Social dimensions of crane and wetland conservation in African rural landscapes: insights from Kenya, Uganda and Zimbabwe

Mabhachi, O.

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Proefschrift

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van rector magnificus prof.dr.ir. H. Bijl,
volgens het besluit van het college voor promoties
te verdedigen op donderdag 15 juli 2021
klokke 15.00 uur
door

Osiman Mabhachi

geboren te Bikita, Zimbabwe
in 1974

Colofon

Social dimensions of crane and wetland conservation in rural landscapes:
Insights from Kenya, Uganda and Zimbabwe

Lay-out and printing: GVO Drukkers & Vormgevers, Ede

ISBN: 978-94-6332-772-5

Front Cover Picture : Grey Crowned Crane on a nest located on a wetland near Lyantonde, Uganda.
Photo taken October 2011, Osiman Mabhachi

Promotoren:

em.prof.dr.ir. W.T. de Groot (Radboud Universiteit Nijmegen)
prof.dr. G.R. de Snoo

Promotiecommissie:

prof.dr. J.C. Biesmeijer (Naturalis Biodiversty Center)
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Preface

The genesis of my PhD research and subsequent compilation of this thesis is intertwined with my professional career development.

I was introduced to the world of cranes when I was hired by BirdLife Zimbabwe to fill a newly created position of Crane Conservation Officer in April 2003. I had previously spent almost four years working as a Graduate Research Assistant at the University of Zimbabwe, attached to a research project aimed at evaluating the effectiveness of soil and water conservation techniques in agricultural fields in the semi-arid Chivi District, southern Zimbabwe. During that time, I spent time interacting with small-scale farmers, community leaders, agricultural extension officers and agribusiness dealers (input suppliers and product buyers). As we conducted our research activities, we acknowledged farmers as land users, capable of making decisions and act in ways that would protect soil and water resources. This was my first exposure to community-based approaches to environmental problem solving, an experience that helped me appreciate the importance of social skills in natural resource management. The community engagement experience I gained working with farmers and other stakeholders along the agricultural value chain became the professional strength that helped me to be hired by BirdLife Zimbabwe.

Joining BirdLife Zimbabwe came with new professional challenges, imperatives and expectations. Having been trained as an Agricultural Engineer at undergraduate level, I had to come to terms with the requirement that I would deal with issues outside the realm of my undergraduate training. I had to familiarise myself with the biology of cranes and the ecology of wetlands. During my induction, my manager jokingly informed me that mastering species biology, habitat ecology and conservation theories would not be the only major challenges. According to him, the challenge would be to effectively apply my social skills to entrench a new conservation ethic among newly resettled farming communities to ensure the coexistence of cranes and people in a landscape that was increasingly being transformed. He stressed that my first task was to read widely, covering topics such as conservation biology, landscape ecology, species surveys and habitat assessments.

The project that BirdLife Zimbabwe hired me to lead was to be implemented in the Driefontein Grasslands, a landscape that supports Zimbabwe's key populations of Grey Crowned and Wattled Cranes. Between 2000 and 2002, sweeping land ownership changes took place as "black" subsistence farmers settled in the area following the exodus of "white" commercial farmers, under Zimbabwe's fast-track land reform programme. For decades, cranes had thrived on privately-owned livestock ranches, managed under rotational grazing systems, characterised by minimal human presence and virtually no wetland cultivation. Three years after being resettled in the area, farmers were using wetlands that contained crane breeding sites for vegetable gardening and communal livestock grazing. This was a cause for concern for BirdLife Zimbabwe as the introduction of crop farming in wetlands would inevitably affect crane breeding habitats. My role was to engage the relevant stakeholders (resettled farmers, village leaders, environmental and agricultural extension officers and local district officials), sensitising them on the need to protect cranes and curb wetland degradation. The main concerns then included agricultural encroachment into wetlands, uncontrolled fires during the dry season that posed a risk to crane nests and chicks and general human disturbance to breeding pairs. Unbeknown to me then, the need to understand human-crane interactions and the quest to develop effective community-based solutions to threats to cranes and wetlands would become my PhD research focal areas eight years later.

During my four-year stint (2003–2007) as a Crane Conservation Officer, I facilitated crane and wetland conservation awareness activities, promoted crop farming in uplands as an alternative to wetland cultivation, conducted surveys to determine crane population status and breeding success and assessed threats to cranes and wetlands annually. Linkages between the stakeholder engagement process and conservation impacts were not readily discernible initially. However, by 2007, internalisation of conservation messages by community members and support from local community leaders and district authorities were becoming evident. Crane conservation increasingly became a subject for discussion at village meetings, in schools and at district-level natural resource management forums. Through crane and wetland surveys, nesting and fledging success and maintenance of suitable breeding conditions attributable to actions by individuals, households and the communities were documented. Looking back, I acknowledge that in defining and celebrating project successes, many assumptions were made. Not much was done to gain deeper insight into social and ecological factors contributing to project successes. Constraints to effective reduction of threats to cranes and wetlands were not documented. These became some of the knowledge gaps that I would address through this PhD research.

I moved away from crane conservation for a year (October 2007 - September 2008) when I was pursuing MSc Environmental Management studies at the University of Wolverhampton, United Kingdom. I returned after I was offered a position to coordinate a regional crane conservation programme in November 2008. I joined the International Crane Foundation (ICF)/Endangered

Wildlife Trust (EWT) Partnership as a Community Projects Coordinator. My brief was to provide technical support to country teams in the design and implementation of crane and wetland conservation projects, ensuring that community-based conservation slant, focusing on Kenya, Uganda and Zimbabwe. By that time, I was already aware of my gradual transition from being an Agricultural Engineer to an Environmental Social Scientist. My appointment as a Community Projects Coordinator marked the beginning of my deeper academic interest in the social dimensions of species and habitat conservation, which culminated in this thesis.

In 2009, I visited project sites where crane conservation activities were already underway and traversed other wetlands that supported nationally significant populations of cranes in Kenya and Uganda. These visits opened my eyes to the myriad of challenges associated with promoting a crane and wetland conservation agenda in extensively transformed landscapes. I also observed the similarities and differences in landscape characteristics, social contexts and natural resource governance systems in the two East African countries. After reflecting on these observations in East Africa and my previous experiences in Zimbabwe, I began to formulate questions that needed to be addressed to address knowledge gaps. Broadly, I formulated three questions. First, did we know enough about the nature and drivers of human-crane interactions to be able to develop locally acceptable and implementable project strategies to address threats to cranes and wetlands effectively? Second, Project Officers in Kenya and Uganda were, as I had done in Zimbabwe, already engaging local communities in their conservation outreach, but were they using the right approaches? Lastly, were there any emerging lessons, from a community engagement perspective, that could be discerned from the past or ongoing projects in the three countries? These were the broad research questions that I included in the initial PhD research proposal I submitted to the Institute of Environmental Sciences, Leiden University, in June 2009. Building on the positive feedback from Professor Wouter de Groot, who would later become my PhD Supervisor, I applied for a Nuffic PhD Scholarship in May 2010. I received a positive response three months later. This paved way for the formulation of a detailed research budget, development of data collection schedules, planning of trips to the Netherlands for supervisory support, formulation of modalities on how to balance conservation work and PhD study. After registering as a PhD student in January 2011, I continued to fulfil my role as a Community Projects Coordinator.

As I was developing the research framework, I realised that I would need to adopt a neutral and objective stance since my research would involve critiquing the very projects and field conservation approaches, I was promoting as a Community Projects Coordinator. My research subjects (wetland user groups, local community leaders, government officials, partner organisations) were

people with whom I had developed personal friendships and professional networking linkages. The data collection and analysis processes were also not straightforward as it involved piecing together and making sense of facts, figures, experiences, narratives, perceptions and sentiments. Ultimately, the process of writing this thesis proved to be a long but intellectually stimulating journey, which helped me deepen my understanding of the social dimensions of conservation in human-dominated landscapes.

Contents

1

Introduction

Abstract

This chapter posits the Grey Crowned Crane *Balearica regulorum* and the Wattled Crane *Bugeranus carunculatus*, the focal species in this thesis, in the local extinction narrative. It provides an overview of the biology, ecology and conservation status of the two species. It presents an overview of the overall methodological approaches adopted during the research, with specific reference to the integration of social and ecological science in environmental problem analysis and species and habitat conservation planning. Building on the species background and conservation needs, a justification for this thesis and the methodological approaches adopted are presented. A timeline describing the field data collection periods and the thesis structure are also presented.

1.1. Species decline as a global environmental problem

The decline of animal populations in areas that constitute their traditional geographic ranges is a growing global environmental problem (Gardenfors *et al*. 2001; Gaston and Fuller 2007; Pimm *et al*. 2014). If action is not taken to address the causes of the decline, the disappearance of species in defined geographical regions (local extinction) may occur (Harrison 1991; Gaston 2005; Brook *et al*. 2008). Local extinction of animal species has been conceptualised as part of the global problem of biodiversity loss (Pimm *et al*. 1995; Rands *et al*. 2010). Biodiversity loss manifests itself in the form of reduction in plant and animal species diversity and degradation of ecosystems, leading to a reduction in ecosystems' capacity to provide viable wildlife habitats (Orlove and Brush 1996; Trimble *et al.* 2014; Ceausu *et al.* 2015). There is mounting scientific evidence confirming that globally most of the species declines and extensive habitat loss are driven by anthropogenic factors

(Lande 1998; Pimm *et al*. 2014). Therefore, the escalating risk of local extinction of species driven by human activities, under the umbrella of biodiversity loss, calls for research that integrates social and ecological sciences for informed conservation planning (Brechin *et al*. 2002; Gjersten and Barrett 2004; Trimble *et al*. 2014).

1.1.1. Introducing two African crane species facing local extinction

Concern over the likelihood of local extinction of some bird species in Africa became a topical conservation issue at the turn of the century (Fishpool *et al.* 2001, Brooks and Thompson 2001). In the Gruidae (crane) family, two species have been documented as having declined over the past four decades, the Grey Crowned Crane *Balearica regulorum* and the Wattled Crane *Bugeranus carunculatus* (Meine and Archibald 1996; Beilfuss *et al*. 2007; Harris and Mirande 2013). Both species primarily depend on wetlands for breeding. Globally, wetlands are now classified as threatened ecosystems due to the decline in the areal extent and ecological integrity of wetlands (Junk 2002; Davidson 2014). The Grey Crowned Crane is listed as Endangered on the IUCN Red List of Threatened Species of 2018 (hereafter referred to as the IUCN Red List) (BirdLife International 2017a). The Wattled Crane is classified as Vulnerable on the IUCN Red List (BirdLife International 2017a). Based on a species status review conducted in 2012, the Grey Crowned Cranes declined by 80% over 45 years, mainly as a result of habitat loss and removal of birds and eggs from the wild for domestication and illegal trade (BirdLife International 2017a). The Wattled Crane is threatened by habitat loss caused by the alteration of hydrological regimes and vegetation structure of wetlands (Beilfuss *et al*. 2007; BirdLife International 2017b). A downward trend is projected for both Grey Crowned and Wattled Cranes against a backdrop of an escalation of human-induced threats to the species such as drainage and fragmentation of wetlands through agriculture (BirdLife International 2017a, b).

Since the 1980s, African cranes have increasingly attracted the attention of researchers, naturalists, birdwatchers and conservationists (Urban 1988; Meine and Archibald 1996; Harris and Mirande 2013). Results from surveys conducted since then have provided insights into national population sizes and distribution in the species' range countries and informed decisions on areas that were targeted under early crane conservation projects (Beilfuss *et al*. 1996; Beilfuss *et al*. 2007). By the mid-1990s, Grey Crowned and Wattled Cranes had already become focal species of conservation projects in some biogeographical regions within their range (Meine and Archibald 1996). In recent years, cranes have increasingly become flagship species for wetland conservation, providing entry and rallying points for integrated conservation and livelihood projects (Meine and Archibald 1996; Beilfuss *et al*. 2007). This integrated approach was adopted because degradation of wetlands does not only lead to crane habitat loss but also contributes to the loss of ecosystem services that are critical for local communities' food security and income generation (Meine and Archibald 1996; Beilfuss *et al*. 2007).

There are 15 crane species in the world (Harris and Mirande 2013). Six species occur in Africa, namely the Black Crowned Crane *Balearica pavonina*, Blue Crane *Anthropoides paradiseus*, Grey Crowned Crane *Balearica regulorum*, Demoiselle Crane *Anthropoides virgo*, Eurasian Crane *Grus* and the Wattled Crane *Grus carunculatus* (Beilfuss *et al*. 2007*).* Except for the Demoiselle and Eurasian Cranes, the other four species are considered non-migratory (Meine and Archibald 1996). The non-migratory species occur in defined regions and landscapes across the content, although intra- and inter-seasonal movements within the landscapes occur, mainly influenced by variations in food and water availability (Meine and Archibald 1996).

1.1.3. Biology, ecology and distribution of Grey Crowned Cranes

There are two sub-species of the Grey Crowned Cranes, namely *Balearica regulorum* sub-species *gibbericeps* (found in East Africa) and the *Balearica regulorum* sub-species *regulorum* (found in Southern Africa) (Morrison 2015). The Zambezi River is generally considered the geographical boundary separating the two regions in which the two sub-species occur (Morrison 2015).

Photo 1.1: A pair of Grey Crowned Cranes (*Photo credit: Takashi Muramatsu*)

Grey Crowned Cranes utilise mixed wetland-grassland habitats (Meine and Archibald 1996). They breed in shallow wetlands, associated with floodplains, riverbanks and edges of small dams (Pomeroy 1987; Urban 1988). There is evidence that the species can tolerate and adapt to transformed landscapes and cases of successful breeding events have recorded in fragmented wetland patches, including rice fields (Pomeroy 1987; Olupot *et al.* 2009; Morrison 2015). They forage in wetlands, open grasslands, fallow fields, fields where crops have been harvested and newly ploughed fields (Morrison 2015). Their diet comprises grass seeds, small toads and frogs, insects and cereal crop seeds, among others (Muheebwa-Muhoozi 2001; Morrison 2015). They roost either in trees or on the ground near wetlands. Like other crane species, Grey Crowned Cranes form pairs and bond for life and pairs can raise between one and four chicks per year (Meine and Archibald 1996). They start breeding at four or five years of age and their lifespan ranges between 15 and 20 years (Meine and Archibald 1996).

Confirmed through surveys conducted since 2000, East Africa is the stronghold of the Grey Crowned Crane (Beilfuss *et al.* 2007; Morrison 2015). The global distribution of core populations of the species is shown in Fig 1.1. The global population of the species ranges between 26,500 and 33,500 individuals (Morrison 2015). The largest populations are found in Kenya (10,000–12,500 individuals) and Uganda (5,000–8,000 individuals) (BirdLife International 2017a). In the two countries, the species now depends on remnants of wetlands that used to support more than double the current population of the species half a century ago (Pomeroy *pers. comm*.[1]). As shown in Table 1.1., other countries that support sizeable populations are Zambia and South Africa. It is estimated that 200–700 individuals are found in Zimbabwe (Morrison 2015).

[1] Derek Pomeroy is a retired professor of ornithology. He has lived in Uganda and Kenya since the mid-1960s. Apart from conducting pioneering crane surveys to determine the population status and distribution in Kenya and Uganda, he has supervised academic research projects on the biology and ecology of the species since the late 1970s.

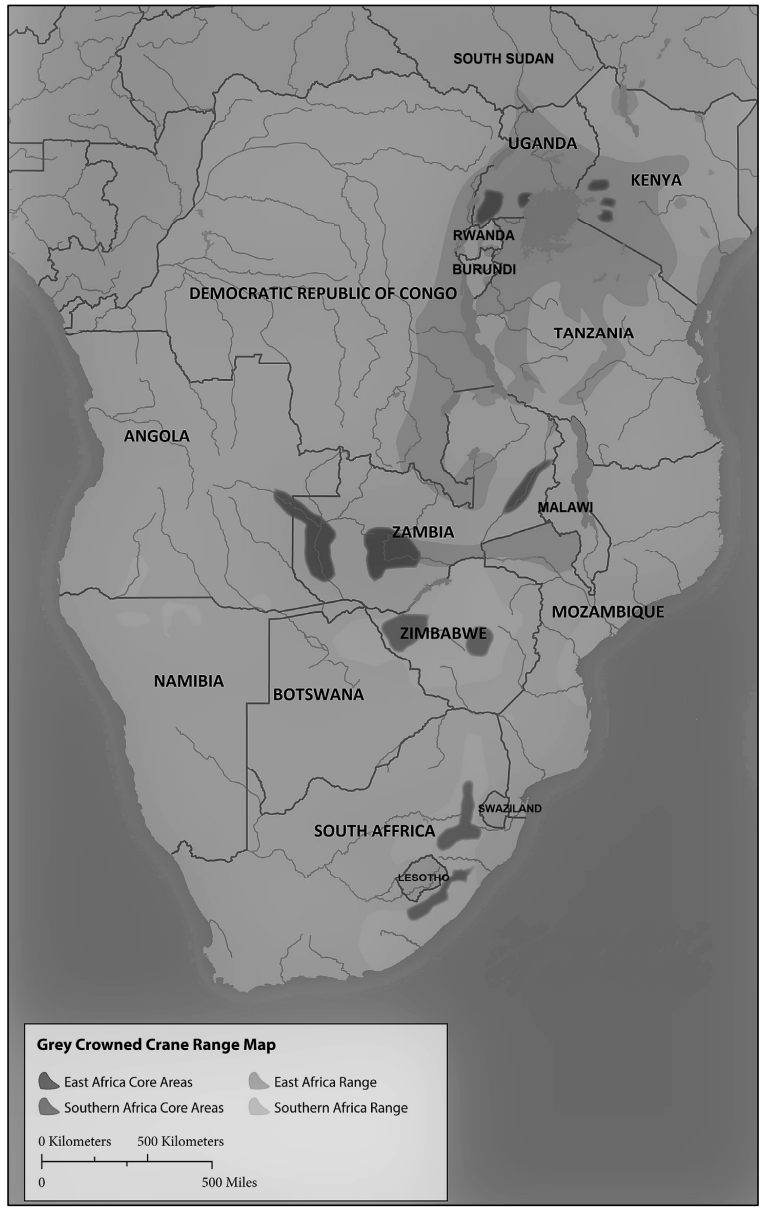

Fig 1.1. Distribution of Grey Crowned Crane populations (Source: Morrison 2015)

Estimates of Grey Crowned Crane populations by country, based on a review conducted in 2013 under the auspices of the African Eurasian Migratory Waterbird Agreement (AEWA), are presented in Table 1.1.

Table 1.1. Estimated populations of the Grey Crowned Crane within its range (Source: Morrison 2015)

Country	**1985 (Urban 1988)**	**2014**
East African Grey Crowned Crane		
Angola	100	0–100
Burundi	<600	10–100
DRC	5,000	300–1,000
Kenya	35,000	10,000–12,500
Malawi	100's	0–100
Northern Mozambique	1,000's	50–100
Rwanda	<1,000	50–500
South Sudan	0	0–10
Tanzania	Low 1,000's	600–1,000
Uganda	35,000	6,500–8,000
Zambia	1,000's	2,000 – 2,500
East African sub-species total	***>90,000***	***19,500 – 26,000***
Southern African Grey Crowned Crane		
Botswana	100	<20
Southern Mozambique	1,000's	>250
Namibia	100	<20
South Africa	Low 1,000's	6,500
Zimbabwe	Several 1,000's	200–700
Southern African sub-species total	***10,000***	***7,000–7,500***
TOTAL	**>100,000**	**26,500–33,500**

1.1.4. Biology, ecology and distribution of Wattled Cranes

The Wattled Crane (*Bugeranus carunculatus*) is the largest and most wetland-dependent of all African cranes (International Crane Foundation 2017).

Photo 1.2: A pair of Wattled Cranes (*Photo credit: Ian N White*)

Wattled Crane breeding pairs are known to defend their territories, which range between 0.25 km^2 and 1.8 km^2 in size (McCann and Benn 2006). The territories comprise an area around nests and surrounding space used for foraging and chick-rearing (Meine and Archibald 1996). They breed in permanently inundated wetlands (often on small islands) covered with short grass, mostly sedges, away from predators (Johnsgard 1983). In Southern Africa, apart from using wetland patches located in large floodplains, they also utilise seasonal wetlands (dambos) and vegetated fringes of small dams for breeding (Meine and Archibald 1996). Although their main food consists of tubers and rhizomes of aquatic plants, mostly sedges and water lilies, found in shallow waters, they also feed on aquatic insects, snails and frogs (Urban 1988). They lay two eggs but, in most cases, they only raise one chick as they tend to abandon the second egg once the first egg has hatched (Meine and Archibald 1996). During the non-breeding season, they form flocks, which facilitates pair formation for young individuals. They start reproducing at the age of seven years and may live up to 30 years (Johnsgard 1983).

Besides the large populations found in floodplains in Botswana, Zambia and Mozambique, small populations occur in scattered wetland systems in Southern African countries, with another isolated population found in Ethiopia (Fig 1.2). A typical example of such small populations is found in Zimbabwe, where an estimated 250 Wattled Cranes occurred in the wild in the late 1980s (Mundy 1989; Mundy *et al*. 2001). The population has declined to less than 200 birds (Beilfuss *et al*. 2007), with over 85% of the population now found in the Driefontein Grasslands, located in the

central region of the country, where they share the same habitat with the Grey Crowned Crane (Chirara 2011; Fakarayi 2016).

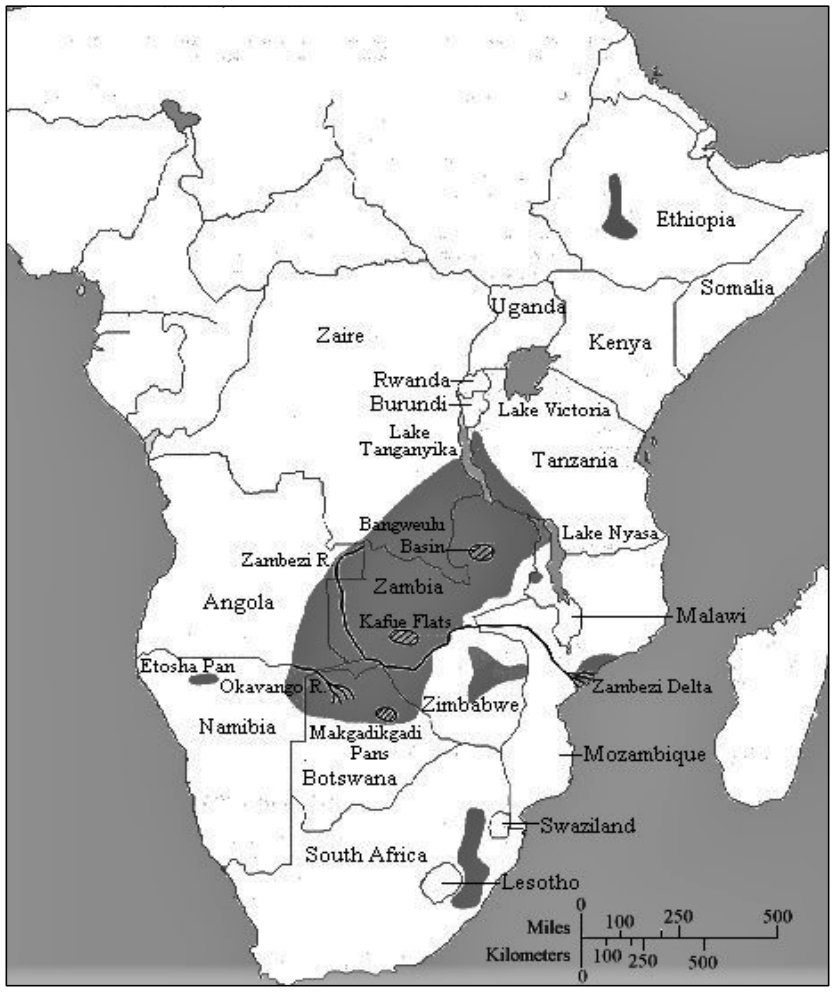

Fig 1.2. Map of Africa showing the distribution of Wattled Crane (Source: Meine and Archibald 1996)

The last global status review of the Wattled Crane was conducted in 2004 and trends in the species' populations since the 1980s are shown in Table 1.2.

Table 1.2. Trends in Wattled Crane populations (Source: Beilfuss *et al*. 2007)

	1985	**1994**	**2004**
Angola	500	500?	<200
Botswana	200	1,400–3,500	1,400
DRC	Several 100s	100s	<300
Ethiopia	100	100s	<200
Malawi	250	50	<20
Mozambique	150	2,500–2,800	350
Namibia	300	200–300	60
South Africa	Several 100s	250–300	250
Tanzania	Several 100s	100s	500
Zambia	11,000	7,000–8,000	<4,500
Zimbabwe	Few 100s	250	200
Total	**13,000–15 000**	**13,000–15,000**	**<8,000**

1.1.5. Human activities as drivers of the decline of cranes

Factors contributing to the decline of Grey Crowned Cranes are linked to human activities (Meine and Archibald 1996; Harris and Mirande 2013; Morrison 2015). This is particularly the case for populations found in rural landscapes within the species' range in East and Southern Africa (Morrison 2015; Pomeroy *pers comm*). In these landscapes, habitat loss, a major contributor to reduced productivity, is driven by various activities undertaken by local communities to meet their livelihood needs, mainly the transformation of wetlands for agriculture and harvesting of wetland plant resources (Harris and Mirande 2013). The species' occurrence in agricultural production landscapes exposes them to persistent disturbance during the breeding season as community members conduct their farming activities, spending extended periods within the vicinity of breeding sites (Morrison 2015). Though this interaction in space and time does not always lead to conflict, cases of mortalities due to poisoning and direct attacks have been reported (Muheebwa-Muhoozi 2004; Olupot *et al*. 2009; Morrison 2015). The ecological requirements of the species are not prioritised in rural land use planning in most range countries, creating a leeway for degradation and fragmentation of crane habitats (Olupot *et al*. 2009; Chirara 2011; Harris and Mirande 2013). Removal of eggs and chicks from the wild for food, domestication and trade has been reported as a major threat to Grey Crowned Cranes in some parts of East Africa (Morrison 2015).

Wattled Cranes are sensitive to human disturbance, especially during the breeding season (BirdLife International 2017b). Breeding pairs may abandon their nests or breeding territories if they are

disturbed persistently (Meine and Archibald 1996; McCann and Benn 2006). Although the majority of the Wattled Crane populations are found in protected areas in Southern Africa, mostly in Botswana and Zambia, they are not immune to human-induced threats. Prevalence of threats to Wattled Cranes (egg removal, hunting of adult birds, nest disturbance) potentially linked to local communities traversing into the protected areas, associated with major floodplains in Botswana, Mozambique and Zambia were reported by Beilfuss *et al*. (2003). Land use on privately-owned farmlands and the commons influence the quality, size and availability of habitats for small and isolated populations found in rural landscapes (Fakarayi *et al*. 2016). Apart from human disturbance, the other threats that have been recorded in these agricultural landscapes include modification of wetlands through damming and drainage (Meine and Archibald 1996; McCann and Benn 2006), overgrazing of nesting areas and trampling of nests by livestock (Morrison and van der Spuy 2012; Fakarayi *et al*. 2016), uncontrolled fires destroying nests (Meine and Archibald 1996; Chirara 2011) and the removal of eggs and chicks from the wild for trade (Morrison and van der Spuy 2012).

