the biodiversity conservation focus if the primary driver for the former is economic rather than environmental. Indeed the overall study finds that the main drivers for the creation of community PAs and group conservancies is expectation of economic gain in both the Ewaso and the Mara ecosystems. Increasingly this is also true of the state PAs, with their mandate to safeguard and develop Kenya's PAs as central economic assets in its growth strategy. This growing emphasis on tourism and economic returns risks diluting the sector's focus on biodiversity conservation, and thus its capacity to deliver environmental outcomes.

However, a number of factors could mitigate this threat and ensure that biodiversity conservation remains a primary focus in Kenya's PA system:

Many stakeholders remain focused on the longer term sustainability of the PA system, and recognise that safeguarding the quality of Kenya's biodiversity asset underpins the long-term economic value of its PAs.

Many group conservancies and community PAs are dependent on conservation organisations and environmental philanthropy for at least part of their funding, which supports their choice to strive to achieve environmental outcomes.

As natural resource use starts to become more sustainable in community PAs and group conservancies (e.g. through grazing planning, water conservation, and/or increased livestock count or improved cattle breeds) and the benefits are seen in increased income from livestock-based activities (through increased grass productivity), conservation activities become more directly relevant to livelihood security.

There are plenty of non-economic drivers for the establishment and maintenance of new PAs, including the perceived security benefits and a desire to maintain cultural values. Malleret-King and Hatfield (2008) showed that one of the main values of community PAs and group conservancies is to create community pride and status.

Overall Study Conclusions

The results of the study revealed a number of issues that are relevant to the ongoing development and use of the complementary concept.

First, the concept of complementarity between different types of PAs is relatively new and surprisingly under-developed. The literature on the topic is fairly thin, limited primarily to that dealing with systematic conservation planning where the term assumes a specific meaning (and which is almost entirely focused on state PA networks). Although some case study analyses explore the added value of different kinds of protected areas (those based on either privately-owned or communally-owned land) in terms of biodiversity coverage, and in some cases compare the effectiveness of state versus other kinds of PAs, no studies really try to understand the underlying factors that may lead to added value, and no overall conceptualisation of PA complementarity has to date been published. Furthermore, no studies exploring protected area networks at any scale from local to global have extended beyond state PAs to consider those owned or managed by non-state actors. Yet, this would seem to be an important gap given that such areas under some form of conservation management are becoming increasingly common.

Second, the concept of complementarity is multi-faceted. The case study research showed that there is a complex array of complementarities between community, state and private PAs, and these complementarities contribute undeniably to strengthening the overall PA sector and increasing its resilience as well as its capacity to generate environmental outcomes.

Third, exploring complementarity across different types of PAs demands a stable classification of PA types and up-to-date information on PA inventories, both of which proved difficult to obtain and maintain across the study. Our study led to a more than doubling of the list of Kenyan PAs on the WCMC World Database of Protected Areas (WDPA) and to Kenyan stakeholders, under KWS leadership, agreeing on a process to update and maintain this list. Our initial classification of state, private and community PAs proved, however, overly simplistic to discuss environmental complementarity and required further refinement. In Ewaso, private PAs tend to be individually-owned, while in the Mara they can be coalitions of hundreds of landowners and share many of the same characteristics as community PAs. Meanwhile, state PAs include not just those managed at the national level, but also those managed by local or county government. Moreover, in Kenya as elsewhere, the actor who *owns* the land on which a PA exists may not be the same

(or same kind of) actor that *manages* it even though this was usually the case in our case studies (except in the Mara). The different kinds of management goal applied to an area (especially those under some form of mixed land use) also imply some variation in the extent to which different areas within a PA category are more or less "under conservation management". This suggests that a richer and more context-specific classification system may be required.

Fourth, testing evidence of environmental complementarity requires equivalent data across all individual and PA sites and categories ,which is rarely–if ever–available. For example, whilst species lists (at least for species of economic value or conservation concern) can usually be gathered or estimated for many PAs, accurate location data (including GIS polygons) are largely limited to state PAs (although in many cases even these are inaccurate or unavailable). Likewise, avoiding assumptions of equivalent effectiveness across individual PAs and PA categories requires comparative data on biodiversity trends relevant to conservation goals. A significant amount of effort within this study was dedicated to developing a comparative database for Kenyan PAs, relying on information gathered from key informants. While wildlife surveys have been done in some areas, these have not been undertaken in a consistent way across the country, and so are not comparable through time or across sites. Data on biodiversity outcomes were almost entirely lacking, and the case studies therefore relied largely on anecdotal evidence from informants and secondary sources as to biodiversity outcomes and their dependence on complementarity factors as drivers.

The issues highlighted above may go some way to explaining why complementarity, within a national or landscape-level network of state and non-state PAs, has not received more attention. Yet, despite the challenges faced, this study provides a strong rationale for why PA networks must be considered as more than a series of individual PAs, and why assessing the effectiveness of PA management only at the level of individual PAs may be useful but is still insufficient to evaluate the effectiveness of PA networks or the achievement of national conservation goals. At the final discussion workshop for the study, held in Nairobi in September 2013 with representatives of government, private and community stakeholders, the study's conceptual framework and case study findings were universally applauded as providing important insights into how best to understand and build the effectiveness of Kenya's PA system. In a context where non-state protected areas are increasingly recognised in the Wildlife Bill and are granted more powers, we believe that using the lens of complementarity to assess PAs network is more necessary than ever before.

Acronyms

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Acronyms

AFD	Agence Française de Développement
AWF	African Wildlife Foundation
IIED	International Institute for Environment and Development
KWS	Kenya Wildlife Service
MMNR	Masai Mara National Reserve
NGO	Non-Government Organisation
NMK	National Museums of Kenya
NRT	Northern Rangelands Trust
PA	Protected Area
UNEP	United Nations Environment Programme
WCMC	World Conservation Monitoring Centre

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Exploring Environmental Complementarity between Types of Protected Areas in Kenya

Protected areas which have long been and remain the cornerstone of biodiversity conservation are expected to play a central role in addressing the current global biodiversity crisis. They are, however, by no means uniform. Considerable work has been done to understand the effectiveness of various types of protected area. But it appears that, until now, there has been very limited investigation of how a combination of different types of protected areas within a system affects its global environmental outcomes. This research initiates this investigation in order to better identify how to improve the outputs of a network of protected areas and in so doing contribute further to addressing the environmental crisis. Using Kenya as a case study, it aims to define and explore the concept of environmental complementarity between different types of protected areas, investigate how this complementarity enables them to enhance their ability to achieve positive environmental outcomes, and test the developed conceptual framework at landscape level.

This research will interest anybody looking to better understand whether, in the words of Aristotle, the whole (i.e. the protected areas system) is greater than the sum of its parts (i.e. the individual protected areas that make up the system).

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