1.2. Approaches for understanding and addressing species decline

1.2.1. Multidisciplinary approaches to address species decline

Up until the 1970s, assessment of threats to species in landscapes that defined their geographical range primarily involved gathering and analysing biological and ecological knowledge about species and habitats (Soulé 1985; Mascia *et al*. 2003; Drew and Henne 2006). The evolution of conservation biology as a discipline saw the increasing recognition and application of social science principles in threat and habitat assessment to generate knowledge required for conservation planning (Nyhus *et al*. 2002; Drew and Henne 2006). This prompted the wide application of analytical approaches that involve the integration of social and ecological factors in the assessment of direct causes and underlying drivers of species decline, habitat loss and ecosystem degradation (Jacobson and McDuff 1998; Manfredo and Dayer 2004; Walters and Vayda 2009). These analytical approaches are being adopted in recognition of the influence of human and social factors such as environmental perceptions, knowledge and values on species survival and habitat integrity (St John *et al*. 2010; Brooks *et al.* 2013; Villamor *et al*. 2014). These factors, in turn, influence patch- and landscape management decisions and actions that impact species' breeding success, foraging requirements, safety and long-term survival (Lande 1998; Fisher *et al*. 2006; DeFries *et al*. 2007).

1.2.2. Untangling the complexity of social and ecological interactions

The complexity of connections and interactions between social and ecological factors associated with species decline is acknowledged in literature (Hoffman 2004; Bryan *et al*. 2010). The interactions have spatial and temporal dimensions as well as feedback mechanisms that must be understood if efforts to mitigate the problem are to be successful (Tallis and Kareiva 2006; Moran 2010). To untangle the complexity, various frameworks that can be used to conceptualise and analyse direct causes and underlying drivers of species decline have been developed (e.g., Williams *et al*. 2008; Maxim *et al*. 2009). These frameworks are also used to define linkages between human activities behind threats to species and how conservation actions led to threat reduction and ultimately long-term survival of animal populations (Salafsky and Margoluis 1999; Parrish *et al*. 2003).

In most cases, factors contributing to species decline are nested in broader causal chains behind environmental problems extending beyond farm boundaries, watersheds and administrative regions (Poiani *et al*. 2000; Fischer *et al*. 2008). This calls for the recognition of connections between site- and broader landscape-level problems in environmental problem analyses. This also enables the identification of people behind actions (actors), factors that influence the actors' decisions and actions, thereby portraying an array of social causal chains behind an environmental problem, as exemplified by Vayda (1983), De Groot (1992; 1998) and Walters and Vayda (2009). In this regard, species and habitats targeted for conservation can be conceptualised as components within a social-ecological system comprising human communities, natural landscapes, modified landscapes and built infrastructure, among others (Liu 2001; Redman *et al*. 2004).

1.2.3. Balancing human needs and species requirements in human-dominated landscapes

Species conservation projects designed to balance livelihood needs of communities and ecological requirements of species gained recognition in recent years (DeFries *et al*. 2004; Trimble and Aarde 2014). This is linked to the global shift from fortress conservation (state-led, top-down and people-exclusive approaches) to community-based conservation (decentralised, bottom-up and people-centred approaches) (Hackel 1998; Adams and Hulme 2001; Brooks *et al*. 2013). Irrespective of whether the community-based approaches are applied around protected areas or in human-dominated rural landscapes, local communities are placed at the centre in the design, implementation and evaluation of conservation actions, providing platforms for local decision-making and collective action to address threats to species and habitats (Hulme and Murphree 1999; Ruiz-Mallen *et al*. 2015). Species protection and habitat management in human-dominated

landscapes entail managing conflicts between wildlife and humans, acknowledging the economic trade-offs associated with creating or maintaining space for wildlife in landscapes used for primary production such as agriculture, fisheries and forestry (DeFries *et al*. 2007; Morrison 2015).

1.2.4. Focus on social dimensions in the evaluation of conservation projects

Acknowledging that they are actors behind threats to species and taking cognisance of their potential role in interventions to address species decline, local communities are recognised as both subjects and participants in the evaluation of conservation initiatives (Waylen *et al*. 2009; Brooks *et al*. 2013). They interact with species and habitats targeted for conservation when they utilise soil, plant and water resources to sustain their livelihoods (Salafsky and Wollenberg 2000; Nepal and Spiteri 2011). The interaction patterns in space and across time scales and impacts on the species are influenced by local resource access, utilisation and management institutions (Colding *et al*. 2003; Persha *et al*. 2011) and local communites' environmental values and attitudes (Mehta and Heinen 2001; Decaro and Stokes 2008).

The success of conservation projects implemented in landscapes inhabited by humans does not only entail achieving the desired threat reduction and species survival goals. It involves taking stock of changes in the socio-economic well-being of communities, success in building local institutions supportive of conservation goals and attainment of pro-conservation attitudes and behaviour among communities in an integrated way (Pejchar *et al*. 2007; Woodhouse *et al*. 2015). These factors, which connect human communities to species and habitats targeted for conservation, are referred to as the social dimensions of conservation (Mascia *et al*. 2003; Knight *et al*. 2010). Social dimensions of conservation also encompass a host of other factors that influence human decisions and actions, including economic motivations (Kabii and Horwitz 2006), moral and ethical standards, legal requirements and learning processes (Brechin *et al*. 2002), rights and traditions (Miller *et al*. 2012), and shared beliefs and pride (Jenks *et al*. 2010). Research to understand the social dimensions of conservation is an entry point for promoting socially acceptable conservation programmes in a wide range of settings (Knight *et al*. 2010). Understanding social dimensions paves way for informed conservation planning, which may involve identifying ways in which local actions to reduce threats to species and habitats can be integrated into local communities' environmental plans, resource use regimes and collective action processes (Salafsky *et al*. 2001; Brooks *et al*. 2013). The level of support and buy-in from community leadership, local administrative authorities and environmental agencies influences the acceptability and sustainability of conservation initiatives and are therefore critical aspects of the social dimensions of conservation (Dixon 2008; Chen *et al*. 2012).

1.3. Relevance of the study

1.3.1. Contextualising the social dimensions of crane conservation

The decline of African crane populations is an environmental phenomenon that warrants investigation. It is critical to conduct research that generates conservation solutions applicable and adaptable in a wide range of social and ecological contexts. If the solutions are to be effective in addressing the decline, the research should focus on the social dimensions of crane conservation. Acknowledging the approaches and trends in conservation planning presented in the previous section, the research could generate empirical evidence on the nature, proximate causes, underlying drivers and impacts of human-crane interactions. This would then enable the systematic and focused design conservation of interventions taking into consideration the various facets of human-crane interactions, including conflict situations. Development of conservation actions informed by findings from assessments of human-wildlife conflicts is increasingly being popularised globally (Bell 1995; Treves *et al*. 2009; Redpath *et al*. 2013). The effectiveness of crane conservation interventions could be enhanced if they are nested in national, regional and global species and habitat conservation frameworks (Steiner *et al*. 2003; Brooks *et al*. 2006).

A significant proportion of landscapes that contain crane breeding and foraging sites lie outside formally protected areas. Most of the landscapes have, in recent decades, undergone transformation due to human activities, most agriculture (Meine and Archibald 1996; Morrison 2015). In East and Southern Africa, cranes interact with humans in undisturbed wetlands, cultivated wetland fringes and agricultural fields located in the uplands (Meine and Archibald 1996). The interactions occur in mosaics comprising grazing areas, crop fields and upland zones where plants and non-timber products are harvested (Beilfuss *et al*. 1996; Muheebwa-Muhoozi 2004; Olupot *et al*. 2009). In most rural landscapes in East and Southern Africa, access to land and associated resources is governed by local rules and national environmental policies (Hulme and Murphree 1999; Nelson and Agrawal 2008). This implies that human-crane interactions in these rural landscapes are influenced by local and national resource management institutions. Whereas the interactions take place at farm or patch level, it is important to consider social and ecological processes that operate at higher geographical scales within watersheds of wetlands and administrative regions. When human-animal interactions are influenced by an array of social and ecological factors operating at different scales, it becomes imperative to adopt threat assessment

and conservation planning tools that integrate social science and ecology (Chazdon *et al*. 2009; Dickman 2010; Ban *et al*. 2013).

1.3.2. Justification for selected study sites

This thesis focuses on the social dimensions of crane conservation in rural landscapes in Kenya, Uganda and Zimbabwe. Six landscapes located within the geographical distributions of the two crane species in question, Grey Crowned and Wattled Cranes were selected as the study sites. When this study was conceptualised in 2011, these landscapes were already recognised as core areas supporting globally significant crane populations. They were initially mapped and coded as priority areas for crane conservation during a workshop on African cranes held in August 1993 (Beilfuss *et al*. 1996). Staff from in-country conservation organisations and academics that had conducted surveys and other crane-related research activities in Africa provided the bulk of the data used in the mapping and prioritisation process. Since then, knowledge on the status and distribution of cranes has improved as surveys were held as part of crane conservation projects. Kenya, Uganda and Zimbabwe were examples of countries where such ground-breaking projects were implemented.

The target landscapes were all inhabited by rural communities and had no formal protected area status. This made them suitable sites for conducting social dimensions research, with local communities as the subjects. One of the objectives of the study was to evaluate field approaches and conservation impacts of crane conservation projects implemented at the study sites. Kenya, Uganda and Zimbabwe were therefore chosen as the focal countries recognising that it is where pioneering community-based crane conservation projects had been implemented. Although the figures shown in Tables 1.1 and 1.2 confirm that there were other core areas in other countries, they were not covered in this study mainly because including them would make data collection unsurmountable given the high time and financial requirements for extensive field work. Although the landscapes share a common attribute in that they are inhabited by communities whose livelihoods revolve around crop and livestock farming, the social, cultural, biophysical contexts differ. Focusing on the selected landscapes therefore would make it possible to explore the social dimensions of crane conservation under different social, geographical and eco-hydrological contexts. The wetlands used by cranes in the landscapes varied in terms of type, ecological characteristics, functions and size, making it possible to conduct cross-site comparisons of social dimensions of crane conservation.

1.3.3. Practical relevance of this study

This study was motivated by the need for evidence-based design of crane conservation programmes, building on findings from analyses of human-crane interactions and evaluation of community-based conservation projects. It was a response to a call for comprehensive social dimensions research to generate knowledge to strengthen the African Crane Conservation Programme, a joint initiative between the International Crane Foundation (www.savingcranes.org) and the Endangered Wildlife Trust (www.ewt.org.za). As the leading organisations promoting the development of national crane conservation programmes in Africa, they valued the incorporation of a social science dimension to species conservation action planning. Although some studies had been conducted to draw linkages between threats to cranes and human activities in Kenya, Uganda and Zimbabwe they were not strongly grounded in environmental social science theories. This study was, therefore, necessary to address gaps in knowledge on social dimensions of crane conservation, focusing on countries that supported globally significant populations of cranes. Given that the International Crane Foundation / Endangered Wildlife Trust Partnership and some in-country environmental organisations were already investing funds into site-focused conservation projects, there was the need to determine the effectiveness of field approaches used and overall impacts of the projects on cranes, wetlands and human communities. Such evaluative studies would shed light on the feasibility and effectiveness of community-based conservation approaches that were rooted in local community decision-making and collective actions.

1.4. Research questions addressed

The main goal of this research was to develop a general conceptual conservation model for the conservation of cranes and wetlands applicable in human-dominated landscapes in Africa. This was achieved through the integration of knowledge on patterns and drivers of human-crane interactions and promising developments (bright spots) from the evaluation of site-based crane conservation projects implemented in Kenya, Uganda and Zimbabwe. To achieve the goal, each chapter addresses specific questions on the social dimensions of crane and wetland conservation in rural landscapes in the three countries. The questions are as follows:

1. What are the causal linkages between wetland-based livelihoods, local communities' decision-making frameworks and underlying drivers of Grey Crowned Crane habitat loss in Kenya, Uganda and Zimbabwe? (Chapter 2)

2. How do socio-economic, institutional, cognitive and biophysical factors influence interactions between Wattled Cranes and people in the Driefontein Grasslands, Zimbabwe? What conservation actions can be discerned from an actor-based analysis of human-crane interactions? (Chapter 3)

3. How effective is community-led conservation in the quest to save cranes and secure their habitats, based on project experiences in western Kenya? What lessons for conservation planning can be drawn from the analysis of social processes associated with community-led conservation? (Chapter 4)

4 . How can local institutions be developed and nurtured to protect cranes and secure their habitats? How effective are the local institutions, based on project experiences from southwestern Uganda? (Chapter 5)

5. What lessons can be drawn from the analysis of human-crane interactions and evaluation of crane conservation projects implemented in Kenya, Uganda and Zimbabwe? How can the lessons be integrated to inform conservation planning to save crane populations in human-dominated landscapes? (Chapter 6)

To address these questions systematically and effectively, two methodological frameworks are used. Both offer a set of inter-related concepts that guide the researcher towards a coherent set of phenomena to describe through the field work, such as 'primary actors', 'secondary actors', 'motivations', 'action arenas', 'collective actions' and 'institutional outcomes'. The first framework is the Action-in-Context (AiC) (De Groot 1992), used to analyse social causation chains in problem analysis. It was therefore selected for the research presented in Chapters 2 and 3. The other framework is called Institutional Analysis and Development (IAD) (Ostrom 2011), designed for institutional description and evaluation. It was specifically used in Chapter 5. In Chapter 4, the framework used for the analysis of human-human interactions designed to achieve conservation outcomes has been left more implicit but is anchored in social processes. More information on the frameworks can be found in the specific chapters.

1.5. Fieldwork periods

A significant volume of secondary data was gathered through a review of project reports (unpublished), policy documents and technical reports. Review of these secondary data sources as part of country-level strategic conservation planning was part of my job responsibilities as a coordinator of a regional crane conservation programme between November 2008 and December 2017. The programme's focal countries included Kenya, Uganda and Zimbabwe. The programme was funded and supported technically by the International Crane Foundation/Endangered Wildlife Trust Partnership. My position as a coordinator enabled me to gain access to various unpublished data and project reports compiled by national organisations involved in crane conservation in the three countries. The organisations were: Kipsaina Crane and Wetland Conservation Group (Kenya), Nature Uganda (Uganda) (www: http://www.natureuganda.org) and BirdLife Zimbabwe (Zimbabwe) (www.blz.co.zw). While fulfilling my formal job responsibilities, I had opportunities to visit the crane conservation project sites (defined as study sites in this thesis) where I interacted with government officers, community leaders and wetland users who are cited as respondents in this thesis. These interactions provided me with opportunities to gather complementary data which I used to verify and substantiate primary data collected during the formal data collection periods presented below.

Gathering of primary data required dedicated field work periods during which field observations, as well as individual and group interviews with local people and officials, could be undertaken. Table 1.2 summarizes the periods, major activities undertaken, and the chapters in which the results are presented. All in all, the total period spent in the field amounted to 9.25 months.

Table 1.3 The field work periods, activities undertaken and relevant chapters

Period	Country	Major activities	Chapters
1st week of January – 3rd week of February 2011	Kenya Uganda Zimbabwe	Preliminary assessment of ecological characteristics, social contexts and institutional arrangements at the study sites (required to have a good understanding of the sites to enable me to finalise the research proposal)	Chapters 2 and 3
July 2011	Zimbabwe	Data collection on interactions between cranes and people (interviews and field observations)	Chapters 2 and 3
October 2011	Uganda	Data collection on interactions between cranes and people (interviews and field observations)	Chapter 2
November 2011	Kenya	Data collection on interactions between cranes and people (interviews and field observations)	Chapter 2
March 2012 (2 weeks)	Zimbabwe	Data verification exercise, following up on issues and gaps identified after preliminary analysis of human-crane interactions (interviews and field observations)	Chapter 3
October 2012	Kenya	Preliminary data collection on project thematic focus, mapping the geographical focal area and profiling of target community groups (required for framing research questions)	Chapter 4
Mid-September – mid-October 2013	Uganda	Data collection on institutional development (interviews and field observations)	Chapter 5
Mid-October 2013 – mid-November	Kenya	Data collection on social processes (interviews and field observations)	Chapter 4
Last week of April – Mid- May 2014	Zimbabwe	Routine work visit but used to cross-check data collected in earlier years	Chapters 3 and 6
October 2015	Kenya, Uganda	Routine work visit but used to cross-check data collected in earlier years	Chapters 4, 5 and 6

1.6. Thesis structure

This thesis is an output of research conducted in three laps. First, social causal chains behind threats to cranes and wetlands were analysed. Second, social and institutional processes and associated conservation outcomes under site-focused conservation projects were evaluated. A conceptual conservation model for crane and wetland conservation was developed by integrating knowledge generated through the human-crane interface analysis and the promising field conservation approaches discerned from projects implemented since the early 2000s at the study sites. The outputs of the research are presented in five chapters, structured as follows.

Chapter 1 introduces and contextualises the environmental problem that necessitated this research (the decline of cranes in rural landscapes in Africa). It highlights the importance of understanding the nature and interactions between social and ecological factors in assessing the decline of cranes and the development of conservation solutions. Chapter 2 focuses on one of the major causes of the decline of cranes in rural landscapes, habitat loss, in Kenya, Uganda and Zimbabwe. Chapter 3 contributes to an improved understanding of how socio-economic, institutional, cognitive and biophysical factors influence interactions between Wattled Cranes and humans in a landscape that supports the great majority of Zimbabwe's Wattled Cranes, the Driefontein Grasslands. Chapter 4 draws lessons on the effectiveness of community-led conservation approaches through an evaluation of a renowned initiative in Kenya that has been operational for over 25 years, the Kipsaina Crane and Wetland Conservation Project. Chapter 5 presents the results of an evaluation of the institutional development process and the ensuing environmental conservation impacts at three sites in Uganda where conservation projects were initiated in 2002. Chapter 6 is a synthesis of key findings from the preceding chapters, addressing the question of what works for crane and wetland conservation in rural landscapes in East and Southern Africa.

All chapters were structured in such a way that they could be turned into scientific papers for submission to international journals at a later stage. They, therefore, have their site descriptions, methodology sections and list of references. This leads to an unavoidable slight degree of repetition but also makes them coherently readable as stand-alone contributions.

References

Adams, W.M., and Hulme, D. (2001). If community conservation is the answer, what is the question? Oryx 35(3):193–200.

Ban, N. C., Mills, M., Tam, J., Hicks, C. C., Klain, S., Stoeckl, N., Bottrill, M. C., Levine, J., Pressey, R. L., Satterfield, T., and Chan, K. M. A. (2013). A social-ecological approach to conservation planning: Embedding social considerations. Frontiers in Ecology and the Environment 11(4): 194–202.

Beilfuss, R., Tarborton, W. R., and Gichuki, N. N. (eds.) (1996). Proceedings of the 1993 crane and wetland training workshop. International Crane Foundation, Baraboo.

Beilfuss, R., Bento, C., Hancock, P., Kamweneshe, B., McCann, K., Morrison, K., and Rodwell, L. (2003). Water, Wetlands and Wattled Cranes: A regional monitoring and conservation program for Southern Africa. International Crane Foundation, Baraboo.

Beilfuss, R. D., Dodman, T., and Urban, E. K. (2007). The status of cranes in Africa in 2005. Ostrich: Journal of African Ornithology 78 (2):175–184.

Bell, R. H. V. (1995) Conservation with a human face: Conflict and reconciliation in African land use planning. In Anderson, D. and Grove, R. (eds.) (1995). Conservation in Africa: People, policies and practice. Cambridge University Press, Cambridge.

BirdLife International. (2017a). Species factsheet: Balearica regulorum. http://www.birdlife.org.

BirdLife International. (2017b). Species factsheet: Bugeranus carunculatus. http://www.birdlife.org.

Brechin, S. R., Wilshusen, P. R., Fortwangler, C. L., and West, P. C. (2002). Beyond the square wheel: Toward a more comprehensive understanding of biodiversity conservation as social and political process. Society and Natural Resources 15(1): 41–64.

Brook, B. W., Sodhi, N. S., and Bradshaw, C. J. A. (2008). Synergies among extinction drivers under global change. Trends in Ecology and Evolution 23(8): 453–460.

Brooks, J., Waylen, K. A., and Borgerhoff Mulder, M. (2013). Assessing community-based conservation projects: A systematic review and multilevel analysis of attitudinal, behavioral, ecological, and economic outcomes. Conservation Evidence 2(2): http://www.environmentalevidencejournal.org/content/2/1/2.

Brooks, T. M., Mittermeier, R. A., da Fonseca, G. A. B., Gerlach, J., Hoffmann, M., Lamoreux, J. F., Mittermeier, C. G., Pilgrim, J. D., and Rodrigues, A. S. L. (2006). Global biodiversity conservation priorities. Science 313: 58–61.

Bryan, B. A., Raymond, C. M., Crossman, N. D., and King, D. (2010). Comparing spatially explicit ecological and social values for natural areas to identify effective conservation strategies. Conservation Biology 25(1): 172–181.

Ceausu, S., Gomes, I., and Pereira, H. M. (2015). Conservation planning for biodiversity and wilderness: A real-world example. Environmental Management 55: 1168–1180.

Chazdon, R. L., Harvey, C. A., Komar, O., Griffith, D. M. Ferguson, B. G., Martinez-Ramos, M., Morales, H., Nigh, R., Soto-Pinto, L., Van Breugel, M., and Philpott, S. M. (2009). Beyond reserves: A research agenda for conserving biodiversity in human-modified tropical landscapes. Biotropica 41(2): 142–153.

Chen, H., Shivakoti, G., Zhu, T., and Maddox, D. (2011). Livelihood sustainability and community-based co-management of forest resources in China: Changes and improvement. Environmental Management 49: 219–228.

Chirara, C. (2011). The status of the Wattled Crane in the Driefontein Grasslands of Zimbabwe. Honeyguide 57(1): 10–14.

Colding, J., Folke, C., and Elmqvist, T. (2003). Social institutions in ecosystem management and biodiversity conservation. Tropical Ecology 44(1): 25–41.

Davidson, N. C. (2014). How much wetland has the world lost? Long-term and recent trends in global wetland area. Marine and Freshwater Research 65: 934–941.

De Groot, W.T. (1992). Environmental Science Theory: Concepts and methods in a one-world, problem-oriented paradigm. Elsevier Science Publishers, Amsterdam.

De Groot, W.T. (1998). Problem-in-Context: A framework for the analysis, explanation and solutions of environmental problems. In Nath B., Hens L., Compton P., Devuyst D. (eds.) Environmental management in practice. Vol. 1: Instruments for environmental management. Routledge, London and New York.

Decaro D., and Stokes, M. (2008). Social-psychological principles of community-based conservation and conservancy motivation: Attaining goals within an autonomy-supportive environment. Conservation Biology 22(6): 1443–1451.

DeFries, R., Turner, B. L., Reid, R., and Liu, J. (2007). Land use change around Protected Areas: Management to balance human needs and ecological function. Ecological Applications 17(4): 1031–1038.

Dixon, A. B. (2008). The resilience and sustainability of local wetland management institutions in Illubabor and Western Wellega, Ethiopia. Singapore Journal of Tropical Geography 29: 341–356.

Drew, J. A., and Henne, A. P. (2006). Conservation biology and traditional ecological knowledge: integrating academic disciplines for better conservation practice. Ecology and Society 11(2): 34. http://www.ecologyandsociety.org/vol11/iss2/art34/.

Dickman, A. J. (2010). Complexities of conflict: the importance of considering social factors for effectively resolving human-wildlife conflict. Animal Conservation 13: 458–466.

Fakarayi, T., Mashapa, C., Gandiwa, E., and Kativu, S. (2016). Varying land-use has an influence on Wattled and Grey Crowned Cranes' abundance and distribution in the Driefontein Grasslands Important Bird Area, Zimbabwe. PLOS One 11(11): doi:10.1371/journal.pone.0166209.

Fischer, J. Lindenmayer, B. D., and Manning, A. D. (2006). Biodiversity, ecosystem function and resilience: Ten guiding principles for commodity production landscapes. Frontiers in Ecology and the Environment 4(2): 80–86.

Fishpool, L. D. C. and Evans, M. (eds). (2001). Important Bird Areas in Africa and Associated Islands: Priority Sites for Conservation. Pisces Publications, Cambridge.

Gardenfors, U., Hilton-Taylor, C., Mace, G. M., and Rodriguez, J. P. (2001). The application of IUCN Red List Criteria at regional levels. Conservation Biology 15(5): 1206–212.

Gaston, K. J. (2005). Biodiversity and extinction: species and people. Progress in Physical Geography 29(2): 239–247.

Gaston, K. J., and Fuller. R. A. (2007). Biodiversity and extinction: losing the common and the widespread. Progress in Physical Geography 31(2) (2007) pp. 213–225.Gaston, K. J., and Fuller, R. A. (2007). Commonness, population depletion and conservation biology. Trends in Ecology and Evolution 23(1): 13–19.

Gjertsen, H., and Barrett, C. B. (2004). Context-dependent biodiversity conservation management regimes: Theory and simulation. Land Economics 80(3): 321–339.

Hackel, J. D. (1999). Community conservation and the future of Africa's wildlife. Conservation Biology 13(4): 726–734.

Harris, J., and Mirande, C. (2013). A global overview of cranes: status, threats and conservation priorities. Chinese Birds 4(3): 189–209.

Harrison, S. (1991). Local extinction in a metapopulation context: an empirical evaluation. Biological Journal of Linnean Society 42(1-2): 73–88.

Hoffmann, J. P. (2004). Social and Environmental Influences on Endangered Species: A Cross-National Study. Sociological Perspectives 47(1): 79–107.

Hulme, D., and Murphree, M. (1999). Communities, wildlife and the 'new conservation' in Africa. Journal of International Development 11(2): 277–285.

Jacobson, S. K., and MacDuff, M. D. (1998). Training idiot savants: The lack of human dimensions in conservation biology. Conservation Biology 12(2): 263–270.

Jenks, B., Vaughan, P. W., and Butler, P. J. (2010). The evolution of Rare Pride: Using evaluation to drive adaptive management in a biodiversity conservation organization. Evaluation and Program Planning 33: 186–190.

Johnsgard, P. A. (1983). Cranes of the world. Indiana University Press, Bloomington.

Junk, W. J. (2002). Long-term environmental trends and the future of tropical wetlands. Environmental Conservation 29(4): 414–435.

Kabii, T., and Horwitz, P. (2006). A review of landholder motivations and determinants of participation in conservation covenanting programmes. Environmental Conservation, 33(1): 11–20.

Knight, A. T., Cowling, R. M, Difford, M., and Campbell, B. M. (2010). Mapping human and social dimensions of conservation opportunity for the scheduling of conservation action on private land. Conservation Biology 24(5): 1348–1358.

Lande, R. (1998). Anthropological, ecological and genetic factors in extinction and conservation. Researches on Population Ecology 40(3): 259–269.

Liu, J. (2001). Integrating ecology with human demography, behaviour, and socioeconomics: Needs and approaches. Ecological Modelling 140: 1–8.

Manfredo, M., and Dayer, A. (2004). Concepts for exploring the social aspects of human-wildlife conflict in a global context. Human Dimensions of Wildlife 9(4): 1–20.

Mascia, M. B., Brosius, J. P. Dobson, T. A., Forbes, B. C., Horowitz, L., McKean, M. A., and Turner, N. J. (2003). Conservation and the social sciences. Conservation Biology 17(3): 649–650.

Maxim, L., Spangenberg, J. H., and O'Connor, M. (2009). An analysis of risks for biodiversity under the DPSIR framework. Ecological Economics 69(1): 12–23.

McCann, K. I., and Benn, G. A. (2006). Land use patterns within Wattled Crane *Bugeranus carunculatus* home ranges in an agricultural landscape in KwaZulu-Natal, South Africa. Ostrich 77(3-4): 186–194.

Mehta, J. N., and Heinen, J. T. (2001). Does community-based conservation shape favorable attitudes among locals? An empirical study from Nepal. Environmental Management 28(2): 165–177.

Meine, C. D., and Archibald, G. W. (eds.) (1996). The cranes: Status survey and conservation action plan. IUCN, Gland.

Miller, B. W., Caplow, S. C., and Leslie, P. W. (2012). Feedbacks between conservation and social-ecological systems. Conservation Biology 26(2): 218–227.

Moran, E. F. (2010). Environmental social science: Human–environment interactions and sustainability. John Wiley and Sons, West Sussex.

Morrison, K (Compiler). (2015). International single species action plan for the conservation of the Grey Crowned Crane *Balearica regulorum,* AEWA Technical Series. African-Eurasian Migratory Waterbird Agreement, Bonn.

Morrison, K. and van der Spuy, S. (2012). Joint efforts for Wattled Crane conservation in Africa. WAZA Magazine. 8–11.

Morrison, S. A. (2015). A framework for conservation in a human-dominated world. Conservation Biology 29(3): 960–964.

Muhebwa-Muhoozi, J. (2004). Assessing the status of the Grey Crowned Crane Balearica regulorum in Uganda, MSc Thesis. Makerere University, Kampala.

Mundy, P. J. (1989). Notes on the cranes in Zimbabwe. Addendum to the Proceedings of the First Southern African Crane Conference. In Southern African Crane Foundation. Proceedings of the First Southern African Crane Conference. Southern African Crane Foundation, Durban.

Mundy, P. J., Maozeka, F., and Couto, J. T. (2001). An update on the status of Wattled Cranes in Zimbabwe. Honeyguide 47 (2): 129–134.

Nelson, F., and Agrawal, A. (2008). Patronage or participation? Community-based natural resource management reform in Sub-Saharan Africa.

Nepal, S., and Spiteri, A. (2011). Linking livelihoods and conservation: an examination of local residents' perceived linkages between conservation and livelihood benefits around Nepal's Chitwan National Park. Environmental Management 47(5): 727–738.

Nyhus, P. J., Westley, F., Lacy, R. C., and Miller, P. S. (2002). A Role for Natural Resource Social Science in Biodiversity Risk Assessment. Society and Natural Resources 15(10): 923–932.

Orlove, B. S. and Brush, S. B. (1996). Anthropology and the conservation of biodiversity. Annual Review of Anthropology 25: 329–352.

Olupot, W., Mugabe, H., and Plumptre, A. J. (2009). Species conservation on human-dominated landscapes: the case of crowned crane breeding and distribution outside protected areas in Uganda. African Journal of Ecology 48: 119–125.

Orlove, B. S., and Brush, S. B. (1996). Anthropology and conservation of biodiversity. Annual Review of Anthropology 25: 329–352.

Ostrom, E. (2011). Background on the Institutional Analysis and Development Framework. The Policy Studies Journal 39(1): 7–27.

Parrish, J. D., Braun, D. P., and Unnasch, R. S. (2003). Are we conserving what we say we are? Measuring ecological integrity within protected areas. BioScience 53(9): 851–860.

Pejchar, L., Morgan, P. M., Caldwell, M. R., Palmer, C., and Daily, G. C. (2007). Evaluating the potential for conservation development: Biophysical, economic, and institutional perspectives. Conservation Biology 21(1): 69–78.

Persha, L., Agrawal, A., and Chhatre, A. (2011). Social and ecological synergy: Local rulemaking, forest livelihoods, and biodiversity conservation. Science 331(1606): 1606–1608.

Pimm, C. N., Jenkins, R., Abell, T. M., Brooks, J. L., Gittleman, L. N., Joppa, P. H., Raven, C. M., Roberts, J. O. and Sexton, S. L (2014). The biodiversity of species and their rates of extinction, distribution, and protection. Science 344(6187): 987–998.

Pimm, S. L., Russell, G. J., Gittleman, J. L. and Brooks, T. M. (1995). The future of biodiversity. Science 269: 347–350.

Poiani, K. A., Richter, B. D., Anderson, M. G., and Richter, H. E. (2000). Biodiversity conservation at multiple scales: Functional sites, landscapes, and networks. BioScience 50(2): 133–146.

Pomeroy, D. E. (1987). The ecology and status of the Grey Crowned Crane in East Africa. In Archibald, G. W. and Pasquier, R. F. (eds.), Proceedings of the 1983 Crane Workshop. International Crane Foundation, Baraboo.

Rands, M. R. W., Adams, W. M., Bennun, L., Butchart, S. H. M., Clements, A., Coomes, D., 5 Entwistle, A., Hodge, I., Kapos, V., Scharlemann, J. P. W., Sutherland, W. J., and Vira, B. (2010). Biodiversity conservation: Challenges beyond 2010. Science 329(5997): 1298–1304.

Redman, C. L., Grove, J. M., and Kuby, L. H. (2004) Integrating social science into the Long-Term Ecological Research (LTER) network: Social dimensions of ecological change and ecological dimensions of social change. Ecosystems 7(2): 161–171.

Redpath, S. M., Young, J., Evely, A., Adams, W. M., Sutherland, W. J., Whitehouse, A., Amar, A., Lambert, R. A., Linnell, J. D. C., Watt, A., and Gutiérrez, R. J. (2013). Understanding and managing conservation conflicts. Trends in Ecology and Evolution 28(2): 100–109.

Ruiz-Mallen, I., Schunko, C., Corbera, E., Ros, M., and Reyes-Garcia. 2015. Meanings, drivers, and motivations for community-based conservation in Latin America. Ecology and Society 20(3): 33. http://dx.doi.org/10.5751/ES-07733-200333.

Salafsky, N., and Margoluis, R. (1999). Threat reduction assessment: A practical and cost-effective approach to evaluating conservation and development projects. Conservation Biology 13(4): 830–841.

Salafsky, N., Cauley, H., Balachander, G., Cordes, B., Parks, J., Margoluis, C., Bhatt, S., Encarnacion, C., Russell, D., and Margoluis, R. (2001). A systematic test of an enterprise strategy for community-based biodiversity conservation. Conservation Biology 15(6): 1585–1595.

Salafsky, N., and Wollenberg, E. (2000). Linking livelihoods and conservation: A conceptual framework and scale for assessing the integration of human needs and biodiversity. World Development 28(8): 1421–1438.

Soulé, M. E. (1985). What is conservation biology? BioScience 35(11): 727–734.

St. John, F. A. V., Edward-Jones, G., and Jones, J. P. G. (2010). Conservation and human behaviour: Lessons from social psychology. Wildlife Research 37: 658–667.

Steiner, A., Kimball, L. A., and Scanlon, J. (2003). Global governance for the environment and the role of Multilateral Environmental Agreements in conservation. Oryx 37(2): 227–237.

Treves, A., Wallace, R. B., and White, S. (2009). Participatory Planning of Interventions to Mitigate Human-Wildlife Conflicts. Conservation Biology 23(6): 1577–1587.

Trimble, M. J., and van Aarde, R. J. (2014). Supporting conservation with biodiversity research in sub-Saharan Africa's human-modified landscapes. Biodiversity Conservation 23(9): 2345–2369.

Tallis, H. M., and Kareiva, P. (2006). Shaping global environmental decisions using socio-ecological models. Trends in Ecology and Evolution 21(10): 562–568.

Urban E. K. (1988). Status of cranes in Africa. In Backhurst, G. C. (ed.), Proceedings of the Sixth Pan-African Ornithological Congress, Francistown (Botswana) 1985. Sixth PAOC Committee, Nairobi.

Vayda, A. (1983). Progressive contextualisation: Methods for research in ecology. Human Ecology 11(3): 265–281.

Villamor, G. B., Palomo, I., López Santiago, C. A., Oteros-Rozas, E., and Hill, J. (2014). Assessing stakeholders' perceptions and values towards social-ecological systems using participatory methods. Ecological Processes 2014, 3:22. http://www.ecologicalprocesses.com/content/3/1/22.

Walters, B., and Vayda, A. P. (2009). Event ecology, causal historical analysis, and human-environment research. Annals of the Association of American Geographers 99(3): 534–553.

Waylen, K. A., Fischer, A., McGowan, P. J. K., Thirgood, S. J., and Milner-Gulland, E. J. (2010). Effect of local cultural context on the success of community-based conservation interventions. Conservation Biology 24(4): 1119–1129.

Williams, S. E., Shoo, L. P., Isaac, J. L., Hoffmann, A. A., and Langham, G. (2008). Towards an integrated framework for assessing the vulnerability of species to climate change. PloS Biology 6(12): 2621–2626.

Woodhouse, E., Homewood, K.M., Beauchamp, E., Clements, T., McCabe, J. T., Wilkie, D., and Milner-Gulland, E. J. (2015) Guiding principles for evaluating the impacts of conservation interventions on human well-being. Philosophical Transactions of the Royal Society A. http://dx.doi.org/10.1098/rstb.2015.0103.

2

Drainage and agricultural encroachment are threats to crane habitats at Kingwal Swamp

Narratives of Grey Crowned Crane habitat loss in Kenya, Uganda and Zimbabwe

Abstract

This chapter provides a largely qualitative overview of how social factors influence wetland management decision-making, drawing linkages between human actions and ecological changes associated with crane habitat loss. Habitat loss, mainly caused by agricultural encroachment into wetlands used by cranes, is a major contributing factor in the decline of the species' breeding success. Through the narratives of habitat loss at six study sites, the chapter explores major issues affecting cranes in various social and ecological contexts. The chapter is a background for the more detailed chapters that follow.

2.1. Introduction

2.1.1. The Grey Crowned Crane: A species in decline

The Grey Crowned Crane *Balearica regulorum* is classified as Endangered on the IUCN Red List. It has declined by as much as 79 % since the 1960s and is regarded as the fastest declining crane species in the world, with loss of its breeding habitat (hereafter referred to as crane habitat loss) being cited in literature as a major cause of the decline across its range (Morrison 2015). As is the case with most cranes globally, low wetland utilisation pressure made it possible for Grey Crowned Crane to breed and thrive in the past in African landscapes (Harris 1994). However, human activities, over the years, caused the decline of the ecological integrity of wetlands across the species' range which covers much of Eastern and Southern Africa, with Kenya and Uganda defining the northern limits. Beilfuss *et al.* (2007) estimated a 50 % decline over a 20-year period in East Africa, mainly in the species' strongholds, Kenya and Uganda. Information about the species' recent population trends in Zimbabwe, which supports the third largest population in southern Africa (Morrison 2015) is scant. However, emerging evidence confirms that land use change from commercial cattle ranching to subsistence mixed farming, a result of the land reform programme implemented by the Zimbabwean government between 2000 and 2002, impacted negatively on the ecological integrity of wetlands thereby compromising the condition of crane habitats (Chirara 2011; Fakarayi *et al*. 2015).

Grey Crowned Cranes (hereafter referred to as cranes) depend on wetlands for breeding (Meine and Archibald 1996). Agriculture-induced wetland fragmentation, drainage and removal of native vegetation have a detrimental effect on the species' productivity as they reduce the quality and size of breeding habitats (Meine and Archibald 1996; Beilfuss *et al*. 2007; Harris and Mirande 2013).

Habitat loss emanating from reduction in vegetation cover increases the risk of disturbance for breeding pairs and makes eggs and chicks vulnerable to trampling and predation (Harris and Mirande 2013). Wetland degradation that leads to habitat loss is mainly caused by agricultural encroachment, overgrazing, removal of wetland plants and the introduction of alien plants (Meine and Archibald 1996; Morrison 2015). These actions are rooted in land use decisions by wetland user communities and wetland management regulations enforced by state environmental agencies. In this regard, wetland users and government agencies can be described as actors because their decisions and actions affect the ecosystems, habitats and species. They operate in an environment (decision context) defined by socio-cultural factors, resource governance regimes, economic conditions and conservation policies and programmes (Jones 1999; Fabricius 2007).

2.1.2. The quest for evidence-based knowledge for informed conservation planning

Local communities' experiential knowledge and site-specific studies are critical in research aimed at furthering the understanding of the dynamics of land transformation, which affects both ecological and social components of ecosystems (Redman *et al*. 2004; Castillo *et al*. 2018). There is also a growing realisation that the analysis of contextual factors for conservation planning should go beyond the consideration of proximate factors affecting species and habitats to include analysis of values and motivations for environmental attitudes and behaviour change (Brooks *et al*. 2013; St John *et al*. 2014). Multi-disciplinary approaches that allow integration of social science, humanities, ecological economics, landscape ecology and other disciplines are used in contemporary environmental problem analyses (Machlis 1992; Liu 2001; Walters and Vayda 2009). By adopting such approaches and selecting robust methodological tools, researchers can collect and analyse qualitative and quantitative data to gain a holistic insight into the broader context of local conservation challenges in a rapid and cost-effective manner.

Analysing factors influencing wetland users' (primary actors) decisions in their local context and other actors and factors operating outside the wetland users' immediate social and geographical sphere of influence is critical in understanding social drivers and dynamics of habitat loss (Norton *et al*. 2013; Dorresteijn *et al*. 2015). This, in turn, provides a basis for evidence-based conservation planning (Pullin and Knight 2003; Sutherland *et al*. 2004; Pullin and Knight 2009), an approach that has been gaining recognition since the early 2000s. In line with this contemporary conservation approach, it is important to analyse direct causes and underlying drivers of the decline to generate evidence that could be used to inform conservation planning.

Recent rapid habitat assessments undertaken by individuals that have coordinated pioneering crane conservation projects have revealed the escalation of habitat loss in Kenya (Wanjala[2] *pers. comm*; Pomeroy *pers. comm*) and Uganda (Muheebwa-Muhoozi[3] *pers. comm*; Pomeroy *pers. comm*). The same trend have also been observed in Zimbabwe (Fakarayi[4] *pers. comm*). Common phenomena observed by these country-based crane conservationists are threats to crane habitats emanating from wetland-based livelihoods. Despite these worrying observations, no comprehensive study has been undertaken to draw linkages between wetland-based livelihoods, local decision-making contexts and ecological factors behind crane habitat loss. Contemporary knowledge on social drivers of crane habitat loss is based on broad-based extrapolation drawn from ecological, as opposed to environmental social science-based, research conducted at some crane sites in the past (e.g., Pomeroy 1987; Gichuki 1993; Beilfuss *et al*. 1996). Narratives of the interface between people and wetlands have been published in wetland survey reports, livelihood assessment reports and policy documents (e.g., Richardson 1993; Odada *et al.* 2004; Turyahabwe *et al*. 2015). In the absence of empirically generated knowledge on social causation of environmental degradation, land use planners and conservationists tend to rely on generalised interpretations for drivers and patterns of environmental phenomena described by Jones (1999) and Walters and Vayda (2009) as meta-narratives. Limited understanding of the local context is an obstacle to effective leveraging of local opportunities for effective management and conservation of resources (Walters and Vayda 2009). Against this background, the present chapter presents specific cases of crane habitat loss in Kenya, Uganda and Zimbabwe, to lay a foundation for evidence-based conservation planning.

This chapter presents a cross-national comparison of linkages between wetland-based livelihoods, actors' decision-making and underlying drivers of crane habitat loss. This is achieved through characteristic narratives which were elicited through semi-structured interviews, field observations by the researcher and review of secondary data. The narratives also inspire more formal and detailed analyses presented in subsequent chapters. In that vein, the chapter serves as a relatively introduction to the chapters. Its secondary purpose is to add to the international stock of stories of land use and biodiversity change and their underlying drivers, informing the science of land use change and linkages to biodiversity loss (e.g., Rudel and Roper 1997; Geist and Lambin 2002; McKinney *et al*. 2009.

[2] Maurice Wanjala is a community leader who formed a community-based group to address threats to cranes and wetlands in 1990. He has conducted extensive surveys to determine the distribution of and trends in the Grey Crowned Crane population in western Kenya since 1990.

[3] Jimmy Muheebwa-Muhoozi is a Conservation Biologist. He studied the ecology and distribution of the Grey Crowned Cranes as part of his MSc research project. He initiated projects aimed at conserving Grey Crowned Cranes in Uganda in the early 2000s. He has been a leading figure in crane conservation and has monitored cranes since 1998.

[4] Togarasei Fakarayi is Wildlife Management Scientist. He has worked for BirdLife Zimbabwe, a national conservation organisation, as a Crane Conservation Officer since 2004. Apart from conducting annual crane surveys, he conducted his MSc research in one of the key Grey Crowned Crane areas in Zimbabwe, focusing on crane habitat assessments and human-crane interactions.

2.1.3. Research framework and questions

Various methodologies used to characterise and analyse social drivers of environmental change were reviewed to assess their applicability in analysing drivers of crane habitat loss. The Action-in-Context (AiC) framework developed by de Groot (1992, 1998) was ultimately selected on the strength of its capacity to integrate multi-disciplinary data for holistic problem analysis. It also enables the researcher to explicitly define the social context in which the problem occurs and establish linkages between the contextual factors, underlying drivers of problems and tenable options for addressing the problems. The AiC framework was used during field data collection in six wetland landscapes containing crane breeding sites in Kenya, Uganda and Zimbabwe. More details about the framework are presented in the next section.

The AiC Framework was used to generate narratives of crane habitat loss, taking one or more key direct factor(s) contributing to crane habitat loss at each site as the departure points for the detailed analysis. The narratives then trace and shed light on the causal linkages behind these factors, with the subsequent qualitative elicitation of the implications for crane habitat conservation. Thus, building on the basic research question formulated in Chapter 1, this chapter addresses the following specific research questions:

- What historical developments contributed to current actions currently affecting the structure and functions of wetlands?
- What are the observable manifestations of key factor(s) affecting crane habitats at the study sites?
- What are the causal human actions and actors directly behind these factors?
- How do the underlying contextual drivers (local and external) influence actors' decision-making?
- What are the commonalities and differences in these drivers of crane habitat loss across the sites?
- What are the emergent implications of these findings for crane habitat conservation planning?

2.1.4. Structure of the chapter

In the next section, a description of the study sites, background information on biophysical characteristics of the landscapes containing study sites, sites' environmental history, common land uses, natural resource governance and socio-economic contexts are summarised. Key elements of the AiC methodological framework and field data collection methods are then outlined. In the results section, site-specific narratives of crane habitat loss are presented. In the discussion section, commonalities and differences in drivers of crane habitat loss across the six study sites are presented, regarding implications for crane and wetland conservation being made. In conclusion, tenable habitat conservation options and entry points for specific interventions in the context of prevailing policies, land tenure systems, local wetland management institutions, market forces and community environmental behaviours, are elaborated.

2.2. Methods

2.2.1. Study sites

The study sites have diverse environmental histories and biophysical characteristics. The study communities have varied cultural histories and are characterised by a mix of socio-economic systems, land tenure and natural resource governance regimes. Primary data were collected from communities bordering wetland landscapes that contain crane breeding sites in Kenya, Uganda and Zimbabwe. Since some of the secondary actors were not based in the communities in question, the author had to travel and interview them at their homes and offices during the data collection process. The landscapes and the countries in which they are located (in brackets) are: Driefontein Grasslands (Zimbabwe), Kaku, Mitooma and Nyamuriro (Uganda) and Kimondi-Kingwal and Saiwa (Kenya). The landscapes contain globally-recognised habitats for breeding crane pairs and flocks (Morrison 2015).

Study sites' biophysical characteristics, land use patterns, crane population status and human population density are presented in Table 2.1. Summaries of contextual factors (environmental history, human settlement and demographic trends, current socio-economic practices) at the study sites are summarised below. Contextual information on wetland sizes, central coordinates of sites and wetland characteristics were obtained from unpublished crane survey results and conservation project reports compiled by organisations that were coordinating crane conservation projects in their respective countries (BirdLife Zimbabwe, Kipsaina Crane and Wetland Conservation Group and Nature Uganda). Data on environmental history, cultural history, livelihoods, land ownership, settlement patterns and community development patterns were collected through interviews with community leaders and elderly members of the community. During field data collection, biophysical characteristics of landscapes around wetlands were observed and documented by the author.

Fig 2.1. Map of Africa showing the regions in which the study areas (black stars) are located in Kenya, Uganda and Zimbabwe

(Adapted from: United Nations 2015)

Both Kenyan sites lie in landscapes that underwent extensive transformation after the country attained independence in 1963. Around *Saiwa*, during the colonial era and for a decade after independence, land use was predominantly commercial maize, wheat and barley farming by European settlers and some indigenous farmers. Resettlement policies enacted in the early 1970s

made it possible for families from other regions of the country to move into the area, leading to the emergence of multi-ethnic villages. Subsequently, villagers started clearing indigenous riverine forests on wetland edges for agriculture. Wetland edges were gradually turned into privately owned farms, with some remnant patches becoming common access grazing zones. Currently, households practise rain-fed crop production and cattle rearing. Crop production takes place in upland fields and household food gardens are found on wetland fringes and riverbanks. The area falls under what is now recognised as one of Kenya's main maize production zones.

The *Kimondi-Kingwal* wetland was managed as a common access resource under customary regulations by the Nandi people up until the 1970s. Thereafter, local communities subdivided the wetland's floodplain into dairy and crop production plots, with human settlements being established in the upland areas. Farmers grow cereals (maize and sorghum) and graze dairy cows, sheep and goats on the plots located on wetland edges. Apart from the privately-owned fenced plots, small patches where open access communal grazing regimes prevail are also prevalent. Despite the human-induced transformation, the wetland still contains patches where relics of past wetland vegetation are visible.

In Uganda, the focus was on three wetlands situated in the country's south-western region. The wetlands are a source of water for domestic use and crop production, in addition to providing pastures and papyrus for craft making, construction and fuel. *Kaku* is the main source of water for over 250 households from nearby villages and the town of Kyazanga. Up until the 1960s, its catchment area was sparsely populated as it receives less rainfall about the surrounding areas hence it did not attract new settlers at first. However, family groups, mostly from the southwest and central parts of Uganda settled in the area in the 1960s. The wetland is managed as a common access resource, which allows people from outside the wetland's geographical catchment to graze their livestock around the site during the dry season. Fishing is a major livelihood activity.

Nyamuriro is located in a densely populated area with a history of intensive agriculture on steep-sided hillslopes documented as far back as the 1960s (Carswell 2002). It is a source of livelihood for over 500 households that depend on it for crop production, water supply and provision of papyrus used for fuel and as raw materials for making crafts (baskets, mats, trays, ropes) and construction of roofs, ceilings and fences. Current threats to the wetlands are rooted in the rapid human population growth between the 1970 and 1990s which caused the demand for arable land and papyrus to escalate. Since the wetland is bordered by steep-sided hillslopes that are inherently marginal for agriculture, locals have been forced to encroach onto the wetland over the years. Human settlements are located on the hillslopes where indigenous hardwood forests were cleared. Irish potato production on reclaimed sections of the wetlands is a major source of income for the community.

At *Mitooma,* conversion of wetlands into crop fields peaked in the 1970s as the demand for land increased. This led to the emergence of a mixed crop-livestock farming system on privately-owned agricultural plots as households privatised wetland sections that previously been managed as commons. Goats and cattle are now grazed on these plots. Most households grow bananas as a cash and food crop. Human settlements are scattered on small hills interspersed by a network of riverine wetlands. In recent years, eucalyptus plantations have become a dominant feature in the landscape.

In *Driefontein*, the focus was on wetlands that form part of a network of rivers and streams that traverse the mainly grassland landscape. Commercial cattle ranching was the predominant land use before the fast-track land reform programme implemented in 2000. Subsistence crop and livestock farming were introduced when hundreds of families were resettled in the area between 2001 and 2002. Farmers grow vegetables and cereal crops (maize and wheat) and graze their livestock in communal pastures on wetland edges and grasslands in the uplands. Customary rules enforced by village committees and government-baked environmental regulations enforced by locally-based officers, define the natural resource governance systems. Households own arable land but share communal grazing areas. Residential areas are located in the uplands.

Table 2.1: Study sites' biophysical characteristics, land use patterns, crane population status and human population density

Country	**Kenya**		**Uganda**			**Zimbabwe**
Wetland	Kimondi-Kingwal	Saiwa	Kaku	Nyamuriro	Mitooma	Driefontein
District / County	Nandi	Trans Nzoia	Lwengo	Kabale	Mitooma	Gutu
Coordinates	0° 16′ N, 35° 9′ E	1° 5′ N, 35° 6′ E	0° 24′ S, 31° 21′ E	1° 12′ S, 29° 43′ E	0° 37′ S, 30° 03′ E	19° 23′ S, 30° 47′ E
Rainfall patterns	Bimodal	Bimodal	Bimodal	Bimodal	Bimodal	Unimodal
Annual rainfall amounts (mm)	1600[5]	1100[6]	840[7]	1200[8]	1230[9]	850[10]
Description	12 km long riverine wetland bordered by an expansive floodplain (size of wetland = 5.5 km^2)	Riverine wetland extending over 8 km dominated by bulrush sedges (size of wetland = 0.95 km^2)	Pan-shaped wetland comprising sections covered by open water, papyrus and other sedges (size of wetland = 2.4 km^2)	High altitude valley-bottom peatland fed by water from steep-sided hillslopes (size of wetland = 3.6 km^2)	Extensive system of papyrus-dominated wetlands associated with streams (size of wetland = 0.8 km^2)	Seasonal wetlands ('dambos') and earth dams (size of wetland = 6.6 km^2)
Main land use within 300 m of wetland edge	Private and communal grazing, vegetable gardening, maize production	Maize production, communal grazing and vegetable gardening	Vegetable gardening, wet season crop production (beans and maize)	Crop production (Irish potato rotated with beans and maize)	Private grazing, eucalyptus plantations, vegetable gardening, crop production (beans and maize)	Communal grazing and vegetable gardening
Catchment characteristics (<2 km of wetland edge)	Seasonally inundated floodplain, gently sloping cultivated fields	Gently sloping cultivated fields and patches of indigenous forests and eucalyptus plantations	Gently sloping cultivated fields, banana plantations	Steep-sided cultivated hill slopes and human settlements	Hilly cultivated landscapes, eucalyptus and banana plantations	Seasonally-wet grasslands, gently sloping cultivated fields
Use of site by cranes	25 nest sites in sedge-covered areas along the river system	15 nest sites in sedge-covered areas along the river system	6 nest sites in sedge covered areas on the edges of the wetland	6 nest sites in sections not converted to crop fields along the river system	8 nest sites in wetlands located on household-owned plots	5 nest sites on river and dam edges
Human population density (inhabitants/ km^2)	310[11]	397[12]	240[13]	401[14]	357[15]	29[16]

[5] Data from Infonet-Biovision (2018)
[6] Data from Infonet-Biovision (2018)
[7] Data from Nsubuga et al. (2014)
[8] Data from Nsubuga et al. (2014)
[9] Data from Nsubuga et al. (2014)
[10] Data from Department of Meteorological Services (1984)

[11] Data from Citypopulation (https://www.citypopulation.de/en/kenya/admin/rift_valley/29__nandi/)
[12] Data from Citypopulation (https://www.citypopulation.de/en/kenya/admin/rift_valley/26__trans_nzoia/)
[13] Data from Citypopulation (https://www.citypopulation.de/en/uganda/central/admin/105__lwengo/)
[14] Data from Citypopulation (https://www.citypopulation.de/en/uganda/admin/western/009__kabale/)
[15] Data from Citypopulation (https://www.citypopulation.de/en/uganda/admin/western/106__mitooma/)
[16] Data from Citypopulation (https://www.citypopulation.de/php/zimbabwe-admin.php?adm2id=804)

2.2.2. Methodological framework

The Action-in-Context (AiC) framework was used to guide field data collection and analysis. Developed by De Groot (1992) as a tool for analysing the social causal chains behind environmental problems, the AiC is based on the progressive contextualisation concept (Vayda 1983). The AiC framework focuses on environmental actors (individuals, households, communities and organisations) and their decision-making criteria. It acknowledges that decisions are made after consideration of social, cultural, economic and political factors. AiC-based problem analysis starts with the identification of action(s) behind the problem before one considers the wider context characterised by actors and underlying factors that influence the actors' decisions. The core of AiC can be presented as a triangular structure (Fig 1), showing that actors act in the way they do because they have (1) options to select and (2) motivations to act.

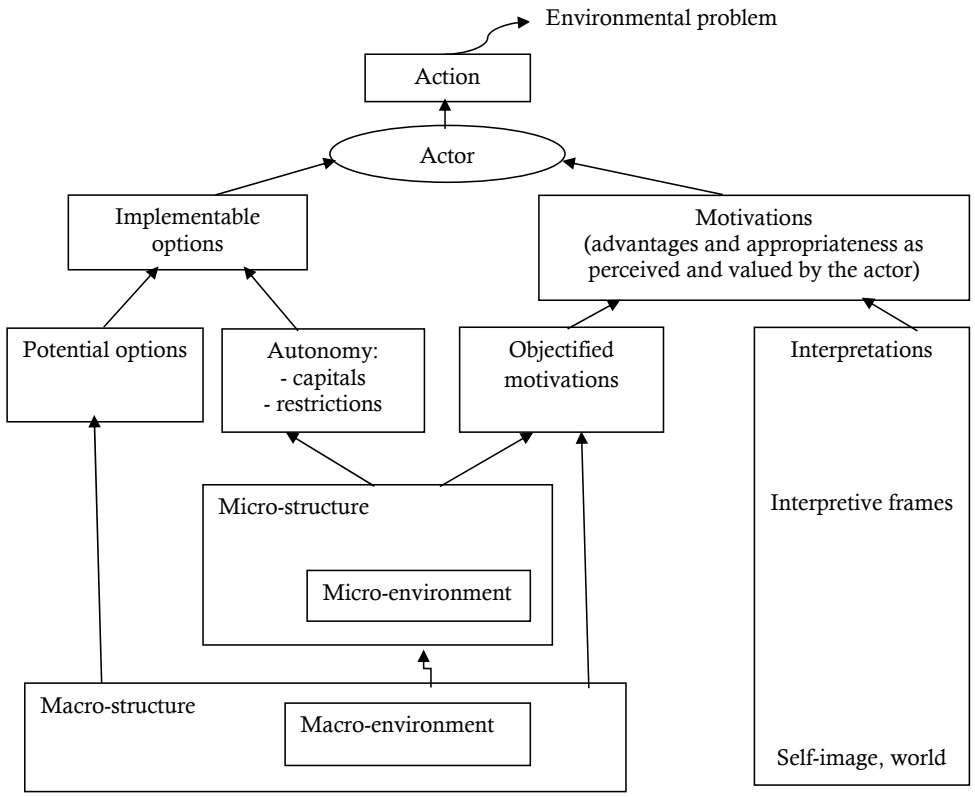

Fig 2.2. Action-in-Context deeper analysis scheme (Source: De Groot 1992)

The framework provides a structure of 'deeper analysis', in which the options and motivations are broken down first into two elements each, as shown in Figure 1. Implementable options (i.e., courses of actions taken by actors) are broken down into potential options and the autonomy. Autonomy includes environmental conditions, human capitals and capacities that aid or constraint the actor's decisions. Motivations are subdivided into objectified motivations comprising quantifiable benefits (e.g., income, food), cultural interpretations and cognitive considerations (norms, values, beliefs, etc). These, in turn, may be connected to technical, empowerment, regulatory, economic and cultural policy options. Shown in Figure 1 is the bottom layer that connects these elements to institutional microstructures (own social groups and networks) and macro structures (markets and society). In AiC, actors can also be connected to each other through 'actors' fields. Actors fields are defined as chains of the causal influence of one actor on the options and/or motivations of another actor (e.g., governments influencing farmers, international agencies influencing governments). The proximate actors are called 'primary actors' and the actors influencing these are called 'secondary', 'tertiary' and so on. In this chapter, the focus is on proximate issues, i.e., primary actors and the first layer of the deeper analysis (Fig 2.2), but reference is made to secondary and tertiary actors if their influences are easily discernible and relevant.

2.2.3. Field data collection

Reconnaissance trips to all study sites were conducted in January and February 2011 to gain preliminary insight into the local context (social structures, land use patterns and environmental governance systems) and how the contextual factors influenced human-crane interactions. The bulk of the data presented in this chapter were collected between July and November 2011. In Zimbabwe, data collection took place in July 2011 and Kenya and Uganda, it was undertaken in October and November 2011, respectively. Although comprehensive data collection took place in 2011, subsequent trips (five in total) to the sites between 2012 and 2014 provided opportunities to verify data collected and identify phenomena that might not have been captured.

Data collection methods included semi-structured interviews, group discussions and researcher observations. The total number of respondents involved in semi-structured interviews and group discussion participants are presented in Table 2.2. In total, 187 individuals were interviewed in the three countries (ranging from 24% up to 32% of the total households in the catchment areas), and 168 individuals were involved in group discussions (group size ranging from 15 up to 44 people). In

Zimbabwe, interviews were conducted in the local language, Shona, the author's first language. Local translators were hired in Kenya and Uganda to cater for non-English speakers although a significant proportion of respondents understood English.

Table 2.2. Number of respondents involved in semi-structured interviews and group discussions

Site	Number of respondents involved in semi-structured interviews and group discussions	Total number of households in the catchment of the wetland under consideration, percentage of households involved in semi-structured interviews
Kimondi-Kingwal	Crop and livestock producers (18), Community elders /leaders (3), Environmental Officers (2), County administrators (2), Milk buyers (3) Group discussion participants (44)	67 (31,3%)
Saiwa	Chief (1), Village leaders (2), Wetland plot holders (22), Environmental Officers (2), Forestry Officer (1), Wildlife Officers (2) Group discussion participants (22)	106 (23,6%)
Kaku	Wetland plot holders (10), Wetland Management Committee members (4), Fishermen (5), Livestock herders (10), Environmental Officers (3), County leaders (2), Nature Uganda Project Assistant (1) Group discussion participants (30)	94 (30,9%)
Nyamuriro	Potato growers (22), Wetland Management Committee members (4), Cooperative society leaders (6), Environmental Officer (1), Agricultural Officer (1), Nature Uganda Project Assistant (1) Group discussion participants (33)	122 (26,2%)
Mitooma	Crop and livestock producers (10), Plantation owners (14), Forestry Officer (1), Environmental Officer (1), Nature Uganda Project Assistant (1), Group discussion participants (15)	76 (31,6%)
Driefontein	Wetland plot holders (19), Village committee members (5), Agricultural Officer (3), Environmental Officer (1), Councillor (1), District Administrator (1) District Lands Officer (1), BirdLife Zimbabwe Project Assistant (1), Group discussion participants (24)	96 (26,8%)

Primary actors involved in semi-structured interviews and group discussions were selected from the wetlands' social catchments, loosely defined as clusters of households that derived socio-economic benefits from the focal wetlands. Delineation of social catchments was done with input from community leaders at all sites. The aim was to interview household heads as they make and ratify decisions at household level. However, it was common for household heads to consult other family members during interviews. At each study site, group discussions were organised and used as platforms to verify facts captured during interviews with individual respondents. Although invitations to participate in group discussions were made open to all wetland users, specific households that were known to use the wetlands for specific purposes were intentionally asked to attend. This approach was used at all study sites. Information on households that used wetland resources and the different uses was availed by community leaders and key informants (agricultural and environmental officers and community project leaders).

Semi-structured interviews involved posing questions framed to enable elicitation of data on actors, active options, potential actions, autonomy, motivations and interpretations (key elements of the AiC framework). Key questions that were used to guide semi-structured interviews and group discussions are presented Box 2.1. Interviews started with easy-going questions about the history and importance of wetlands and interactions between people and cranes. Questions formulated to cover key elements of the AiC deeper analysis scheme (See Box 2.1) were then posed to interviewees so that they could explain the human activities, hydrological processes and social drivers of wetland fragmentation and degradation. The focus of the interviews would then be broadened to include other practices that the community were not undertaking due to lack of capacity or restrictions (policies, standards, customary rules, legal requirements) imposed on them at village and district levels. Questions on social, financial, political, human, cultural and natural capitals that either enabled or inhibited the adoption of specific options would then follow. Data on motivations for actions for actual and potential options were elicited in two phases. Questions on quantifiable benefits and costs were posed first, followed by discussions on the interpretations (norms, values, aspirations and beliefs) explaining why certain wetland management decisions were made. Semi-structured interviews took 30 – 45 minutes and group discussions took two hours.

Box 2.1. Key questions that were used to guide semi-structured interviews and group discussions

1. What is the history of human activities degrading wetlands containing crane habitats?
2. How does degradation of wetlands as a result of the activities occur?
3. How does the degradation of wetlands affect cranes (eggs, chicks, adults)?
4. Who are the people behind activities degrading the wetlands?
5. What local conditions, rules and standards govern human activities in wetlands?
6. What economic benefits do wetland users derive when performing activities degrading wetlands?
7. What are the other non-economic motivations for utilising and managing wetlands containing crane sites?
8. What are costs associated with utilising and managing wetlands?
9. What other activities could communities undertake to manage wetlands (that compromise or protect crane habitats?
10. What social, economic, cultural, institutional, political factors influence wetland management and crane survival?
11. Who are the secondary actors, defined as wetland management decision-makers operating beyond community boundaries?
12. What are motivations of these secondary actors for influencing wetland management decision-making?

Data captured during the interviews with primary actors were reviewed at the end of each working day to identify commonalities and anomalies in responses as well as the underlying factors. Individuals or institutions that influenced decisions and actions made by primary actors were also identified. These secondary actors were interviewed following the AiC procedure, i.e., identifying selected options, potential options, capitals, restrictions, objectified motivations and interpretations. Interview responses were then synthesised into AiC schemes as part of the inductive analytic processes to discern data patterns, themes and implications of the findings. At each site, this preliminary analysis provided insight into issues that needed verification and further investigation, including divergent and unclear responses to questions presented in Box 2.1. These then became data gaps that were addressed through group discussions. Group discussions took place during workshops (one per site) that brought together households that were open to household representatives that had been interviewed and other community members. To facilitate focused discussions during the workshops, participants formed three groups and each group would tackle the questions (all primarily drawn from the main questions presented in Box 2.1) to address the site-specific data gaps. After the discussion, each group shared its points with the rest of the participants. Data gathered through these group discussions was then used to complete the narratives of crane habitat loss, complementing what had been gathered through semi-structured interviews. Responses from semi-structured interviews, enriched through data gathered through group discussions, primarily provided answers to Questions 1–9 in Box 2.1. This was the basis upon which the AiC schema for each habitat loss process.

Transect walks through the wetlands enabled the main author to observe ecological and hydrological phenomena cited during interviews. Physical evidence of wetland degradation were captured photographically for subsequent pictorial analyses to gain a deeper understanding of the nature and scale of the degradation.

An initial list of threats to wetlands, based on field observations, was compiled after the first reconnaissance trips to all study sites in 2011. The threats were broadly defined as human activities that impacted negatively on the wetland's biophysical characteristics (e.g., vegetation structure and composition) as elaborated by Fennesy *et al.* (2007) and Beth *et al.* (2006). This approach was premised on the acknowledgement that such alterations of wetland characteristics affect both surface- and groundwater hydrology of wetlands (Stromberg and Richter 1996, Yu and Ehrenfeld 2010), which can lead to a reduction in wetland's capacity to provide wildlife habitats (Zedler and Kercher 2004). These negative impacts of the change of wetland characteristics have been documented as common threats to cranes (Meine and Archibald 1996). In this vein, assessment of threats to wetlands, which inherently have repercussions on crane habitats, was primarily based on the identification of human- and livestock-induced changes to vegetation structure and composition and water retention and flow patterns.

During the reconnaissance trips, hotspots where signs of wetland degradation were observed (by the author) were marked on topographical maps of the sites. During subsequent formal data collection periods, wetland sections identified as hotspots were revisited and assessed to collect pictorial evidence of wetland degradation. A basic categorical scale (High, Low, Absent) for prevalence of threats to crane habitats was developed. Spatial criteria generally used to describe prevalence include how widespread the threats was (size of wetland area affected by the threat relative to the total area

of the study site) and prevalence within the mapped focal wetland area (e.g., number of alien invasive trees within the focal wetland or number of fields affected). The categorisation was therefore on a per-study site basis, to rank the threats based on their prevalence around the site in question. This made it possible to identify the key human actions contributing to crane habitat loss and analyse the proximate issues (observable signs of habitat degradation) at the site and discern the social causation chain behind the issues.

2.2.4 Review of environmental policies

The entry point for addressing the third (contextual) research question was to review relevant environmental management policies to gain an understanding of how wetland management and associated conservation of biodiversity are articulated in policy documents. Key documents reviewed include the National Environmental Management Act of 2002 (Government of Zimbabwe 2002), Environmental Management and Coordination Act of 1999 (Government of Kenya 1999) and the National Wetlands Policy of 1995 (Government of Uganda 1995). During interviews with policy actors such as the Agricultural and Environmental Officers in Zimbabwe, Environmental Officers in Kenya and Wetland Officers in Uganda (see Table 2.2), policy implementation processes, challenges encountered and possible solutions to implementation bottlenecks were elicited. Application (and lack thereof) of environmental policies and other regulations in community-level wetland management were also explored during interviews with local community leaders. This provided a structured way to obtain answers to Questions 10–12 in Box 2.1.

2.3. Results

Human actions (factors) contributing to crane habitat loss at the study sites are numerous, as this and the subsequent chapters show. However, the critical ones can be grouped into six categories: ditching to drain water from agricultural fields, wetland edge cultivation, introduction of alien invasive species such as eucalyptus trees, overgrazing and trampling by livestock, overharvesting of wetland plants, and persistent human presence in wetlands. The critical ones per site were selected mainly because they featured prominently in discussions with the respondents, who included experienced crane conservation practitioners and local champions that had contextual knowledge about trends in crane breeding success and patterns in the utilisation of wetlands for breeding by cranes. The authors' ecological insight on factors worth in-depth investigation, grounded in field observations and informed by the general threat criteria outlined 2.2.3, also informed the selection of threats covered in detail in this chapter.

The narratives presented in this section take one or more of these factors as points of departure, without trivialising the ones that appeared minor at the time this research was conducted. In each case, the selected factor(s) are locally critical although they are not the only ones prevalent at the sites in question. However, the selection is intentionally meant to avoid lengthy narratives but fulfil the chapter's introductory aim (Section 2.1.2) to uncover characteristic social causation, and more comprehensive information is given in the chapters that follow.

In the following sub-sections, narratives of crane habitat loss at the six study sites are presented. The bulk of the data presented in this section was drawn from semi-structured interviews and group discussions, involving local communities who are the primary actors. Where the data presented is based on researcher observations, it is clearly stated. Where data emanated from interviews with non-local community respondents or informants, mention of the individuals' positions or their organization is made.

Table 2.3. Selected factors causing crane habitat loss at the six study sites

	Factors identified as highly prevalent at the sites
Kimondi-Kingwal	Ditching to drain water from agricultural fields Wetland edge cultivation Overgrazing and trampling by livestock
Saiwa	Wetland edge cultivation
Kaku	Wetland edge cultivation Overgrazing and trampling by livestock Persistent human presence in wetlands
Nyamuriro	Ditching to drain water from agricultural fields Wetland edge cultivation
Mitooma	Wetland edge cultivation, Introduction of alien invasive trees Overgrazing and trampling by livestock
Driefontein	Wetland edge cultivation

2.3.1. Ditching on household-managed plots at Kimondi-Kingwal

According to three village elders interviewed, up until the 1960s, the Kimondi-Kingwal wetland used to be flooded for the greater part of the year, except during drought years. Open access livestock grazing arrangements prevailed on the vast floodplain. Human population density was low and so was the demand for wetland resources. Due to waterlogged conditions in the wetland, crops were grown in the uplands. Low utilisation pressure and inaccessibility of some sections of the wetland meant that breeding habitats of cranes remained relatively undisturbed. However, as the population increased, the demand for arable land also increased, triggering a gradual agricultural encroachment that saw families extending their plots from the upland zones into the floodplain, a phenomenon that affected the entire stretch of the wetland.

The establishment of agricultural plots in the floodplain and current land ownership systems are rooted in post-independence land policies and absence of regulations to curb agricultural encroachment onto the wetland. Agricultural encroachment escalated and reached a peak in the 1980s, with farmers digging ditches (average size: 50 cm wide, 30 cm deep) to drain surface and underground water all year round to maintain soil moisture levels conducive for establishing pastures and enable crop survival. A network of dozens of ditches channels water to the river that meanders through the floodplain. A mosaic of fenced and unfenced plots, varying in size from vegetable gardens (400 m^2) to large pastures (5000 m^2), now covers much of the floodplain. The plots are mostly used for livestock (cattle and sheep) grazing though some plot holders also grow maize, millet and leaf vegetables. Interspersed between these plots are unconverted grassed sections that are used for grazing and provide wetland plants for crafts and construction. Restriction of livestock to fenced plots causes overgrazing and trampling of wetlands. Due to the extensive network of ditches, the flooding regimes of the unconverted sections of the wetland have been altered. The long-term negative impact of the persistent drainage was visible at some plots assessed as part of field data collection. In these plots, there were signs of long-term lowering of the water table, confirmed by community members, and change in grass species composition.

Plot holders belong to various socio-economic categories. They range from wealthy households that employ workers to carry out all farming tasks to comparatively poor households that cannot afford fences whose plots become communal grazing zones during the dry season. Crops grown (maize, millet and leaf vegetables) are mainly for domestic consumption. Milk is marketed in the villages and at the nearby town of Eldoret. On average, a household that owns one cow can generate up to \$300[17] from the sale of fresh milk annually. Sheep are slaughtered for household consumption or sold at \$120 each.

A salient phenomenon of the wetland is the presence of grass-covered wetland patches, some as small as 50 m^2, that provide refuge for crane pairs during the breeding season. These are located on the household-owned plots and on wetland fringes that are managed as commons. The current tenure system gives the plot holders quasi-private ownership rights over land as fenced plots are inaccessible to outsiders and their livestock. Despite the prevalence of uncultivated patches covered with wetland vegetation, information provided by Agricultural Officers and village leaders revealed that almost all land in the floodplain had been taken up by individual households. Some households, however, had not converted their land into crop fields because they owned other productive land in the uplands.

Most community members belong to the Nandi tribe who consider the Grey Crowned Crane a revered species. They believe that if a person kills a crane, flocks will come to mourn the dead crane and by so doing, curse the person responsible and his family. Reverence of the species is a positive phenomenon as respondents confirmed that the community, even young children, always exercised restraint when they encounter cranes, be it in wetlands or uplands. The Nandi have a history of intolerance towards outsiders, including government officers that do not belong to their tribe. The belief that they cast evil spells on outsiders when provoked is widespread in western Kenya. This was confirmed through interviews with environmental and agricultural officers who indicated that at times, they are not free to implement government programmes and enforce environmental regulations for fear of being victimised by the community. The government, through Kenya Wildlife Service, has only shown an interest, feeble though, in the conservation of the wetland because of the occurrence of the Sitatunga *Tragelaphus spekii* at the site. However, Kenya Wildlife Service's activities have not gone beyond public awareness on the need to conserve the wetland and highlighting its potential as a potential eco-tourism site. Despite the wetland providing habitats to 25 breeding pairs (see Table 2.1), no species and habitat conservation efforts by Kenya Wildlife Service were reported by local communities.

[17] All income and costs presented in this chapter are expressed in US dollars for standardization, at the prevailing rate when the data was collected

2.3.2. Wetland edge cultivation at Saiwa

Agricultural encroachment, which involves the removal of wetland vegetation and soil tillage, is the major cause of the reduction in the extent and quality of crane habitats at Saiwa. Households involved in wetland-edge cultivation take advantage of the recession of surface and ground water levels during the dry season to clear wetland vegetation, till the land and plant crops. They grow maize and leaf vegetables on wetland edges. Although normally the floodwater levels follow seasonal rainfall patterns, allowing farmers to grow crops on wetland edges when moisture levels are conducive, extreme scenarios (droughts and above-normal rainfall) were reported by respondents. The annual cycle of grass removal and tillage leaves the sections of the wetland edges devoid of vegetation that cranes require to nest and hide their chicks. There is a tendency by farmers to expand the area under cultivation into wetland zones during drought years. With the width of the grass-covered area having been reduced by up 50% at some points along the wetland according to the leader of the Kipsaina Crane and Wetland Conservation Group, fast-flowing floodwaters erode the loosened soil in cultivated plots and occasionally submerge crane nests.

There are three categories of actors responsible for wetland-edge cultivation. The largest group comprises households that acquired arable land around Saiwa, either through direct purchase after Kenya's independence or inheritance from their parents. The second group comprises outsiders that reside in neighbouring villages and business centres, who rent plots annually. They pay up to $135 per hectare per annum to the plot holders. The third group, locally referred to as squatters, failed to secure arable land in the uplands in the 1970s. The squatters have, for decades, resorted to wetland edge cultivation because they cannot afford to buy upland fields. Most community members regard the central parts of Saiwa as an open access resource that provides communal benefits such as grazing space, reeds for crafts and clay for brick-moulding. However, households in the first category have *de facto* ownership rights to wetland edges adjacent to their upland plots. This allows them to fence off sections of the wetland edge, thereby preventing other villagers from accessing their land. The sizes of the plots on wetland edges vary widely. The average yield of maize from the plots, based on estimates given by the 22 plot holders interviewed is 135 kg[18], enough food to sustain a 5-member household for 3–4 months.

[18] This was calculated since plot holders estimated that their harvests ranged from one bag (90kg Kenyan standard) to two bags (180kg).

A crane and wetland conservation outreach by the Kipsaina Crane and Wetland Conservation Group, a local community-based organisation, has positively influenced community attitudes and behaviour towards cranes over the years. This is particularly evident in Kipsaina village where the group succeeded in persuading wetland users (15 households) that had dug ditches, removed wetland vegetation and cultivated sections of a 1.7 km stretch along the wetland, to stop the practices. Village-based regulations introduced through the project helped curb encroachment, with no new cases of encroachment having been reported since 1997. The leader of the group used his social influence as a respected community development facilitator and opinion leader to promote the new wetland conservation ethic. The community took heed of his passionate conservation messaging. Attempts to introduce similar regulations in adjacent villages to protect other sections of the wetland failed. This was attributed to the fact that the group was not providing viable alternatives to wetland cultivation. The project implementers also had limited authority to impose sanctions for non-compliance and did not receive support from state environmental agencies or local county authorities. National agencies responsible for wetland conservation have not played a significant role in the initiative over the decades apart from occasional public acknowledgement of the group's work during environmental events. Despite the group's decades-long efforts to promote wetland conservation, The issue of the squatters was viewed by most respondents as a long-term problem that the community had no solution to and had to live with.

2.3.3. Multi-dimensional causes of habitat loss at Kaku

The situation at Kaku wetland represents a case of several proximate factors driving crane habitat loss. As stated in Table 2.2, threats to crane habitats at this wetland are multi-dimensional. High demand for arable land has, over the years, resulted in extensive conversion of land in the catchment to agricultural fields. The only remaining communal land, accessed by all livestock owners, is found on the fringes of the wetland. The area receives marginal rainfall and utilisation pressure on the wetland increases during the dry season as hundreds of cattle depend on the wetland when water becomes scarce in areas further away from the wetland. Incidents of droughts and late onset of the rains that had resulted in increased grazing pressure on and trampling of wetland edges were reported. Livestock herders from outside the wetland's immediate social catchment sometimes keep their livestock in the area for weeks until pastures in their areas improve. The locals tolerate the outsiders and view it as a customary arrangement that has been perpetuated over generations.

Human disturbance to breeding pairs emanates from three livelihood activities: fishing, wetland edge cultivation and grass harvesting. The wetland attracts fishers from the local villages, while others come from areas beyond the catchment boundaries. They use canoes to traverse the wetland in search of open water zones where they can cast their nets. On any day, there could be over 20 fishers, while human traffic on the wetland edges is common as traders and fishers transact on designated points on the edges of the wetland. Fish business is lucrative by local community standards. Annual income from the sale of fish ranges from $40 to $180 for inexperienced and seasoned fisherfolk respectively. The community harvests papyrus for crafts and construction from various sections of the wetland. Often, plant harvesters use canoes to navigate their way to the sections where the best stands of papyrus are found. Agricultural encroachment, which was reported to have escalated in the 1980s, is a common feature around the wetland. On some plots, vegetables (cabbage and tomatoes) are grown all year round, irrigated with water drawn from the wetland, while some plots are mainly used for rain-fed maize and bean production. The vegetables are sold to locals and travellers at Kyazanga. Vegetable traders owning 100m^2 garden makes between $25 and $55 annually from the sale of their produce. The persistent presence of fishers, fish buyers, crop growers and plant harvesters is a source of disturbance to breeding pairs.

In 2009, in recognition of the importance of Kaku wetland as a site crucial for biodiversity and community well-being, Nature Uganda facilitated a consultative process to develop a management plan for the wetland. The process, ratified by county authorities, the Wetlands Management Department and community leaders resulted in roles and required actions by different stakeholders to sustain the ecosystem services provided by the wetland being defined. However, the plan was yet to be implemented at the time of this research. Delayed implementation was said to be linked to lack of capacity (technical and legal) on the part of the Wetlands Management Department to finalize the necessary paperwork required to pave way for the official gazettement of the plan to pave way for its implementation. Owing to multiple resources that the wetland provides, with a potential to generate revenue by imposing levies on (especially fishers), management of Kaku was increasingly becoming a thorny issue among local administrative authorities and the state agencies responsible for environmental management, wildlife conservation and fisheries. The source of the conflict is the supposed overlap in mandates and authority among these local institutions and national agencies. These contestations indicated an exercise of undue authority by state actors, while disregarding the conservation requirements as stated in the National Wetland Policy. If implemented, three provisions of the plan, regular biodiversity monitoring, land use land zoning and regulated access, would translate into conservation results beneficial to crane habitats.

2.3.4. Vegetation clearance and furrowing for intensive crop production at Nyamuriro

Approximately 80 % of the Nyamuriro wetland's floodplain, previously covered with *papyrus*, *miscanthus* and *typha*, has been converted into arable land. The land, on either side of a river that runs through the floodplain, is intensively cultivated under a farming system dominated by Irish potato production, in rotation with maize and beans. The furrow-ridge system, used to reduce the impact of waterlogging on crops, causes all water accumulating in the furrows to be channelled to the river. This farming system, practised by over 90% of the farmers, alters the wetland's natural flooding and river flow patterns. Potatoes are grown during the period May–October and thereafter most farmers grow a second crop (maize or beans). Total removal of wetland vegetation, intensive annual tillage, furrowing and growing of crops in a rotational system represents permanent crane habitat loss in the already converted sections of the wetland. Respondents, especially the elderly, reported observing dozens of Grey Crowned Crane pairs breeding before the wetland was reclaimed for potato production in the late 1970s. They reported a gradual decline in nesting sites. At the time of data collection, six crane breeding pairs were using the uncultivated wetland patches for nesting and foraged in the cultivated parts of the floodplain.

Land and agricultural policies of the 1970s led to the emergence of current land access, ownership and management systems. Wetland reclamation was encouraged to boost agricultural production and ten agricultural cooperatives were formed. The cooperatives subdivided the wetland into plots (standard size 400 m^2) and allocated them to their members (households), marking the beginning of encroachment onto the wetland. Households then cleared the vegetation and dug drains to channel excess water from their plots. The cooperatives still have control over who can access land for crop production as well as ensuring cordial relations among plot-holders. When a plot becomes vacant, they allocate it to another household. Households that express interest in acquiring a wetland plot pay $20 first to be registered as members of the cooperative.

On average, households produce 25 kg of beans, 60 kg of maize and 90 kg of potato from the standard 400 m^2 plot per season. Potato production is a major livelihood activity for Nyamuriro farmers. Households may earn as much as $140 per annum from the sale of potatoes and if they decide not to sell their harvest, may have a three-month supply of potatoes. A lucrative market for potatoes in the

nearby Kabale town makes potato production a profitable enterprise. Increased demand for the crop from the fast-food industry in nearby towns was cited as a key driver of intensive potato production at Nyamuriro and adjoining wetlands. High population growth in the area during the last century, a phenomenon known to most of the respondents, was said to have led to the extensive conversion of land on hillslopes for crop production. With the greater part of the floodplain having been converted to crop fields, the remaining uncultivated land is the only common pool source of papyrus for the community. There is no more land for rain-fed crop production on hillslopes hence the only option farmers have is to intensify the use of the 400 m^2 plots they were allocated. A cooperative leader described fallowing to allow the soil to recover as a "luxury" that farmers could not afford.

Agricultural encroachment onto the wetland prompted Nature Uganda (a local environmental organisation) and the Uganda Wetlands Management Department to initiate community-based conservation activities to curb further encroachment and restore already degraded sections of the wetland. This collaborative initiative was leveraged by the existence of a national wetlands policy, which provided the institutional framework for participatory stakeholder engagement for sustainable management. A wetland management plan was developed in 2002, with input from the wetland user community and district authorities. Since 2006, wetland management committees, formed under the initiative, have regulated plant harvesting and enforced no-encroachment regulations within 15 m wide buffer strips on either side of the river. The community's recognition of the buffers and acceptance of community-based regulation mechanisms has contributed to the regeneration of wetland vegetation along 70 % of the length of the river targeted under the restoration exercise.

It was evident that wetland conservation outreach by Nature Uganda and the Wetlands Management Department had raised community awareness on the need for communities to stop wetland drainage, a provision of the wetlands policy enacted in 1995. However, respondents concurred that Environmental Officers did not strictly enforce the ban and as a result, farmers continued to till in wetlands without any fear of being penalised. Agricultural and Environmental Officers cited the lack of financial and material support as a factor that hindered their capacity to provide regular conservation extension support to the farmers. They also stated that when the policy was enacted, encroachment had already taken place and lamented the fact that the policy was not clear on what to do about already-encroached wetlands. They also pointed out that political goodwill, at local and national levels, was lacking. They added that often they feared retribution from politicians if they were seen to be radically implementing policies that could upset key livelihood activities (potato production) of the electorate. Most respondents (85%) cited population increase as the major driver of increased utilisation pressure on the wetland. One farmer expressed a sense of hopelessness by saying: "*our forefathers left the wetland intact but now there are too many of us that depend on it, so it will continue to be degraded as nobody has a solution*".

2.3.5. Eucalyptus trees in wetlands at Mitooma

Although stands of eucalyptus in wetlands were observed at various sites in Kenya and Uganda, the phenomenon was particularly widespread at Mitooma. In this regard, results from the site are presented to illustrate the social causation and associated ecological processes associated with eucalyptus in wetlands.

The eucalyptus stands can be categorised into trees scattered haphazardly and trees planted in rows (plantations) in wetlands. Trees are planted, managed and integrated into the overall land use plan within well-defined plots managed by households. Eucalyptus seedlings are mostly planted along streambanks but owing to their invasive capacity, they gradually spread to other parts of the wetlands. This has a negative impact on cranes as they prefer nest sites located in open grassed wetlands, not dominated by tall leafy trees. Eucalyptus trees are fast-growing and it is common knowledge among community members that they reduce groundwater levels. Evidence of dominance of eucalyptus trees in wetlands that were noticeably previously covered with sedges was documented at seven fenced plots.

The prevailing land ownership patterns and the gradual introduction of eucalyptus in the wetlands are a legacy of land tenure systems during and after the colonial period. Elderly members of the community spoke of the shift from customary land tenure to the current patterns dominated by privately owned plots, with small patches of communally managed wetland systems remaining. There is limited space for plantations in the uplands as they are mostly used for crop production. All plantation owners interviewed were aware that planting eucalyptus in wetlands is prohibited but noted that they continued with the practice as the government had not taken any action. Two common responses to a question about why they were not planting indigenous trees were that indigenous species took longer to mature and that there were no local markets for them.

Growing eucalyptus was said to be a venture that involves minimal effort and low financial costs. One could easily propagate thousands of seedlings from seeds picked from eucalyptus trees at business centres or the commons. High rainfall and well-drained soils create conditions conducive for optimum growth of eucalyptus and make the plantation maintenance costs nominal. To establish an average plantation with 50 trees, it takes only one day for households to dig holes and plant seedlings. Maintaining the plantation (pruning and removal of unwanted herbaceous plants) is done during the first two seasons and takes only some hours per year. Poles, harvested from the plantations at different growth stages, are sold to the Uganda Electricity Board directly or through intermediaries. Local construction companies also buy the poles for use as scaffolds, reinforcements for walls and materials for wooden structures. Prices of the small poles (<15 cm diameter) range between $ 6 and $10 whereas the large poles (> 20 cm diameter) can fetch up to $20 per pole. Eucalyptus trees are viewed as an investment and to quote the words one plot-holder, "*eucalyptus plantations are an alternative way of making and banking money*".

According to Nature Uganda's Project Assistant who also hails from the area, three nesting sites had been rendered unsuitable for breeding due to the introduction of eucalyptus trees since the mid-1990s. Where eucalyptus has not completely covered the wetlands, cranes breed in open grassed sections. However, the size of these remaining refuges may shrink as eucalyptus self-propagate and spread in wetlands. The Project Assistant attributed cases of successful breeding to minimal human disturbance as nine nest sites are located on fenced plots that are not accessible to the public. These notable successes were being used to promote a culture of crane custodianship among the wetland plot holders.

2.3.6. Vegetable gardens along streambanks and dam edges in the Driefontein Grasslands

The Driefontein landscape is characterised by sparsely populated rolling grasslands interspersed with riverine wetlands. Crane breeding sites, situated in the low-lying areas, are associated with streams and dams constructed during the colonial era[19]. Vegetable gardens (average size: 100 m^2), are located around dams and on river edges, were identified as the key livelihood activity causing crane habitat loss. The zones in which the gardens are located were pegged by the Ministry of Lands and Rural Resettlement during the implementation of the land reform exercise between 2000 and 2002. A regulation that gardens should not be within 30 m of wetlands or streams, a guiding principle during the pegging process, was meant to create wetland buffer zones. There are expansive patches within the wetlands that are unutilised and open for allocation to prospective gardeners.

The situation in Driefontein exemplifies a case of active agricultural encroachment as households establish new gardens in wetlands on annual basis. To secure plots for gardening, households approach the village management committee. By executing their duties, village committee members simply fulfil socio-cultural obligations. Being a committee member improves one's social status but there are no other benefits, financial or otherwise. Though village committee members claim to know boundaries of gardening zones, they are not standardised and subject to personal interpretation. Though it is common knowledge among community members that no cultivation should take place within 30 m of streams or wetlands, seasonal soil moisture changes make the wetland-grassland boundary fuzzy. This explains why some gardens and fields for summer crop production are located in seasonally wet grasslands associated with the riverine wetland system. Environmental and agricultural extension officers, tasked to enforce wetland buffer zones, have limited technical knowledge and practical skills in wetland delineation.

Although in some areas, the water table in the uplands makes it possible for households to dig shallow wells for supplying irrigation water, presumptive advantages of locating gardens in wetlands influence the community's norms and standards for land allocation for gardening. Households can only have one garden in the village's designated gardening zone and only relinquish them when they emigrate from the village. Logs, branches and bark are used for fencing which makes the cost of establishing and maintaining gardens minimal. Households get a four-month supply of fresh vegetables in addition to an average income of some $25 from the sale of vegetables from the 100 m^2 gardens.

BirdLife Zimbabwe, a bird conservation organisation, funded the construction of community gardens in 2004 in two villages to prevent the proliferation of scattered household-owned gardens. Approximately 9 % of the households from the social catchment benefitted. In Shashe village, where one of the gardens is located, no new household gardens have been established since then. In the other village, Daviot, the community garden was constructed after some members had already acquired plots for household gardens. Despite benefitting, these households did not stop cultivating their wetland gardens. Since joining the community gardening projects was voluntary, some

[19] Zimbabwe attained independence in 1980 after 90 years of British colonial rule.

households opted not to join and maintained their stand-alone gardens. Respondents' narratives revealed that villagers perceived community gardening as initiatives that succeed if there is financial aid to facilitate group formation and to provide start-up inputs and technical support. This perception is mainly based on the communities' experience with cooperative projects in the 1980s when the government pursued socialist policies and in the 1990s when several donor-funded cooperatives were formed with support from development and relief non-governmental organisations.

After having been the lead agency in land allocation during the land reform exercise, the Ministry of Lands and Rural Resettlement now has a peripheral role in land use monitoring, as the local village committees are now primarily tasked to allocate land and only forward records to the Lands Office at a later stage. The negative impact of the post-land reform economic downturn on the extension services manifested by low budgets allocated to government departments was cited as one reason why extension officers could not undertake regular land use monitoring during the period 2002–2010. Land is still an emotive issue and respondents indicated that any propositions for well-intended rules and regulations to conserve wetlands might be misconstrued by the political leaders as attempts to reverse the gains of the land reform programme. This was noted as one of the reasons why extension officers often do not act against politically connected households that have fields within wetland buffers.

2.3.7. Overgrazing and trampling of breeding sites in Kenya and Uganda

Crane Project Coordinators (whose details are provided in the introductory section of this chapter) in Kenya and Uganda confirmed incidents of overgrazing and trampling at active and potential breeding sites since the early 2000s. At the time of this research, signs of overgrazing were observed during transect walks at Kaku and Mitooma (in Uganda) and Kimondi-Kingwal (in Kenya). Narratives provided by livestock owners and herders shed light on how overgrazing and trampling take place in fenced plots and community grazing zones. Incidents of droughts and late onset of the rains that had resulted in increased grazing pressure on and trampling of wetlands were reported at Kaku and Kimondi-Kingwal. Cases of persistent overgrazing and trampling resulting in breeding pairs abandoning sites were reported by community members at Kimondi-Kingwal and Mitooma.

Two distinct wetland grazing systems were identified. First, communal grazing areas are managed customarily. Under such systems, there are neither restrictions on the movement of livestock nor monitoring of grazing pressure to ensure carrying capacity is not exceeded. The second system involves household-managed plots containing wetland patches where cranes breed. Owing to the small size of the fenced plots confining livestock to restricted zones and absence of enough land for rotations of pastures at Kimondi-Kingwal and Mitooma, grass is intensively grazed, and potential breeding sites trampled. The situation is made worse by the drainage of water which makes recovery of grass slow, especially during the dry season. Livestock owners that own quasi-private plots are also allowed to graze their livestock in the common grazing zones. Due to the depletion of pastures in the uplands, cattle end up frequently grazing in low-lying wetland zones, where crane breeding sites are located.

In both Kenya and Uganda, livestock owners explained that they did not receive much technical advice on how to manage the grazing zones from national agencies responsible for livestock management. The grazing management systems are therefore mostly influenced by traditional practices whereby communities share grazing areas but there are no platforms for the community to work out modalities on how to prevent overgrazing. Some sheep and goat owners resort to zero-grazing and exclusive grazing in the uplands. The main reason for adopting zero-grazing is to save household labour (reduced time allocation to herding activities). However, since the livestock owners' decisions are made without consulting fellow herders due to the absence of platforms for coordinated collective planning, overgrazing tends to occur at sites under common grazing regimes.

Since joint herding arrangements are not common, household labour is involved in the prevailing grazing systems. Wetland grazing was reported to be very critical in sustaining livestock during dry and wet seasons since land in the uplands is gradually being taken up by human settlements and crop fields. Livestock owners that own plots incur costs in erecting fences around their plots and in maintaining them. Barbed wire and poles for fencing a 100 m x 100 m plot (average plot size at Kimondi-Kingwal) cost $260. At Mitooma, eucalyptus poles, either grown by the family or purchased from neighbours, and live hedges are mainly used. If properly erected, the fencing may only need to be maintained after 3–4 years and this entails replacing the old poles.

2.4. Discussion

This study showed that crane habitat loss is an environmental challenge nested in broader wetland degradation processes driven by a host of underlying institutional and socio-economic drivers exerting influence at community level and beyond. The drivers were identified through the use of a methodological approach that involves analyses of motivations and actions that have decision-making powers on how the wetlands are utilised and managed. Broadly, the drivers of wetland degradation represent a cross-section of challenges that should be addressed to secure crane habitats and save the species from local extinction. It is therefore important to undertake a deeper analysis of the drivers, to identify entry points for and possible bottlenecks to landscape management and habitat conservation planning. A deeper analysis of drivers of wetland degradation is a foundational step in programmatic and policy processes aimed at sustaining ecosystem functions and services provided by wetlands (Narayan and Venot 2009; van Asselen *et al*. 2013; Nguyen *et al*. 2016). This chapter focuses on commonalities and differences among drivers of wetland degradation across study sites, drawing insights for tenable landscape and patch management interventions required to curb maintain suitable crane habitats.

Identification of common drivers of habitat loss is important in the generation of knowledge for the design of conservation programmes in a species' geographical range (Fischer and Lindemayer 2007). Common underlying drivers identified through this study can be clustered into four categories: past land policies, weak landscape governance, local land tenure complexities and emerging markets for products from wetland-based enterprises. Although the drivers are presented and analysed separately in this section, there are notable causal linkages among them. It implies therefore that when addressing the drivers, integrated approaches should be adopted, acknowledging that securing crane sites against human-induced threats should be part of landscape management. Integrated approaches to the management of landscapes to balance socio-economic needs and environmental concerns are increasingly being applied in biodiversity conservation planning (Estrada-Carmona *et al*. 2014; Reed *et al*. 2017; Landis 2017).

2.4.1. Influence of land policies

At all study sites, loss of crane habitats in the study countries was found to be historically rooted in landscape transformation processes which were, to a great extent, precipitated by land policies enacted by governments in the past to enhance land access to boost rural agriculture. Whilst in Uganda the policy was intentionally designed to promote wetland reclamation for agricultural purposes, in Kenya and Zimbabwe the policies inherently created a favourable environment for encroachment into wetlands by farmers. In Uganda and Zimbabwe, the policies were largely driven by populist political agendas of the then national governments. Capitalising on opportunities created by land policies and low priority accorded to environmental considerations for sustainable use of wetlands, households privatised and utilised wetlands in ways that fragmented and degraded crane habitats. In the three countries, not much attention was paid to the long-term negative effects of agriculture on wetland integrity and functions. These site-based experiences reflect prompts, enablers and trends in landscape transformation. They exemplify rural communities' historical interactions with land policies, triggering land management decisions and actions that negative implications on the ecological integrity of ecosystems. These findings represent the post-colonial narratives of land degradation in Africa which should be analysed to define ways to navigate sensitive issues pertaining land access, resource governance and equity in conservation planning (Fairhead and Leach 1995; Jones 1999; Carswell 2003).

Apart from the ecological manifestations, past policies have social, economic and political dimensions that add complexity to wetland conservation planning processes (Chapman *et al*. 2001; An *et al*. 2007). In this study, linkages among the dimensions were reflected in narratives captured through an actor-based approach to environmental problem analysis. A common thread in these narratives is the way in which communities adopted wetland-based livelihoods, despite the inherent risk of degrading wetlands, with local and national governments ratifying the land uses. The challenges of dealing with legacies of these past land policies become evident when the need to develop policy and programmatic interventions to address wetland degradation arises. Regarding the three study countries, such interventions would entail transforming already entrenched livelihoods contributing to local economies, getting diverse wetland users to accept pro-conservation wetland management systems, while acknowledging political agendas of local and national authorities. Balancing such issues without creating resentment among stakeholders calls for deliberations to build common agendas with stakeholders that have social, economic and political interests in land management (Mahanty and Russell 2002; Brechin *et al*. 2002; Sayer *et al*. 2013).

Experiences from Kenya and Uganda show that the legacies of land policies persist for decades and thereby pose challenges if new policies, responsive to emerging environmental issues, are to be enacted and implemented effectively. If a clear roadmap and imperatives for transitions from old to

new environmental policies are not defined, the desired impacts of the new policy may not be realised (Kemp *et al*. 2007; He *et al*. 2012). In Uganda, the enactment of a wetland-specific environmental policy did not effectively address some of the drivers of wetland degradation. The wetland policy was enacted and widely publicised but practical steps to effectively deal with agricultural encroachment were not clearly defined. It is therefore critical to reflect on ways to ensure that new policies chart a new dispensation while addressing legacies of past policies. As of 2013, sustainable wetland management was increasingly taking centre stage in Kenya and Zimbabwe. The Kenyan government initiated pioneering stakeholder consultations as a precursor to the formulation of a national wetlands policy. Zimbabwe ratified the Ramsar Convention on Wetlands, a sign of commitment to prioritise wetland management issues. While these were steps in the desired direction from a wetland conservation perspective, there was a likelihood that challenges emanating from past policies could impede policy or programmatic interventions in the two countries.

A lesson to draw from this is that formulating new policies and reviewing existing ones presents opportunities to articulate visions and pathways to sustainable wetland management but should not be viewed as an end in itself. To address past policy legacy issues, a transition management strategy is required. In the case of the three countries, the strategy would entail defining a host of interventions required to make policies socially acceptable, hence, implementable. These comprise articulating the building blocks for the successful transition, including necessary technical support, incentives for switching to desirable practices, creating experimentation and learning opportunities and building social and institutional structures supportive of the new policy regime (Loorbach 2010; Frantzeskaki *et al*. 2012). These interventions provide opportunities to respond to site-level challenges to policy implementation to avoid situations whereby environmental policies remain blueprints that cannot be operationalised on the ground.

2.4.2. Weak wetland landscape governance systems

Weak landscape governance systems, characterised by lax enforcement of environmental policies and ineffective local institutions governing wetland resources, were documented across the sites. Weak landscape governance creates leeway for the adoption of practices that degrade natural resources, leading to biodiversity loss (Paloniemi and Tikki 2008). Assessing natural resource governance systems at community, local administrative authority and national levels help define horizontal relationships and trust (bonding social capital) and vertical hierarchical relationships (linking social capital) that should exist for effective protection of landscapes and associated resources (Pretty and Smith 2003; Bodin *et al*. 2006).

To develop solutions to the challenge of weak governance, it is worthwhile to take a closer look at factors that contribute to lax enforcement of policies by state-based environmental agencies. Through this study, common systemic issues that contribute to inhibiting enforcement of policies and regulations were documented. They include limited resources (financial, human and material) allocated to environmental agencies, low priority accorded to the protection of wildlife habitats outside formally protected areas, implicit assumptions that wetland conservation policies and regulations provide effective protection of habitats for wetland-dependent species, arbitrariness in the delineation of wetland buffers. These challenges represent disconnections between environmental policy and landscape management practice that confront crane conservationists. Acknowledging that limited capacity on the part of government agencies is a major bottleneck policy implementation, suggestions have been made to strengthen bottom-up approaches that empower primary users of natural resources to seek and implement solutions to environmental problems, aligned with the framework of national policy provisions (Hartter and Ryan 2010; Koontz and Newig 2014).

It is also important to gain insight into the dynamics associated with ineffective local institutions, focusing on factors that stifle the emergence of collective and binding arrangements for sustainable resource use. Customary institutions (rules, regulations and norms) enforced by traditional leaders and known to regulate the management of common pool resources in most African rural landscapes did not have a notable influence on the management of wetlands at all study sites. In the absence of customary management regimes, the next issue to explore would be the prospects, conditions and motivations for community self-organisation to create platforms for collective problem analysis and solution-seeking to address wetland degradation and loss of shared wetland ecosystem services. Across the sites, pre-conditions for self-organisation such as respected leadership, existing local community groupings and potential common benefits from sustainable resource use (Varughese and Ostrom 2001; Pagdee *et al*. 2005) generally existed. However, in Kenya and Uganda, it appears the points raised earlier (tenure insecurity and privatisation of commons) discourage community self-organisation. It was encouraging to note organisations promoting crane conservation were working towards building local institutions to spearhead habitat conservation actions around the sites. These institutions could be supported and nurtured so that they can grow into networks of local organisations tackling crane habitat loss across the species' range.

2.4.3. Local land tenure complexities

Overall, experiences across the study sites tell stories of disappearing wetland commons, a socio-ecological process characterised by gradual privatisation of wetland patches, evolution of land boundaries (clear and fuzzy) and emergence of household-based exclusive land use rights. These were land tenure changes that transformed wetland characteristics, with households gradually attaching new socio-economic values to patches they owned and utilised. Mapping the processes behind the tenure change, in spatial and temporal terms, and determining the ultimate environmental and socio-economic impacts of the processes is a critical consideration in land use and conservation planning (Karanth 1992; Altrichter and Basurto 2008).

Across the six sites, land tenure influenced how wetlands were managed. Diverse facets of land tenure (ownership, access and utilisation regimes) influence landowner and user' motivations for and commitment to conserving resources found on the land (Soule *et al*. 2000; Scherr and McNeely 2007). Land tenure patterns were not straightforward and formalised. Whereas in Zimbabwe and, to some extent, in Uganda, land tenure was noted to be relatively well-defined, tenure ambiguities that drive wetland encroachment and drainage were observed in Kenya. If land tenure is clearly defined, actors and actions behind land degradation are relatively easy to identify. Also, if tenure is clear, households involved in processes such as land subdivision, leasing, ownership rights transfer, withdrawal of use rights, and bequeathing are discernible. However, when land tenure is fuzzy, the issue of *de-facto* ownership and utilisation rights crops up. This paves way for land grabs which may lead to inequitable ownership patterns, with community members that fail to access land being forced to exploit marginal areas thereby causing land degradation, as was the case at Saiwa. There is a high likelihood of landscape degradation and fragmentation if boundaries of household-owned patches are fuzzy and when locally-enforced rules and regulations governing the commons do not exist (Wanassai and Shrestha 2008; Teshome *et al*. 2014).

Experiences from Kenya and Uganda prove that land tenure complexities go beyond fuzzy boundaries to include ownership-utilisation dynamics. Cases where plot users (cultivators) changed seasonally due to varying leasing arrangements were documented at Saiwa. Although households had full ownership rights, they ceded utilisation rights periodically for financial gain. Lease agreements were verbal and did not involve conditionalities for ensuring good land husbandry. Given that households had the liberty to lease plots at Kimondi-Kingwal, Mitooma and Saiwa, the possibility of wetlands being degraded by lessees should not be ruled out. Another pertinent facet of this tenure system is the exclusion of local institutional structures (third parties) in the leasing and ownership transfer transactions. Since the plot holder's motivation is to earn extra income and the lessee seeks to maximise yields, the system paves way for the incentivisation of the conversion of the remaining patches of wetland used by cranes. Quasi-private ownership tenure systems prevailing at Mitooma and Kimondi-Kingwal, where plots are fenced to delineate boundaries and assert ownership, add a different dimension to the issue of wetland utilisation rights. Observations at these two sites showed that the plot holders could (mis)manage their land without taking into consideration the welfare of other wetland users downstream with virtually no influence from state environmental agencies. Understanding land ownership-access-utilisation dynamics is critical for conservationists if they are to engage the right actors and promote interventions for incentivising and securing commitment to sustainable land management (Soule 2000 *et al*. 2000; Cocklin *et al*. 2007).

2.4.4. Emerging markets for products from wetland-based enterprises

In Kenya and Uganda, socio-economic developments at local community and national levels contributed to the emergence of markets for agricultural products generated through wetland-based enterprises. This was the case for milk production at Kimondi-Kingwal, potato production at Nyamuriro and eucalyptus plantations at Mitooma. As the evidence gathered at these sites showed, emergence of lucrative markets may lead to intensification of crop, livestock and tree production as communities strive to maximise monetary benefits from wetland-based enterprises. In making decisions at household and community levels, negative environmental impacts of the intensive utilisation of wetlands are often superseded by the communities' socio-economic goals. Although the influence of markets was not documented in Zimbabwe, the site is not immune to utilisation pressure emanating from market-driven livelihoods that could emerge in the future.

Trends in the influence of markets on wetland utilisation have been documented in East Africa. A study by Low (1997) describes how potato production in valley bottom wetlands evolved in southwestern Uganda, culminating in the crop becoming the main cash generator for most households in the district by the 1980s. The district of Kabale, where Nyamuriro is located now produces 50–60 % of potatoes consumed in Uganda (Bonabanna-Wabi *et al*. 2013). The influence of market pressures on land degradation and biodiversity loss continues to grow globally. The interplay between markets and land shortage is evident in the case of eucalyptus plantations in East Africa.

Increasing demand for electricity due to population growth and industrialization has pushed governments in East Africa to prioritise power generation and distribution to business centres in rural areas (Kaijuka 2007; Cook 2011). Wooden poles, made from eucalyptus, are used as part of the distribution infrastructure. The growth of small business centres has also necessitated construction of buildings, creating a demand for wood. This is one of the reasons for the escalating demand for eucalyptus. Since land is no longer readily available, communities resort to planting the trees in wetland patches that they consider too waterlogged to be used for crop or livestock production. These findings also expose weaknesses of current sectoral policies and, by extension, clashes in mandates of government agencies. The current situation is not addressing the issue of incompatible and competing land uses (i.e., agriculture in wetlands vs eucalyptus plantations vs wetland biodiversity conservation). If harmonisation of these sectoral policies is not achieved, efforts to protect wetlands against encroachment and unsustainable utilisation may not succeed.

2.5. Conclusions and recommendations for conservation planning

Through this study, narratives of crane habitat loss in a wide range of social and ecological contexts were documented. The focus was on six sites that support globally significant populations of the Grey Crowned Crane. Activities impacting negatively on crane habitats fall into five broad categories: ditching to drain water from agricultural fields, wetland edge cultivation, the introduction of alien invasive trees, overgrazing and trampling by livestock, overharvesting of wetland plants and persistent human presence in wetlands. To generate insights for crane habitat conservation planning, underlying drivers of wetland degradation, which is contributing to crane habitat loss, were identified. Common underlying drivers were clustered into five categories: past land and environmental policies, weak landscape governance, local land tenure complexities and emerging markets for products from wetland-based enterprises.

The use of the actor-based approach to analyse the factors and underlying drivers of crane habitat loss generated information that could be used for conservation planning. In the discussion section, subtle reference was made to some of the possible entry points, key considerations and recommendations for the design of conservation interventions required to address the underlying drivers of wetland degradation. The interventions should address both the proximate factors causing crane habitat loss and the underlying drivers. Conservation planning processes would therefore entail defining not just the practical actions implementable at site-level by primary actors (households and community groups) to reduce threats to crane habitats but include aligning the habitat conservation agenda with plans and priorities of local administrative authorities and national environmental agencies.

Analyses of drivers of crane habitat loss revealed various contextual bottlenecks that could hinder the implementation of conservation actions. Key intervention areas identified include formulation of guidelines on ways to deal with legacies of past policies, empowering communities to define defensible wetlands to secure them against encroachment and unsustainable utilisation, strengthening wetland landscape governance systems and providing incentives for balancing wetland conservation and utilisation. One of the findings relevant to conservation planning are windows of opportunity for securing the crane habitats. These include actions to ensure that the unconverted wetlands managed as commons and wetland patches in agricultural plots used by cranes for breeding are intentionally secured for the benefit of the species. One way to achieve that is to promote crane custodianship ethics among households that own and manage the agricultural plots and the community groups that derive benefits from the wetland commons. This could mean providing incentives to promote the adoption of pro-conservation practices and the development of local conservation groups, building on already existing community groups and leadership structures. In the following chapters, the feasibility and effectiveness of these broad recommendations are explored through site-based case studies in the three study countries.

References

Altrichter, M., and Basurto, X. (2008). Effects of land privatisation on the use of common-pool resources of varying mobility in the Argentine Chaco. Conservation and Society 6(2): 154–165.

An, S., Li, H., Guan, B., Zhou, C., Wang, Z., Deng, Z., Zhi, Y., Liu, Y., Xu, C., Fang, S., Jiang, J., and Li, H. (2007). China's natural wetlands: Past problems, current status, and future challenges. Ambio 36(4): 335–342.

Beilfuss, R. D., Dodman, T., and Urban, E. K. (2007). The status of cranes in Africa in 2005. Ostrich 78 (2): 175–184.

Beilfuss, R. D, Tarborton, W. R., and Gichuki, N. N. (eds.) (1996). Proceedings of the 1993 crane and wetland training workshop. International Crane Foundation, Baraboo.

Beth, A., Holsten, B., and van Diggelen, R. (2006). Biodiversity management of fens and fen meadows by grazing, cutting and burning. Applied Vegetation Science 9: 307–316.

Bodin, Ö., Crona, B., and Ernstson, H. (2006). Social networks in natural resource management: What is there to learn from a structural perspective? Ecology and Society 11(2): http://www.ecologyandsociety.org/vol11/iss2/resp2/.

Bonabana-Wabbi, J., Ayo1, S., Mugonola, B., Taylor, D. B, Kirinya, J., and Tenywa, M. (2013). The performance of potato markets in southwestern Uganda. Journal of Development and Agricultural Economics 5(6): 225–235.

Brechin, S. R., Wilshusen, P. R., Fortwangler, C. L., and West, P. C. (2002). Beyond the square wheel: Toward a more comprehensive understanding of biodiversity conservation as social and political process. Society and Natural Resources 15(1): 41–64.

Brooks, J., Waylen, K. A., and Borgerhoff Mulder, M. (2013). Assessing community-based conservation projects: A systematic review and multilevel analysis of attitudinal, behavioral, ecological, and economic outcomes. Environmental Evidence 2(2). http://www.environmentalevidencejournal.org/content/2/1/2

Carswell, G. (2002). Farmers and fallowing: agricultural change in Kigezi District, Uganda. The Geographical Journal. 168(2): 130–140.

Carswell, G. (2003). Continuities in environmental narratives: The case of Kabale, Uganda, 1930–2000. Environment and History 9: 3–29.

Castillo, A., Vega-Rivera, J. H. Perez-Escobedo, M. Romo-Dıaz, G. Lopez-Carapia, G., and Ayala-Orozco, B. (2018). Linking social–ecological knowledge with rural communities in Mexico: lessons and challenges toward sustainability. Ecosphere 9(10). https://esajournals.onlinelibrary.wiley.com/doi/pdf/10.1002/ecs2.2470.

Chapman, L. J., Balirwa, J., Bugenyi, F. W. B., Chapman, C., and Crisman, T. L. (2001). Wetlands of East Africa: Biodiversity, exploitation and policy perspectives. In Gopal B, Junk, W. J., and Davis, J. A. (eds.), Biodiversity in wetlands: assessment, function and conservation. Backhuys, Leiden.

Chirara, C. (2011). The status of the Wattled Crane in the Driefontein Grasslands of Zimbabwe. Honeyguide 57(1): 10–14.

Cocklin, C., Mautner, N., and Dibden, J. (2007). Public policy, private landholders: Perspectives on policy mechanisms for sustainable land management. Journal of Environmental Management 85: 986–998.

Cook, P. (2011). Infrastructure, rural electrification and development. Energy for Sustainable Development 15(3): 304–313.

De Groot, W.T. (1992). Environmental Science Theory: Concepts and methods in a one-world, problem oriented paradigm. Elsevier Science Publishers, Amsterdam.

Department of Meteorological Services (1984). Mean annual rainfall: https://esdac.jrc.ec.europa.eu/images/Eudasm/Africa/images/maps/download/afr_zw2001_cl.jpg

Dorresteijn, I., Loos, J., Hanspach, J., and Fischer, J. (2015). Socioecological drivers facilitating biodiversity conservation in traditional farming landscapes. Ecosystem Health and Sustainability 1(8):28. http://dx.doi.org/10.1890/EHS15-0021.1.

Estrada-Carmona, N., Hart, A. K., DeClercke, F. A. J., Harvey, C. A., and Milder, J. C. (2014). Integrated landscape management for agriculture, rural livelihoods, and ecosystem conservation: An assessment of experience from Latin America and the Caribbean. Landscape and Urban Planning 129: 1–11.

Fabricius, C., Folke, C., Cundhill, G., and Schultz, L. (2007). Powerless spectators, coping actors, and adaptive co-managers: A synthesis of the role of communities in ecosystem management. Ecology and Society 21(1). 29. http://www.ecologyandsociety.org/vol12/iss1/art29/.

Fairhead, J., and Leach, M. (1995). False forest history, complicit social analysis: Rethinking some West African environmental narratives. World Development 23(6): 1023–1035.

Fakarayi, T., Mashapa, C., Gandiwa, E. and Kativu, S. (2015). Pattern of land-use and land cover changes in Driefontein Grassland Important Bird Area, Zimbabwe. Tropical Conservation Science 8 (1): 274-283.

Fennessy, S., Jacobs, A. D., and Kentula, M. W. (2007). An evaluation of rapid methods for assessing the ecological conditions of wetlands. Wetlands 27(3): 543–560.

Fischer, J., and Lindenmayer, D. B. (2007). Landscape modification and habitat fragmentation: a synthesis. Global Ecology and Biogeography 16: 265–280.

Frantzeskaki, N., Loorbach, D., and Meadowcroft, J. (2012). Governing societal transitions to sustainability. International Journal of Sustainable Development 15(1–2). 19–35.

Geist, H. J., and Lambin, E. F. (2002). Proximate causes and underlying driving factors of tropical deforestation. BioScience 52(2): 143–150.

Gichuki, N. N. (1993). Factors affecting the reproductive success of the Grey Crowned Crane. Ph.D. Dissertation. University of Cambridge, Cambridge.

Government of Kenya. (1999). Environmental Management and Coordination Act. National Council for Law of Kenya, Nairobi.

Government of Uganda. (1995). National Policy for the Conservation and Management of Wetland Resources. Ministry of Natural Resources, Kampala.

Government of Zimbabwe. (2002). Environmental Management Act. National Enviornmental Management Agency, Harare.

Harris J. (1994). Cranes, people and nature: preserving the balance. In Higuchi H, Minton J. (eds). The future of cranes and wetlands. Wild Bird Society of Japan, Tokyo.

Harris, J., and Mirande, C. (2013). A global overview of cranes: status, threats and conservation priorities. Chinese Birds 2013 4(3): 189–209.

Hartter, J., and Ryan, S. D. (2010). Top-down or bottom-up? Decentralisation, natural resource management, and usufruct rights in the forests and wetlands of western Uganda. Land Use Policy 27: 815–826.

He, G., Lu, Y., Mol, A. P. J., and Beckers, T. (2015). Changes and challenges: China's environmental management in transition. Environmental Development 3: 25–38.

Infonet-Biovision (2108). Mean annual rainfall in mm: https://infonet-biovision.org/res/res/files/3147.800x700.jpeg

Jones, S. (1999). From meta-narratives to flexible frameworks: An actor-based analysis of land degradation in highland Tanzania. In Jones, S., and Carswell, G. (eds.) (2004). Environment, development and rural livelihoods. Earthscan, London.

Kaijuka, E. (2007). GIS and rural electrification in Uganda. Journal of Cleaner Production 15(2): 203–217.

Karanth, G. K. (1992). Privatisation of common property resources: Lessons from rural Karnatak. Economic and Political Weekly August 1-8: 1680–1688.

Kemp, R., Loorbach, D., and Rotmans, J. (2007). Transition management as a model for managing processes of co-evolution towards sustainable development. International Journal of Sustainable Development and World Ecology 14: 1–15.

Koontz, T. M., and Newig, J. (2014). From planning to implementation: Top-down and bottom-up approaches for collaborative watershed management. The Policy Studies Journal 42(3): 416–442.

Landis, D. A. (2017). Designing agricultural landscapes for biodiversity-based ecosystem services. Basic and Applied Ecology 18: 1–12.

Liu, J. (2001). Integrating ecology with human demography, behavior, and socioeconomics: Needs and approaches. Ecological Modelling 140(1–2): 1–8.

Loorbach, D. (2010). Transition management for sustainable development: A prescriptive, complexity-based governance framework. Governance 23(1): 161–183.

Low, J. W. (1997). Potato in southwest Uganda: Threats to sustainable production. African Crop Science Journal 5(4): 395–412.

Machlis, G. E. (1992). The contribution of sociology to biodiversity research and management. Biological Conservation 62(3): 161–170.

Mahanty. S., and Russell, D. (2002). High Stakes: Lessons from stakeholder groups in the Biodiversity Conservation Network. Society and Natural Resource 15: 179–188.

McKinney, L. A., Fulkerson, G. A., and Lick, E. L. (2009). Investigating the correlates of biodiversity Loss: A cross-national quantitative analysis of threatened bird species. Human Ecology Review 16(1): 103–113.

Meine, C. D., and Archibald, G. W. (eds.) (1996). The cranes: status survey and conservation action plan. IUCN, Zurich.

Morrison, K. (compiler) (2015). International Single Species Action Plan for the Conservation of the Grey Crowned Crane *Balearica regulorum*, AEWA Technical Series. African-Eurasian Migratory Waterbird Agreement, Bonn.

Narayanan, N. C., and Venot, J-P. (2009). Drivers of change in fragile environments: Challenges to governance in Indian wetlands. Natural Resources Forum 33: 320–333.

Nsubuga, F. N. W., Namutebi, E. N. and Nsubuga-Ssenfuma, M. (2014). Water resources of Uganda: An assessment and review. Journal of Water Resource and Protection 6: 1297–1315.

Nguyen, H. H., Dargusch, P., Moss, P., and Tran, D. B. (2016). A review of the drivers of 200 years of wetland degradation in the Mekong Delta of Vietnam. Regional Environmental Change 16: 2303–2315.

Norton, D. A., Reid, N., and Young, L. (2013). Ultimate drivers of native biodiversity change in agricultural systems. F1000Research 2: 214, doi: 10.12688/f1000research.2-214.v1.

Odada, E. O., Olago, D. O., Kulindwa, K., Ntiba, M., and Wandiga, S. (2004). Mitigation of environmental problems in Lake Victoria, East Africa: Causal chain and policy options analyses. Ambio 33(1–2): 13–23.

Pagdee, A., Kim, Y., and Daugherty, P. J. (2005). What makes community forest management successful: A meta-study from community forests throughout the world. Society and Natural Resources 19: 33–52.

Paloniemi, R., and Tikka, P. M. (2008). Ecological and social aspects of biodiversity conservation on private lands. Environmental Science and Policy 11(4): 336–346.

Pomeroy, D. E. (1987). The ecology and status of the Grey Crowned Crane in East Africa. In Archibald, G. W. and Pasquier, R. F. (eds.), Proceedings of the 1983 Crane Workshop. International Crane Foundation, Baraboo.

Pretty, J., and Smith, D. (2003). Social capital in biodiversity conservation and management. Conservation Biology 18(3): 631–638.

Pullin, A. S., and Knight T. M. (2003). Support for decision making in conservation practice: An evidence-based approach. Journal of Nature Conservation 11(2): 83–90.

Pullin, A. S., and Knight, T. M. (2009). Doing better than harm: Building an evidence-base for conservation and environmental management. Biological Conservation 142(5): 931–934.

Redman, C. L., Grove, J. M., and Kuby, L. H. (2004). Integrating social science into the Long-Term Ecological Research (LTER) Network: Social dimensions of ecological change and ecological dimensions of social change. Ecosystems 7: 161–171.

Reed, J., van Vianen, J., Barlow, J., and Sunderland, T. (2017). Have integrated landscape approaches reconciled societal and environmental issues in the tropics? Land Use Policy 63: 481–492.

Richardson, B. J. (1993). Environmental management in Uganda: The importance of property law and local government in wetlands conservation. Journal of African Law 37(2): 109–143.

Rudel, T., and Roper, J. (1997). The paths to rain forest destruction: Cross-national patterns of tropical deforestation, 1975–1990. World Development 25(1): 53–65.

Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J-L, Sheil, D., Meijaard, E., Venter, M., Boedhihartono, A. K., Day, M., Garcia, C., and van Oosten, C. (2013). Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing uses. PNAS 110(21): 8349–8356.

Scherr, S. J. and McNeely, J. A. (2007). Biodiversity conservation and agricultural sustainability: towards a new paradigm of 'ecoagriculture' landscapes. Philosophical Transactions of the Royal Society 363: 477–494.

St. John, F. A. V., Edward-Jones, G., and Jones, J. P. G. (2010). Conservation and human behaviour: Lessons from social psychology. Wildlife Research 37: 658–667.

Stromberg, J. C., Richter, B. (1996). Effects of Groundwater Decline on Riparian Vegetation of Semiarid Regions. Ecological Applications 6(1):113–131.

Sutherland, W.J., Pullin, A. S., Dolman, P.M., and Knight, T. M. (2004). The need for evidence-based conservation. Trends in Ecology and Evolution 19(6): 305–308.

Teshome, A., de Graaff, J., Ritsema, C., Kassie, M. (2014). Farmers' perceptions about the influence of land quality, land fragmentation and tenure systems on sustainable land management in the northwestern Ethiopian Highlands. Land Degradation and Development 27(4): DOI: 10.1002/ldr.2298.

Turyahabwe, N., Kakuru, W., Tweheyo, M., and Tumusiime, D. M. (2015). Contribution of wetland resources to household food security in Uganda. Agriculture and Food Security 2:5. http://www.agricultureandfoodsecurity.com/content/2/1/5.

United Nations. (2015). Map No.4095. Revision 5. United Nations Department of Peacekeeping Operations, New York.

Van Asselen, S., Verburg, P. H., Vermaat, J. E., and Janse, J. H. (2013). Drivers of wetland conversion: A global meta-analysis. PlosOne 8(11): e81292. https://doi.org/10.1371/journal.pone.0081292.

Varughese, G., and Ostrom, E. (2001). The contested role of heterogeneity in collective action: Some evidence from community forestry in Nepal. World Development 29(5): 747–767.

Vayda, A. (1983). Progressive contextualisation: Methods for research in ecology. Human Ecology 11: 265–281.

Vayda, A., and B. Walters. (1999). Against political ecology. Human Ecology 27(1): 167–179.

Walters, B., and Vayda, A. P. (2009). Event ecology, causal historical analysis, and human–environment research. Annals of the Association of American Geographers 99(3): 534–553.

Wannasai, N., and Shrestha, R. P. (2008). Role of land tenure security and farm household characteristics on land use change in the Prasae Watershed, Thailand. Land Use Policy 25: 214–224.

Yu, S., Ehrenfeld, J. G. (2010). Relationships among plants, soils and microbial communities along a hydrological gradient in the New Jersey Pinelands, USA. Annals of Botany 105: 185–196.

Zedler, J. B, and Kercher, S. (2004). Causes and consequences of invasive plants in wetlands: Opportunities, opportunists, and outcomes. Critical Reviews in Plant Sciences 23(5): 431–452.

3

Focus group discussion on human-crane interactions at Chipisa Village, Driefontein Grasslands

Cranes, communities and conservation: Exploring the linkages in the Driefontein Grasslands, Zimbabwe

Abstract

This chapter outlines major human actions that impact Wattled Cranes and their habitats, elaborating the underlying social causations behind the actions. Tenable conservation actions to ensure human-crane coexistence are presented. The actions are rooted in already existing community practices and tenable interventions given the social and biophysical context, acknowledging the role of local communities in addressing the threats to the species and its habitats, are presented.

3.1. Introduction

3.1.1. The Wattled Crane, a species in need of conservation

The most recent review of the status of African cranes by Beilfuss *et al*. (2007) revealed that the Wattled Crane *Bugeranus carunculatus* has declined across much of its range since the 1970s. Classified as Vulnerable on the IUCN Red List, the Wattled Crane is the most wetland-dependent of Africa's crane species (Meine and Archibald 1996). The species' global population ranges between 6,000 and 6,300 individuals, with Zambia supporting the largest population, estimated to be around 4,500 individuals (BirdLife International 2017). Although large populations thrive in major floodplains in Botswana and Zambia, there are small populations that depend on isolated wetlands in human-dominated landscapes in Angola, Mozambique, South Africa, Tanzania and Zimbabwe (Beilfuss *et al*. 2007; BirdLife International 2017).

In Zimbabwe, as in most other countries, data on the species' historical distribution is scant. However, aerial surveys conducted in the early 1980s confirmed the occurrence of flocks and breeding pairs at sites scattered in the country's central watershed (Mundy *et al*. 1984). The total population of Wattled Cranes in the early 1980s was estimated to be around 250 individuals (Irwin 1981) but by the mid-2000s, the number had declined to less than 200 individuals (Beilfuss *et al*. 2007). The species' range has also dwindled, and the largest population is now found in the Driefontein Grasslands, an area inhabited by rural communities resettled in 2002 under the land reform programme (Chirara 2011). Results of ground surveys conducted between 2000 and 2010 by BirdLife Zimbabwe, a bird conservation organisation, showed that the species' population in the Driefontein Grasslands has been declining (Chirara 2011). Results of the surveys are presented in Table 3.1.

Table 3.1. Results of Wattled Crane surveys conducted between 2000 and 2010 (Source: Chirara 2011)

Date of survey	Total number of cranes counted	Number of breeding pairs	Number of chicks	Number of juveniles
October 2000	123	16	3	7
August 2002	37			
April 2002	100			
August –September 2003	55	11		
September –October 2004	138	38		12
November 2005	87	30		9
September 2006	67			
November 2006	72	17		4
June 2007	70	16		4
September 2007	44	13	2	3
July 2008	27	9	2	1
November 2008	46	13		5
April 2009	34	11		5
November 2009	35	10		3
June 2010	37	10		1

The general perception among local birdwatchers, who have been instrumental in collecting crane sightings data since the colonial era, is that the species thrived in relatively undisturbed habitats for decades on commercial cattle ranches in the Driefontein Grasslands before 2000 (Chirara *pers. comm*. 2011; Rockingham-Gill[20] *pers. comm*.). This school of thought portrays human-induced threats emanating from the land reform programme, implemented by the government to redistribute to indigenous communities, as a process that will gradually push the species towards local extinction. In the *Roberts birds of Southern Africa,* Hockey *et al*. (2005) state that the land reform programme made the Zimbabwean Wattled Crane population the most threatened. Concern over the future of the species prompted BirdLife Zimbabwe to initiate a conservation programme in 2002 to sensitise

[20] David Rockingham-Gill is an avid birdwatcher and long-standing member of BirdLife Zimbabwe (formerly Rhodesian Ornithological Society). A former commercial farmer, he developed interest in birds in the 1950s. He has been coordinating waterbird counts across Zimbabwe since the 1980s. Cranes are some of the waterbirds that are counted by birdwatchers every year.

resettled farmers on the need to protect the species and its habitats. Key programme activities implemented included environmental education and conservation awareness targeting schools and the broader community, formation of community groups to assist in spreading crane conservation messages, and the establishment of consolidated community gardens in two villages to discourage the proliferation of scattered household-owned gardens in wetlands containing the species' breeding sites. The organisation also conducts annual crane surveys to determine breeding success and recruitment of chicks into flocks.

A review of BirdLife Zimbabwe's internal project documents (action plans, funding proposals, project reports) revealed that the initial design of its crane and wetland conservation programme was guided largely by expert opinions and theoretical assumptions on patterns and drivers of human-crane interactions. Given that there was no empirical study to gain insight into the social factors that influenced the survival of cranes and the integrity of wetlands before the design of the project, there was the need for the collection and analysis of data to generate contextual evidence upon which crane conservation action could be grounded. In this chapter, this specific objective is tackled in combination with a more general aim, the elucidation of a research approach that provides a strong connection between field realities and conservation action.

3.1.2. What to do - predetermined theories or context-specific learning?

Species and habitat conservation planning can be approached from two lines of reasoning. The first builds on conservation traditions that tend to be strongly paradigmatic or *theory-based*. Thus, we find fortress *vs* community-based conservation, ethics *vs* economics-based conservation (e.g., Payment for Ecosystem Services), socially pessimistic visions (e.g., Hardin 1968) *vs* socially optimistic visions (e.g. Ostrom 1990), etc., and the idea of political ecology that assumes that in the end, all root causes of species decline, and habitat loss are political. The advantage of theory-driven conservation work is that the researcher knows what to look for in problem analysis and the manager knows what to implement to address the problem. For instance, if the problem is people encroaching into habitats and harvesting resources in an unsustainable manner, then the answer is a "fortress". Or if the problem is a lack of economic incentives, the answer is payments. If the local people are unable to implement their good intentions, the answer is community empowerment.

Theory-driven environmental conservation approaches have weaknesses as exemplified by Vayda and Walters (1999) and Walters and Vayda (2009). They may blind the conservation researcher to what really is at stake and thereby mislead the conservation manager or project implementer. In response to this inherent pitfall, there is room to try out *evidence-based* approaches, which are more inductive and allow the researcher to take an open-minded look at local contexts and respond to them in a manner that is more detailed in space and more flexible over time. This resonates with calls for evidence-based conservation (Sutherland *et al*. 2015), whereby context-specific data is used to inform the design, implementation and evaluation of conservation initiatives, paving way for adaptive management. 'Adaptive management' is a term used to express that flexibility that allows continuous monitoring of field realities to resolve the multi-faceted and ever-changing environment-society dilemmas (Armitage *et al*. 2008).

This chapter presents an evidence-based approach, rooted in social causation analysis, focusing largely on the actors' experiences and perspectives, herein referred to as the *actor-based* approach. Actor-based approaches may result in more flexible and efficient conservation management, resilient in the face of uncertainty (Jepson *et al*. 2011; Pahl-Wostl *et al*. 2007). The flipside is that lacking strong theory guidance, it becomes unclear what data to gather data in the field. Should one be purely led by intuition, which may be just as blinding as theories? Vayda and Walters (1999) advocate for analytical techniques that give less precedence to *a priori* judgements, assumptions and theories. To make up for the lack of substantive theory (including prejudice), actor-based approaches require robust methodological frameworks to guide the data gathering and analysis. In the present chapter, one such framework is adopted, without claiming that this framework is in any way superior.

3.1.3. Need for an actor-based approach to developing solutions to challenges affecting cranes

There is a need for species- and habitat-oriented conservation actions informed by a comprehensive understanding of the human-crane interface in the Driefontein Grasslands. There is a dearth of knowledge on how Wattled Cranes populations fare under human-induced threats in rural landscapes, where social factors vary widely. As noted by Hulme and Murphree (1999) and Adams and Hutton (2007), a lack of attention to an array of social factors, community needs and aspirations that shape people's interactions with species and their habitats, makes conservation actions ineffective. This chapter seeks to provide empirical evidence supporting the need to direct efforts at the human dimensions in conservation planning in support of propositions by Manfredo and Dayer (2004) and Treves *et al*. (2006). To this end, and expanding on the basic research question in Chapter

1, the analyses of causal explanations of the human-crane interface in the Driefontein Grasslands were guided by the following research questions:

- What is the nature and periodicity of interactions between Wattled Cranes and people that have negative impacts on the species?
- What are the social causalities underlying the human-crane interactions?
- What are the implications of the findings for human-crane co-existence?

This next section of this chapter covers the biophysical, social-economic and institutional context in the Driefontein Grasslands. The methodological framework is then presented, followed by results of the actor-based analysis of direct and indirect human-crane interactions. Implications of key findings for crane conservation, focusing on opportunities identified to tackle cases of mortalities, low productivity and habitat loss through community involvement are elaborated. As part of the conclusion, insights for species conservation in human-dominated landscapes are presented.

3.2. Methods

3.2.1. Biophysical, social-economic and institutional context

A summary of contextual factors (biophysical characteristics, land use patterns, numbers of cranes environmental history, human settlement and demographic trends, current socio-economic practices) at the study sites summarised below. Some of this background information was obtained from unpublished crane survey results and conservation project reports compiled by BirdLife Zimbabwe. Data on environmental history, cultural history, livelihoods, land ownership, settlement patterns and community development patterns were also collected through interviews with community members and government officers responsible for land management, agriculture and environmental conservation. During field data collection, biophysical characteristics of landscapes around wetlands were observed and documented by the author.

The Driefontein Grasslands are located in central Zimbabwe, straddling the Masvingo, Mashonaland East and Midlands provincial boundaries (Central coordinates: 19° 23′ S, 30° 47′ E) (Fig 3.1). The landscape is characterised by undulating grasslands, seasonal and permanent wetlands ('dambos') and acacia and miombo forests (Childes and Mundy 2001). *Hyperrhenia* grass species dominate in the grasslands. In the wetlands, sedges, rushes and typha are common. Fast-draining Kalahari sands are found in the uplands, with greyish silty clays predominating in the wetland zones. The area experiences humid sub-tropical climate characterised by a wet season (November–March), followed by a dry season, which includes a mild winter season between May and August. Features signifying human footprint in the landscape include rural dwellings, small earth dams, agricultural fields in uplands and on wetland fringes and vegetable gardens on river sides. Management of natural resources is governed by state-based environmental regulations and customary institutions.

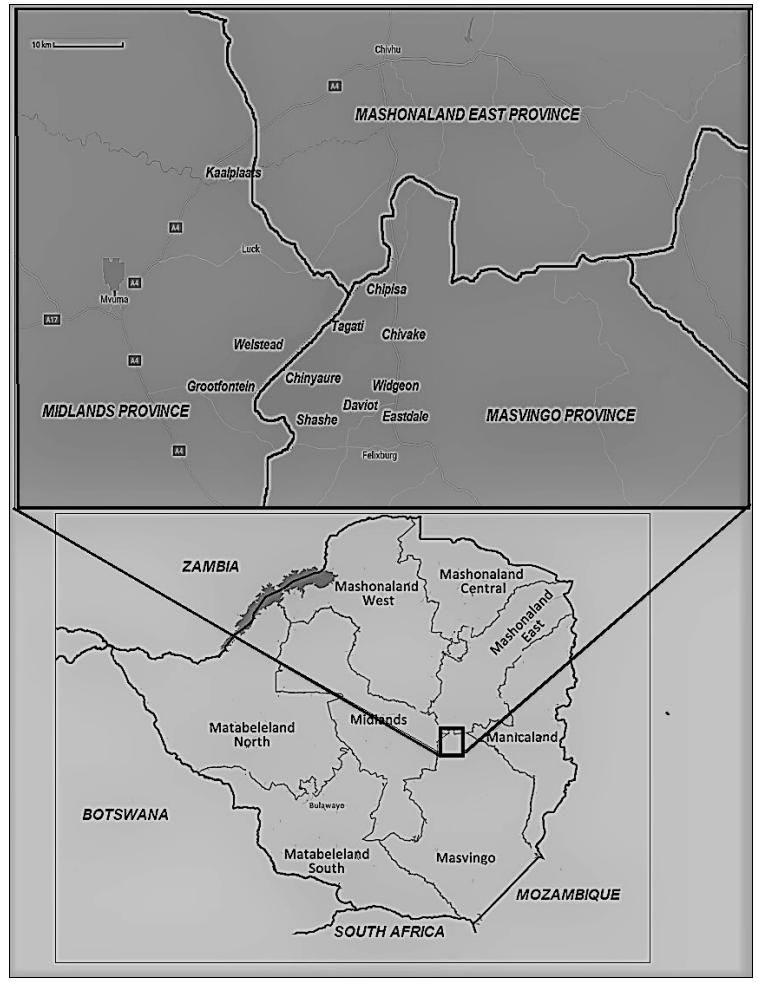

Fig 3.1. Provincial map of Zimbabwe showing the location of the Driefontein Grasslands and villages covered in this study (insert)

Up until 2002, cattle ranches managed by white commercial farmers dominated the landscapes. In that landscape, there are numerous impoundments and marshes used for livestock watering, where Wattled Cranes bred for decades. Land use and ownership patterns changed dramatically when the government-backed fast-track land reform was implemented during 2000–2002. This period saw the resettlement, in the area, of hundreds of black subsistence farmers from neighbouring communal lands and other parts of the district. Farmers produce grain and legume crops during the wet season in the uplands and mainly focus on wetland vegetable production during the dry season, which coincides with the Wattled Cranes' breeding cycle. Water from riverine wetlands, seeps and dams is used for irrigation and livestock watering. Cattle provide draught power and manure and are used as an investment that can be converted to cash when the need arises.

A large part of the study area falls under Ward 1 (local government administrative unit) of the Gutu Rural District Council. It is inhabited by Shona-speaking communities. Seven-member village committees are responsible for enforcing customary rules as well as ensuring that villagers adhere to government regulations. They are also responsible for land allocation and regulating the use of the common grazing areas (wetlands and grasslands) and forests. Streams, roads, paths and forest edges are accepted as landmarks that delineate areas falling under the jurisdiction of the various village committees. Though their work is often constrained by limited resources, extension officers provide technical support to communities on crop production, livestock management and the conservation of grasslands and wetlands. BirdLife Zimbabwe is the only non-governmental organisation that has played a role in sustainable natural resource management, focusing on birds, wetlands and grasslands.

The Driefontein Grasslands are one of Zimbabwe's twenty landscapes recognised as priority areas for bird conservation, Important Bird Areas (Fishpool and Evans 2001). The total mapped by BirdLife International and recognised as providing critical habitat for cranes extends over 20,000 hectares (BirdLife International 2017). It is also one of the few areas in the country where the Wattled Crane shares the same wetland habitats with Grey Crowned Crane *Balearica regulorum*. Riverine wetlands and aquatic zones on the edges of earth dams provide critical breeding habitats for both species. Though Wattled Cranes mainly feed on tubers and rhizomes of sedges and water lilies in wetlands, they also forage in grasslands and cereal stubble in the uplands. Based on unpublished data held by BirdLife Zimbabwe, over 50 wetlands where Wattled Crane pairs have bred since 1996 have been geo-referenced in the area. In the mid-1990s, 40 active nesting sites were counted in the area (Childes and Mundy 2001). However, by 2010, the number was reported to have declined to 25, largely attributed to habitat fragmentation following the resettlement programme (Chirara 2011).

In this chapter, the focal species is the Wattled Crane mainly because it is more sensitive to human disturbance than the Grey Crowned Crane and may even permanently abandon traditional ranges if its preferred habitats are extensively altered (BirdLife International 2017). Since both Wattled and Grey Crowned Cranes use the same wetlands for breeding, measures to prevent habitat degradation, to a great extent, would inherently benefit both species.

3.2.2. Methodological framework

In this study, the Action-in-Context (AiC) framework was used to analyse the human-crane interface. Based on Vayda's (1983) progressive contextualisation concept, the AiC framework was developed by De Groot (1992) as a methodology to analyse the social causal chains behind environmental problems. Its basic principle is that only actors (not social systems, markets or cultures) directly cause social change. Actors are generally defined as individuals, households, communities and organisations that have decision-making capacity and make decisions after considering a host of social, cultural, economic and political factors. Actors may be found at different causal distances from the problem, depending on the length of the causal chain.

AiC-based problem analysis starts with the identification of the problem and the action(s) causing the problem before one ventures into the wider context characterised by actors and underlying factors that influence the actors' decisions. The core of AiC can be presented as a simple triangular structure expressing that actors act the way they do because they have (1) options to act and (2) motivations to act, *cf.* Elster's (1999) 'opportunities' and 'desires' (Fig 3.2). Since motivations may be of any kind (economic, cultural, ethical), AiC represents a broad rational choice actor model.

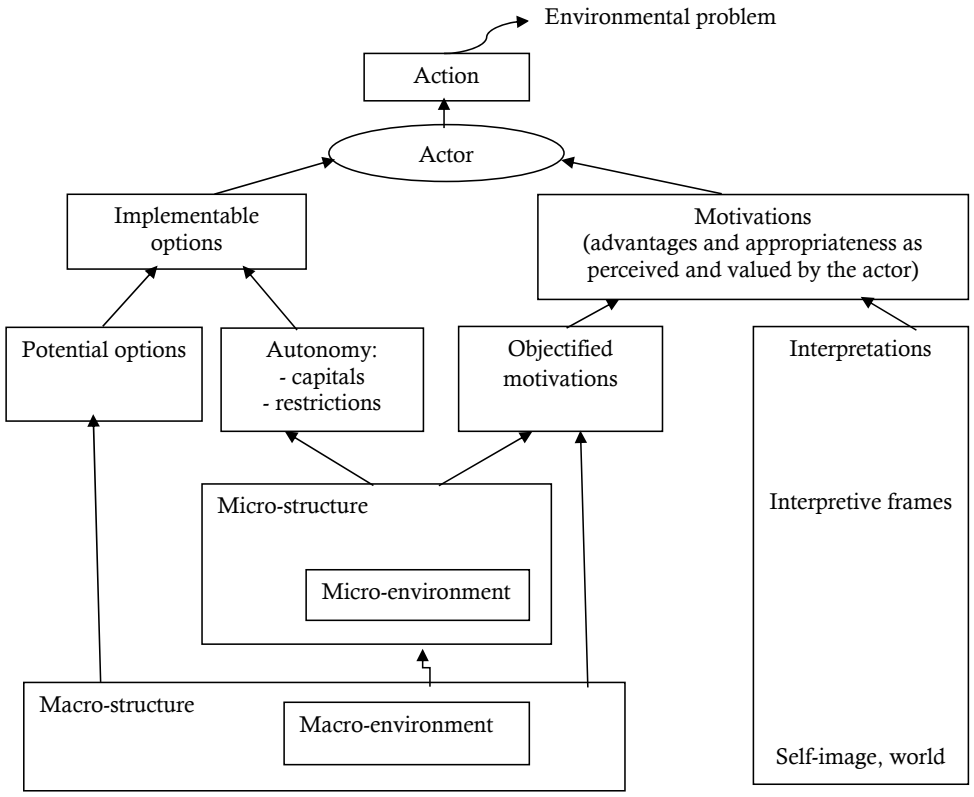

Fig 3.2. Action-in-Context deeper analysis scheme (Source: De Groot 1992)

The AiC provides a structure of 'deeper analysis', in which the options and motivations are broken down first into two elements each, as depicted in Figure 3.2. Actual options (i.e., courses of actions that the actor can readily take) are broken down into potential options and capacities. Capacities determine the difference between potential and actual options and are subdivided into financial capital, social capital and other positive components, *cf.* Bebbington (1999), plus negative components such as restrictions. Thus, if an actor were infinitely rich or powerful, all potential options would be actual options to this actor. Motivations are subdivided into objectified motivations comprising all easily quantifiable choice criteria such as money, hours or calories on the one side, and more cultural interpretations on the other, expressing, for instance, the values attached to the honour, virtues and social norms, etc. Shown in the schematic diagram is the bottom layer that connects these elements to microstructures (e.g., own groups) and macro structures (e.g., markets and society).

In AiC, actors can be connected to each other through 'actors fields'. Actors fields are defined as the causal influence of one actor on the options and/or motivations of another actor. For instance, if the problem is low yields due to poor soil fertility, the farmer is the 'primary actor'. Applying fertilizer is a potential option. If the price of fertilizer is among his motivations to apply it, a government subsidy on fertilizer then is a secondary action and the government establishing the subsidy is the secondary actor, which in turn has its own options and motivations to install the subsidy. If the IMF were to exert influence on the government to abolish all agricultural subsidies, the IMF would be a tertiary actor, again with its own options and motivations (e.g., economistic beliefs). AiC analysis is intimately linked to the design of interventions (policies, conservation, etc.). The actors field analysis generates the options of whom to work with ('target groups', e.g., farmers, government, IMF). The deeper analysis, in its turn, delivers the options for action, e.g., teach more potential options ('extension'), change capacities (micro-credit, 'empowerment'), change objectified motivations (taxes, subsidies, …), change interpretations (norms, appropriateness,). In our analysis here, the focus is on the primary actors and the first layer of the deeper analysis (Fig. 2), with secondary actors mentioned peripherally.

3.2.3. Collation of data on threats to cranes from secondary sources

Human activities in the Driefontein Grasslands that pose threats to Wattled Cranes were initially inventoried building on the species' behavioural responses to human activities summarised by Meine and Archibald (1996). Data on crane mortalities, unsuccessful breeding, nest abandonment, egg loss, habitat alteration and other human-crane conflicts in the Driefontein Grasslands were obtained from BirdLife Zimbabwe crane survey reports for the period 2001–2010. Results of the review of scientific literature and unpublished reports archived at BirdLife Zimbabwe and field observations were used to generate an array of factors that affected the breeding productivity and survival of the Wattled Crane population in the area. A conceptual diagram showing factors affecting cranes was then developed (see Fig 3.3) and used to guide data collection. A field verification exercise was subsequently undertaken through community consultation and personal observation in July 2011. Subsequent visits to the study area over the next three years (2012–2014) were used as opportunities to verify observations on threats to cranes and wetlands, and how they were linked to human actions.

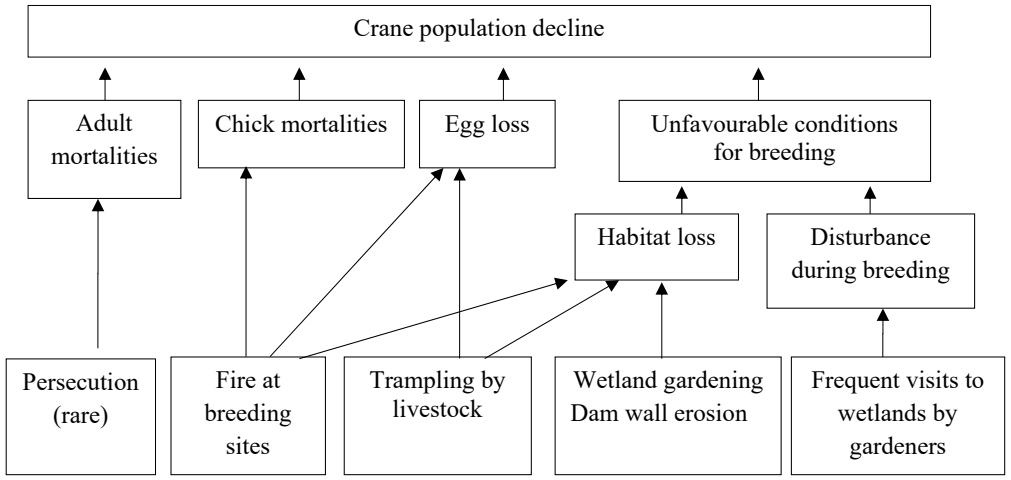

Fig 3.3. Conceptual diagram showing factors affecting cranes used to guide data collection

The factors in boxes in the bottom layer of Fig. 3.3 were used departure points to initiate discussions with respondents.

3.2.4. Field data collection

The bulk of data on human-crane interactions was collected in July 2011. The geographical focus was defined by 11 villages where breeding pairs and flocks had been observed during surveys undertaken since 2000. A purposive sampling approach was adopted to ensure the selection of respondents from villages where incidents of crane harassment and mortalities had been documented by BirdLife Zimbabwe and confirmed by the locals. The villages were Chinyaure, Widgeon, Shashe, Daviot, Eastdale, Chivake, Chipisa, Kaalplaats, Grootfontein, Tagati and Wellstead. In-depth interviews were conducted with all village chairpersons (n=11) and 22 village committee members. The criteria for selecting village committee members was that two members, a man and a woman, were to be randomly selected from each village. In total, 55 community members (22 adult women, 22 adult men, 11 youths) were interviewed. The adult community members were randomly selected, with a target of five people representing different households being chosen from each village. The average number of households per village was 21. Eight of the youths were members of Site Support Groups, teams of young volunteers that were promoting crane conservation with support from BirdLife Zimbabwe. The other three youths were selected because they had previously worked as guides when Zimbabwe Parks and Wildlife Management Authority was conducting crane surveys in the area. Five teachers, focal persons under BirdLife Zimbabwe's environmental education outreach at three secondary and two primary schools located in the study area, were interviewed. Also interviewed were four Agricultural Officers, two Land Officers, two Water Officers and two Environmental Officers and two District Administration Officers and three police officers. Two officers from the Zimbabwe Parks and Wildlife Management Authority and four BirdLife Zimbabwe officers that had previously been involved in crane surveys and awareness activities were interviewed so that they could give accounts of their personal observations of human-crane interactions. Six focus group discussions attended by 10 community members were held in each village. The villages were Chinyaure, Chipisa, Daviot, Grootfontein, Kaalplaats and Shashe. These were the villages where data gaps and issues that needed further investigation were identified after preliminary analyses.

A second round of relatively informal data collection took place in March 2012. This provided an opportunity to observe any impacts of threats documented during the previous year on nest sites. Site Support Group members voluntarily took part in the assessments, involving transect walks along wetlands and visits to crop fields and open grasslands where cranes foraged. Informal interviews, guided by questions posed during the detailed interviews in 2011, were held with 14 community members who were opportunistically encountered during the transect walks.

Interviews with respondents started with general questions about cranes or comments about people's perceptions and experiences with cranes, including threats they had observed. Guided by the AiC deeper analysis scheme, interviewees were then asked to explain the main activity causing the threat under consideration. The discussion would then be broadened to cover other actions and potential options that the community were not undertaking due to lack of capacity or restrictions (policies, standards, customary rules, legal requirements) imposed on them at village and district levels. Discussions on social, financial, political, human, cultural and natural capitals that either enabled or inhibited the adoption of specific options would then follow. Motivations for actions for actual and potential options were discussed in two phases. Quantifiable benefits and costs were discussed first, followed by an assessment of the interpretations (knowledge, norms, values, attitudes, aspirations and beliefs) that explained why certain decisions were made. Questions that were used as a guide in the semi-structured interviews are presented in Box 3.1.

Key questions posed during interviews are presented in Box 3.1.

Box 3.1. Key questions that were used to guide semi-structured interviews and group discussions

1. What human activities degraded wetlands containing crane habitats?
2. How does degradation of wetlands as a result of the activities occur?
3. How does the degradation of wetlands affect cranes (eggs, chicks, adults)?
4. Who are the people behind activities degrading the wetlands?
5. What local conditions, rules and standards govern human activities in wetlands?
6. What economic benefits do wetland users derive when performing activities degrading wetlands?
7. What are the other non-economic motivations for utilising and managing wetlands containing crane sites?
8. What are costs associated with utilising and managing wetlands?
9. What other activities could communities undertake to manage wetlands (that compromise or protect crane habitats?
10. What social, economic, cultural, institutional, political factors influence wetland management and crane survival?
11. Who else (beyond community boundaries) plays a part in deciding how wetlands are utilised and managed?
12. What are their motivations for influencing wetland management?

On average, interviews with individuals took between 60 and 90 minutes. Group discussions, which took up to two hours, were used to verify facts captured during interviews with individuals. In cases where questions were deemed to cause a feeling of incrimination, hypothetical scenarios were used to avoid offending respondents. Most interviews were conducted at the respondents' homesteads. Group discussions were followed by excursions to crane breeding and foraging sites to give discussants opportunities to highlight practical aspects of human-crane interaction mechanisms. Chinyaure, Daviot and Grootfontein group discussants visited wetland and dam sites where cranes breed. In Chinyaure, Shashe and Chipisa, group discussion participants undertook transect walks through a grazing area that had recently been burnt.

Respondents that could not accurately quantify costs and benefits in standard metric units were asked to express them in terms of perceived values or in the local unit of measurement (which were later converted into metric units). Data, captured in the form of short notes, descriptions of phenomena and real-life stories, past events were reviewed at the end of each working day by the researcher and his assistant to identify anomalies, data gaps and convergent ideas. Preliminary analysis of data elicited from primary actors provided insights on the underlying factors and was later used to identify the secondary and tertiary actors. Secondary and tertiary actors were interviewed following the AiC procedure, i.e., identifying selected options, potential options, capitals, restrictions, objectified motivations and interpretations.

During data collection and analysis, the progressive contextualisation process (identifying actors, options and motivations) was ended when there was a convergence of ideas on underlying factors and actors. In other cases, the analysis was stopped when the underlying factors were noted to be beyond the scope of a normal conservation programme or when the cause of certain behaviour was associated with cultural norms or political beliefs. Interview responses were progressively synthesised into AiC schemes during field data collection. The schemas were later refined as part of the inductive analytic processes to discern data patterns, themes and overall implications of the findings.

At each site, this preliminary analysis provided insight into issues that needed verification and further investigation, including divergent and unclear responses to questions presented in Box 3.1. These then became data gaps that were addressed through focus group discussions. An invitation to participate in group discussions was extended household representatives (randomly selected) that

had been interviewed, ensuring that there was gender balance. To facilitate focused discussions, participants formed three groups and each group would tackle the questions formulated (by the author) to address the site-specific data gaps. After the discussion, each group shared its points with the rest of the participants. Data gathered through these group discussions was then used to complete the narratives of crane habitat loss, complementing what had been gathered through semi-structured interviews.

3.3. Results

This section gives a synthesis of the major elements of the human-crane interface, with one explicit AiC scheme on wetland gardening (Fig. 3.4) to illustrate the outputs of the AiC-based analysis. For clarity, we present the results based on our field-based classification of factors affecting cranes and their habitats listed below:

i. Disturbance to breeding pairs at sites near wetland gardens,
ii. Habitat fragmentation through wetland gardening,
iii. Community inaction on repair and maintenance of earth dams,
iv. Overgrazing and trampling of breeding sites by livestock, and
v. Ineffective fire management systems affecting crane chicks and nesting sites.

The number of Wattled Crane breeding sites in the study villages where the factors (threats to cranes and their habitats) listed above were prevalent are listed in Table 3.2. This data is based on field observations by the author. The total number of sites surveyed was 25.

Table 3.2. Number of sites where threats to cranes and their habitats were observed

	Threats				
Village	Human disturbance	Habitat fragmentation	Erosion of dam walls	Overgrazing and trampling	Uncontrolled fires
Chinyaure	2	2	1	0	3
Chipisa	1	0	3	1	1
Chivake	0	0	2	1	1
Daviot	2	2	0	1	2
Eastdale	2	2	2	0	2
Grootfontein	2	2	2	2	0
Kaalplaats	0	0	2	1	1
Shashe	2	2	0	0	0
Tagati	0	1	0	1	0
Welstead	0	0	1	2	3
Widgeon	2	2	1	3	1
Totals	**13**	**13**	**14**	**12**	**15**

3.3.1. Human disturbance due to wetland gardening

Wetland gardening affects the Wattled Crane in two ways. First, disturbance to breeding pairs occurs when villagers visit wetlands during the dry season to undertake gardening activities. Establishment of gardens near breeding sites leads to habitat fragmentation, discussed in detail in 3.3.2. As noted in Table 3.2, human disturbance was identified as a threat at 13 sites. Wetland farmers are therefore primary actors in breeding pair disturbance and habitat loss. Proximate factors that influence decision-making by households in the planning and execution of gardening activities are summarised in Fig 3.4. In making calculations to quantify costs and benefits, a standard 100 m^2 garden owned by most households, was considered.

Household members, mostly women and children, make three or four trips per week to gardens located close to breeding sites and spend, on average, two hours working in their gardens. This schedule is followed during the Wattled Cranes' nest-building, incubation and chick-rearing periods. Although adult community members are generally indifferent towards cranes, children are attracted to nest sites by the cranes' imposing size and movements. Respondents reported observing cranes

leaving their nests when humans approached garden sites, proving that the gardens are located within the species' alert distance. This temporary nest desertion poses a predation exposure risk for eggs or newly hatched chicks. In Chinyaure and Grootfontein, where gardens are within 50 m of nests, respondents stated that when the number of people at garden sites increased, cranes generally stayed away from their nests for hours.

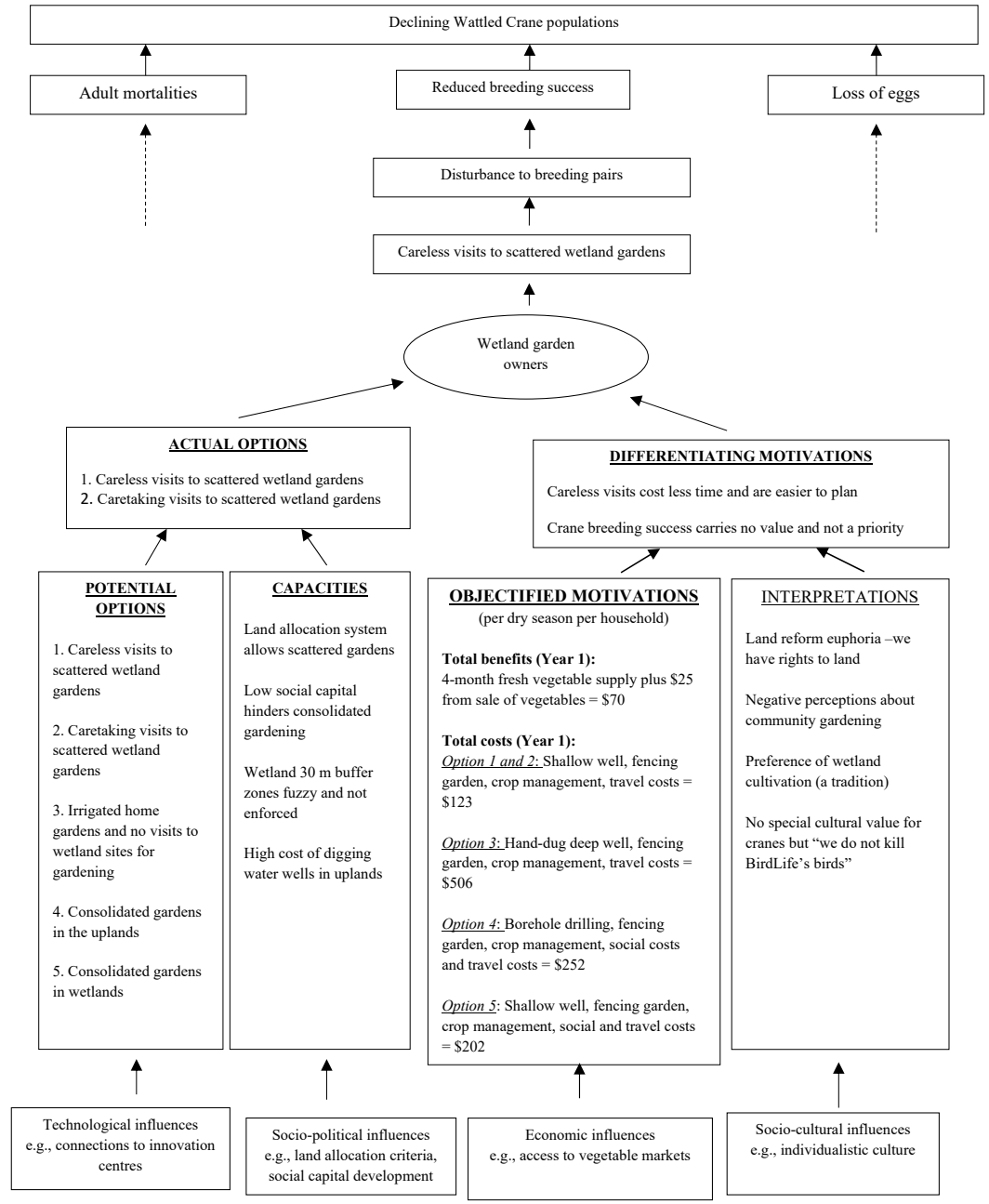

Fig 3.4. AiC deeper analysis diagram showing factors influencing gardening decision-making

The gardening season starts in June-July when flooding in wetlands eases and this coincides with the start of the breeding season of the Wattled Crane. Gardening activities end when the rainy season sets in October. Households do not follow regular gardening schedules. Protracted disturbance to breeding pairs is likely since households visit gardens at different times of the day and on any day of the week. The number of gardening hours depends on the task at hand, but it is common for children to mill around the gardens and sometimes take longer to complete tasks. Although households normally dig shallow wells within the fenced garden, it is also common practice to fetch water for irrigation directly from dams, ponds or streams, adding to crane disturbance.

Also covered in the discussion were community perceptions about the status of cranes in the area and attitudes towards cranes. Whilst the majority believed that cranes were declining, there were some sceptics. During a group discussion in Daviot village, one woman stated that she believed cranes were simply "constantly re-organising themselves since the villagers disturbed them all the time". When explaining community attitudes towards cranes, respondents repeatedly mentioned BirdLife Zimbabwe's crane conservation programme. Although cranes do not have a special role in the lives and culture of the community, cases of attacks and harassment of cranes are rare due to restraint rooted in the social ties between the community and BirdLife Zimbabwe officers that have grown over the past decade. Community members avoid harassing or killing cranes to avoid hurting the feelings of BirdLife Zimbabwe officers. It was common to hear them saying, "*hatiurayi shiri dzeveBirdLife*" (we do not kill BirdLife's birds). Some garden owners wanted to know about the practicability of relocating cranes to another area, where they would not be disturbed by people. Given the opportunity to express their views on their role in conserving cranes, some respondents tended to steer the discussion towards immediate and long-term benefits that would accrue to communities if they protected the species.

3.3.2. Habitat fragmentation through wetland gardening

Habitat fragmentation due to wetland farming was observed at 13 sites. Gardens are scattered around dams and on edges of streams in zones pegged by the Ministry of Lands and Rural Resettlement. No comprehensive assessment of possible impacts of gardening on the ecology and hydrology of wetlands was carried out before the zoning process. A loose guiding principle in the pegging process was that gardens were not to be located within 30 m of wetlands or streams. Vegetation structure around breeding sites is altered when scattered gardens are established on wetland fringes and dam edges.

To secure plots for gardening, households approach the village committee with their request. After being allocated land, they construct a stand-alone garden. Although in some areas, households can establish gardens in the uplands with high water tables, households are driven by presumptive advantages of locating gardens in wetlands. Under the prevailing land tenure system, households own wetland plots and only relinquish them when they decide to emigrate from the village. A household is entitled to one wetland plot. Logs, branches and bark from indigenous trees used for fencing are readily available and therefore households from all wealth classes can establish gardens.

Gardens tend to be located too close to wetland edges because the points from which measurements should be taken when delineating wetland buffers are not clearly defined. Though village committee members claimed to be aware of the physical features delineating gardening zones, an element of subjectivity in defining wetland boundaries was detected during discussions. Though it is common knowledge among community members that cultivating within 30 m of streams or wetlands is prohibited, seasonal water-level fluctuations and vegetation cover changes blur the wetland-grassland boundary. This explains why some gardens and fields for rain-fed crop production are located in seasonal wetlands. Environmental and agricultural extension officers, who are tasked with the responsibility of enforcing wetland conservation regulations, have limited knowledge and skills in wetland delineation.

Village committee members allocate land and are herewith identified to be important secondary actors. They do not get any financial benefits and simply execute their roles to fulfil socio-cultural obligations. Being a village committee member improves one's social status. Except in Wellstead and Grootfontein, village committee members in other villages believed that there were still large tracts of wetland that were unutilised land, open for allocation to prospective residents. Discussions on trends in requests for land over the years and the actual rate of conversion of wetlands to gardens revealed that dozens of households had been allocated wetland plots but were not utilising all their land. This explains the variations in the size of gardens and the patches of untilled land between some gardens.

Most gardens are private because it is a tradition to concentrate on household-based production. However, there are no restrictions that would hinder the establishment of community gardens in the wetland zones designated for gardening or in the uplands. The general perception among villagers, rooted in their experiences with cooperative gardening projects since the 1980s, was that such gardens could only be successfully initiated by an external agency, presumably an NGO or specific government programme facilitating group formation and providing inputs at the inception phase.

Mistrust, high initial social mobilisation and joint planning costs associated with community projects were cited as factors that discourage villagers to initiate community gardening projects. Respondents indicated that households would dedicate the same number of hours to gardening activities under the different gardening options. Walking to and from gardens located in wetlands accounts for 16 hours per season and an additional 9 hours would be added for joint work and group planning activities in the case of community gardens. Working in groups gives farmers greater bargaining power when applying for credit and inputs from lending institutions and government programmes but this appeared not to be a strong motivation for the establishment of community projects.

Results of basic cost-benefit analysis per household of the five types of gardens (presented as potential options in Fig 3.3) for the first year of establishing the garden are shown in Table 3.3. The calculations were based on contextual information provided by communities at the time of data collection. The information includes average shallow well depths, average borehole depths, crop maintenance practices, input costs, time allocated group project activities and average vegetable yields. The results show that establishing household gardens with shallow wells in wetlands is the cheapest option. Although having a garden at home significantly reduces the travel costs, the cost of digging a well in the uplands, normally done through hired labour, is costly for the household.

Table 3.3. Cost-benefit analysis for five types of gardens for the first year

	Options 1 and 2	**Option 3**	**Option 4**	**Option 5**
Costs (Zimbabwe Dollars[21]):				
Digging well (options 1, 2, 3 and 5) / borehole drilling costs (option 4)	2	400	60	2
Fencing materials (tree cutting for options 1, 2 and 3 and purchase of wire for options 4 and 5)	0	0	75	75
Fence erection (100m^2 for options 1, 2 and 3 and 2000m^2 community garden for options 4 and 5)	32	32	26	26
Average seed costs per season (Kale seeds = $1.20, Tomato = $1.20)	3	3	3	3
Pesticide (10g sachet of Aphid Kill)	3	3	3	3
Irrigation, crop-bed maintenance and harvesting (2hrs per day x 3 days per week x 14 weeks x $0.8/hr)	67	67	67	67
Planning and social mobilisation	0	0	10	10
Travel costs - walking to and fro the garden	16	1	8	16
Total cost per season	**123**	**506**	**252**	**202**
Benefits (Zimbabwe Dollars):				
Value of fresh vegetables consumed by household over 14 weeks	45	45	45	45
Income from sale of vegetables	25	25	25	25
Total benefit per season	**70**	**70**	**70**	**70**

Notes:
Option 1: 2m deep shallow well in garden, Option 3 = 30m hand-dug deep well in upland, Option 4 = 60m borehole in community garden in upland, Option 5 = 2m deep shallow well in community garden in wetland
Length of gardening season = 105 days
Cost of unskilled labour = $0.80 per hour
Standard size of household garden = 100m^2
Standard size of community garden (membership: 20 households) = 2000m^2
Total community gardening social mobilisation costs (12hours x $0.802) = $9.62
Average distance from homes to wetlands = 1.2km (takes 14min to walk)
Households consume $0.80 worth of vegetables four days per week for the entire gardening season
Same soil, crop and water management are assumed for the garden options

[21] At the time of data collection, the Zimbabwe was using the US dollar as its official currency

Agricultural and environmental officers provide technical support to households and village committees on land management issues and are therefore both secondary and tertiary actors. BirdLife Zimbabwe was noted to have played a significant role in influencing community attitudes and behaviour towards cranes and as such was identified as a secondary actor. The organisation provided fencing materials used to construct community gardens in Daviot and Shashe in 2004. These were set up as models that could be replicated in other villages to prevent the proliferation of stand-alone, household-managed gardens which exacerbate crane habitat loss. In other parts of the Gutu District, other non-governmental organisations fund joint livelihood projects and, as such, influence local perceptions about how community gardening projects should be initiated, funded and managed.

Despite having been the lead agency responsible for land allocation during the land reform exercise, the Ministry of Lands and Rural Resettlement is not involved in land use monitoring. Extension officers lamented the negative impact of the post-land reform economic downturn on the extension services as the meagre budgets allocated to their departments made it difficult for them to maintain regular contact with farmers and undertake regular land use monitoring. Limited knowledge and technical skills on ecosystem management were noted to have a negative influence on the performance of extension officers when dealing with wetland and grassland management. There was a consensus among respondents that any suggestions that have implications on wetland use and access would be viewed by the political leaders as attempts to reverse the gains of the land reform programme. This explains why extension officers often do not act against households that are tilling within the wetland buffers.

3.3.3. Community inaction on repair of dams used by cranes as breeding sites

Wetlands created by earth dams are critical for Wattled Crane breeding pairs. Dam wall erosion was identified as a phenomenon that affects the water holding capacity of the dams, and hence the vegetation around nesting sites. The dams were built for livestock watering during the era of private commercial cattle ranches, and erosion used to be minimised through the rotation of pastures. They are now open access resources prone to degradation. There were no community-initiated plans to monitor, maintain or repair dams even though the dams supply water for irrigation, construction and livestock. Physical signs of dam wall erosion were observed at 14 of 18 breeding sites associated with earth dams.

Respondents concurred that dam embankments are gradually being eroded due to cattle and humans using the raised embankments when crossing streams and wetlands. Cattle also trample the loose soil on the upstream and downstream sides of dam embankments. At most sites, sandy soil making up the embankments was noted to be prone to erosion when grass cover is reduced during the dry season. Total embankment failure was observed in Grootfontein and Chipisa. Reduced dam capacity due to structural defects as well as trampling of vegetation was reported by dam users in Kaalplaats, Grootfontein and Widgeon.

An average household abstracts approximately 50,000 litres of water from a dam to meet basic needs (irrigation, livestock watering, domestic uses) during the dry season. Knowledge on the steps that should be taken to address the problem of dam wall erosion varied, with some dam users indicating that they were not aware that proactive dam maintenance was necessary. Evidence of futile attempts by villagers to restore damaged embankments was observed in Chipisa, Chinyaure and Grootfontein. In all cases, individuals that repaired the dams failed to convince other community members to participate in the exercise and subsequently dropped the work. Probing to ascertain the government's role in dam maintenance revealed that national water agencies were detached from the community. Community members were not fully conversant with the roles of the agencies. As one agricultural extension said, "the government is yet to give full responsibility for maintenance of dams in former commercial farming areas to a specific agency".

Spatial distribution of dams and their location in relation to homesteads influences the level of dependence on the dam water among households. Respondents affirmed that the community had the capacity (labour and tools) to repair the dams without external support. They indicated that mobilising all villagers to collectively work together to repair eroded dam walls using locally available tools would take up to two days. Estimated time to fill up eroded parts of embankments with soil ranged from one to two days. Given that the rural district council is responsible for coordinating rural development projects, outcomes of previous attempts to engage the council in community projects were elicited. It turned out that water projects implemented by the district council in other areas were donor-funded but the donors' beneficiary selection criteria did not include households resettled under the land reform programme. The donors, mostly non-governmental organisations, were funded by

western nations that had raised objections about the way the land reform programme was implemented. Villagers in the Driefontein Grasslands were therefore not eligible for donor support.

Key themes that emerged from the discussions were integrated into two underlying factors. First, as noted earlier, dams were critical common pool resources for villagers but there were no concrete indications of internal organising at community level to address dam wall erosion. In this regard, village committees were identified as important secondary actors. Second, maintenance of dams on former commercial farms was a grey area for the water sector and the government was yet to formally delegate the responsibility of maintaining the dams to a specific agency. Due to structural changes and shifts in mandates of government departments in the post-land reform era, some government agencies were presumed to oversee specific water management issues even though they were not actively involved. For instance, the Irrigation Department of the Ministry of Agriculture was presumed to be responsible for maintenance of all dams in former commercial farming areas. The District Irrigation Officer, like other extension officers, bemoaned the lack of vehicles for transportation to be able to reach out to communities and indicated that, on many occasions, he had to use his resources to make trips to different parts of the district. The department had not undertaken dam repair and maintenance work in any resettlement area in the district.

3.3.4. Overgrazing and trampling around breeding sites

Grazing practices and pasture management during the dry season that lead to overgrazing and trampling of crane breeding sites by livestock, a phenomenon reported at 12 sites during the period 2006–2010, were identified by consolidating personal experiences by livestock owners and herders. They reported that because common access grazing regimes prevail when pastures in the uplands are depleted, cattle frequent the low-lying wetland zones and grassed areas around watering points. They reported that below normal seasonal rainfall had, in the past, caused had early onset of the problem as signs of increased grazing pressure and trampling around dam sites were observed as early as June, a critical month in the breeding cycle of the Wattled Crane. This phenomenon was reported by herders in Widgeon, Grootfontein and Kaalplats.

A common observation among respondents was that overgrazing was an environmental problem ranked lowly by the communities. They attributed this to the general perception that there is abundant grazing land and as a result, they do not pay attention to patch-level vegetation changes. Livestock owners, therefore, do not restrict or monitor their livestock's movements during the day. No community meetings to deliberate on grazing matters were reported. At village level, matters related to livestock grazing during the dry season become topical when the village committee announces a date marking the start of the free-grazing period. The date, which normally falls in the first two weeks of May, is announced when all villagers have finished harvesting their summer crops in the uplands. This coincides with the start of the Wattled Crane breeding season. There were no mechanisms to replace, repair and maintain fences that were previously used by commercial cattle producers to facilitate rotational grazing. In Daviot, Widgeon, Shashe and Chinyaure, old fences were moved to demarcate grazing zones and to isolate crop fields. Although, to a notable extent, village-based informal regulations to avoid vandalising fences have been effective, overall, the current fencing patterns do not restrict the movement of livestock through areas that contain crane breeding sites.

The majority of respondents complained that the Livestock Production Department did not offer technical advice on grazing management. The Livestock Production Department's one-officer-per-district policy was cited as a major impediment to effective extension service as the officers are overwhelmed and do not have the capacity to cover the entire district. The officers were said to be only active in animal disease control programmes as it was a national priority. A sizeable number of households were previously members of community grazing schemes before the land reform programme but hinted that they had not initiated such projects in the Driefontein Grasslands as pastures were abundant, as opposed to the perennially overgrazed pastures they had had in their old villages.

3.3.5. Ineffective fire management systems affecting crane chicks and nesting sites

Records supplied by BirdLife Zimbabwe confirmed that 16 breeding sites had been affected by uncontrolled fire during the period 2003–2010. Most of these fires had mainly been started by the resettled farmers when clearing grassed patches before they establish new gardens or dryland fields. Other common causes of fire included careless dumping of hot ashes around homesteads and careless use of fire by community members when extracting honey from beehives. Suspected cases of hunters that started fires to clear grasses to be able to spot animals easily were reported and so were fires started by naughty children. When they settled in the area, communities did not maintain the firebreaks that existed before 2002 and as a result, when a fire breaks out, it spreads unchecked across

grasslands and seasonal wetlands. Apart from posing a risk to the crane nesting sites located in seasonal wetlands, fire could also lead to mortalities of unfledged chicks. Cases of fire incidents that affected crane breeding sites were confirmed in Chinyaure, Widgeon, Eastdale and Chivake. Most fires that had devastated wetlands had occurred between August and October but incidents of fires in June and July were reported.

All villages resort to reactive firefighting. Although village committees always devise strategies to extinguish fires, detection and firefighting team mobilisation times vary and, in most cases, collective action to extinguish fires only starts when fire has spread extensively. Average time costs associated with the current fire management systems are presented in Table 3.3. Despite it being common knowledge that if a fire starts in one village, it invariably spreads to other villages, no formal community meetings are held to enhance collaboration when fighting fires. The maximum distance that the community members are willing to walk to take part in firefighting is 3 km. All the same, some informal communication channels within and between villages exist. This explains why almost all causes and origins of fires always become public knowledge. Respondents bemoaned the social complexities associated with acting against individuals that started fires in their villages. They feared retribution and risked having sour relations with friends and neighbours if they reported the culprits to the authorities.

Table 3.4. Average time costs associated with current fire management systems

Activity		**Time (minutes)**
Time to mobilise village members to form firefighting teams		30
Time to walk from homestead to area affected by fire		5–30
Time taken to extinguish fire based on experiential knowledge (for a team of 20 people)	When fire is observed within 30 minutes after breaking out	60
	Moderate fire	120
	When fire has spread extensively	180 or longer

Roads, tracks and seasonal streams, physical features that could potentially act as firebreaks, have on several occasions not been effective in stopping fires. Although no formal cross-village meetings to deliberate on fire management issues are held, village-level norms and structures to facilitate firefighting exist. As the village chairperson of Chinyaure explained, "a fire outbreak is like a funeral because every adult is compelled to act regardless of their personal circumstances and commitments". There is a social norm that binds every community member over the age of 14 years to take part in firefighting when the need arises. Asked about the triggers of community action in the event of a fire, the response was that whenever they observed smoke in wetlands or grasslands, villagers check and if the fire is unattended, they mobilise each other. General landscapes that should be protected against fire, are known to the community. Cited among the infrastructure and resources that the community protects against fire were gardens, grazing areas and any structures near homesteads constructed with combustible materials. Also known were specific patches within grassland and wetland landscapes that, if threatened by fire, would instantly trigger action by the household from a specific section of the village. For instance, villagers in Chinyaure indicated that they would act if fires spreading from the Widgeon side crossed over the Shashe stream since most of their gardens are located on the edges of the stream. On a positive note, through BirdLife Zimbabwe's outreach, community members in Chinyaure, Daviot and Widgeon were increasingly making it a priority to prevent fires from spreading to wetlands containing crane breeding sites. This pro-crane conservation development was led by Site Support Group members, village-based teams formed by BirdLife Zimbabwe to champion crane and wetland conservation.

Potential ways in which the community could act to address the problem of ineffective fire management systems were discussed. Topical among the suggestions put forward by respondents were (a) development of community-based fire management systems (social networks, controlled burns, fire guards), (b) imposition of stricter measures to penalise community members responsible for starting fires, and (c) engaging the rural district authorities to focus their attention on local-level capacity building. The options were discussed to scrutinize the opportunities and challenges of strengthening common property resource management systems.

The biggest setback, according to the majority of respondents, is that penalties for causing fires are seldom enforced by the responsible authorities, the police and the district authorities. Village committees and the rural district council were identified as secondary actors here. Rural district council by-laws stipulate that individuals that start fires should pay is $2 for every hectare burnt. According to the Agricultural Extension Supervisor, fires affected between 5,000 and 10,000 hectares every year. Respondents concurred that even if the by-laws were to be strictly enforced, the amounts to be paid by culprits would be higher than the average annual income for the majority of villagers.

Hence, system of fines is considered by the community as one of many by-laws that exist on only paper and not enforceable. Even though village committees carry out informal investigations to determine the origins of fires, they have no mandate to apprehend or fine the culprits. They resort to reporting the cases to the police and the rural district council.

3.4. Implications for human-crane coexistence

This study sheds light on the interactions between cranes and humans in a landscape where the human footprint became increasingly pronounced following a government-backed resettlement programme. Spatial and temporal human-crane interaction patterns evolved as the resettled communities adopted crop and livestock farming routines, utilised water from man-made dams and developed systems for managing shared natural resources such as wetlands and grazing lands. Positive attitudes towards cranes also emerged as community members interacted and built social ties with BirdLife Zimbabwe's crane conservation project facilitators.

Studies on human-wildlife interactions reveal processes through which threats to species and habitats manifest themselves, generating insights for strategic entry points for developing appropriate conservation solutions (Dickman 2010; Redpath *et al*. 2013). To develop effective solutions, it is also important to look beyond human-wildlife interface to factor in human-human interactions and ensuing relationships that aid or constraint species survival (Madden 2004; Marchini 2014). This study fulfilled these two foundational conservation planning requirements. Findings of human-wildlife interactions have been used successfully used to develop threat reduction pathways, including social and ecological conditions necessary for human-wildlife coexistence (Madden 2004; Carter *et al*. 2012). Building on these broad methodological considerations, it is possible to discern the implications for the coexistence of Wattled Cranes and local communities in the Driefontein Grasslands from the findings presented in the previous section. These implications, framed as generic conservation approaches and interventions that prevent local extinction of Wattled Cranes in the face of human-induced threats, are presented in this section.

When framing tenable conservation interventions, it is important to note that long-term survival of Wattled Cranes in the Driefontein Grasslands hinges on local communities accommodating species in space and across temporal patterns, while taking action to address threats identified in this study. It is therefore important to explore practical mechanisms through which human-crane coexistence could be achieved. Options for achieving human-wildlife coexistence by applying principles of "land-sharing" with and "land-sparing" for species of conservation concern have been proposed (Kremen 2015; Shackelford *et al*. (2015). Although such land management practices, planned with wildlife in mind, may contribute to the maintenance of suitable habitats for the target species, they need to be complemented by a positive species protection ethic among local communities, a key contributor to effective conservation outcomes (Paterson 2006; Hare *et al*. 2018). Accordingly, a holistic conservation solution to the host of threats affecting cranes in the Driefontein Grasslands would therefore involve the integration of land management systems that factor in the ecological requirements of Wattled Cranes blended with the promotion of positive values and attitudes to ensure that the species is protected when breeding, foraging and roosting. As the study findings show, current land management systems do not include strong elements of crane breeding habitat protection which is required to ensure the long-term survival of the species in the area. This highlights the need to define practical crane-focused conservation actions implementable at farm and site levels, bearing in mind that actions have to be acceptable to local communities.

The need to integrate knowledge drawn from ecology and social sciences when resolving conflict associated with human-wildlife interactions is recognised globally (e.g., Hill 2004; Riley 2007; White and Ward 2011). This has given rise to conservation approaches that factor in community practices, values, norms and perceptions in the quest to ensure the survival of species and maintenance of habitats (Reyers *et al*. 2010; Bennett *et al*. 2018). Actor-based analyses used in this study led to the identification of socio-psychological factors, such as land use preferences, entitlements, responsibilities and returns concerning the management of wetland resources. Understanding the interplay between local institutional arrangements and livelihood strategies and resultant influence on natural resource management is critical (Hulme and Murphree 1999; Fabricius 2007). Implications for human-crane coexistence presented below were conceptualised acknowledging that the need to integrate the ecological requirements of cranes and livelihood practices of the local communities.

Understanding broad range of motivations for conservation action by individuals, households and community groups is a key aspect of contemporary conservation (Kabii and Horwitz 2006; Dearborn

and Kark 2009). As argued by Haggith *et al.* (2003) and Zafirovski (2003), human behaviours that have implications on environmental conservation should be analysed from both economic and non-economic perspectives. This study shows that though the quest to meet basic household needs is a key determinant in household decision-making, socio-cultural and socio-political structures and processes also have a profound influence. Therefore, a portfolio of interventions addressing a full range of livelihood-related, cognitive, cultural and institutional factors should be developed to secure long-term community involvement in conservation action. This recommendation is in line with the concept of creating refuges for the long-term survival of cranes in human-dominated landscapes, by not just creating physical space for the species but cultural space as well, building the species into the communities' narratives of sense of place and belonging (Miller 2005; Hausman *et al.* 2015).

The need for identifying entry points to help the conservation facilitator and communities to develop a common ground has been highlighted in contemporary conservation planning (Foli *et al.* 2014; Weeks *et al.* 2014). This study revealed entry points that could be leveraged to develop a network of patches that provide suitable breeding habitat for cranes, involving local communities in the process. They include inherent land allocation and wetland management practices that leave space used by cranes for breeding and positive attitudes that emerged as outcomes of a crane conservation awareness programme. As noted by Colding and Folke (1997) and McNeely and Schroth (2006), inherent community beliefs and practices that contribute to habitat protection and species survival, rooted in customary systems or state-enforced policies, can be used to demonstrate the feasibility of human-wildlife coexistence. In the case at hand, a land allocation system that inadvertently leaves distinct wetland patches unconverted offers hope for the species. Although cranes are already using the patches for breeding, there is a need to intentionally incorporate the ecological requirements of cranes in farm- and village land use planning, even if it means doing so informally initially. Advocating for wetland management systems that solely give precedence to crane requirements at the expense of livelihoods would be analogous to promoting fortress conservation, which has been noted to be problematic as it alienates local communities (Hulme and Murphree 1999; Berkes 2007). It is therefore worthwhile to negotiate and facilitate the incorporation of crane conservation matters into village land use plans and strengthen inherent pro-crane conservation practices such as the prioritisation of wetlands as zones that require protection in the event of a fire outbreak. From a resource governance perspective, social control mechanisms enforced by village committees seem to be strong enough and implicitly suppress haphazard encroachment into parts of wetlands that are important for cranes. Given that areas earmarked for gardening and grazing are already defined, a window of opportunity to influence future land use patterns exists for the benefit of cranes, building on landscape management mechanisms that have evolved since the communities were resettled in the area. Mapping current and projected land use patterns, involving local community leadership structures, about active and potential crane breeding sites could provide insights on wetlands that should be managed with the intention to secure crane breeding sites.

Community attitudes towards cranes that reflect positive neutrality ("*we do not harm cranes, but they would be better off if relocated to another place*") and altruism ("*we do not harm BirdLife's birds*") are the second entry point. These positive attitudes evolved through interactions with conservation facilitators and the community which, in turn, contributed to the emergence of a common understanding around the need to protect cranes. Such human-human relationships are a necessary condition for the success of conservation projects facilitated by governmental and non-governmental organisations (Madden 2004; Nyhus 2016). This points to the need for the facilitators (in this case BirdLife Zimbabwe staff) to remain relevant, reputable and socially connected to the community. The emergence of positive attitudes towards cranes, spurred by BirdLife Zimbabwe initiatives also highlights the feasibility of building attachment to species and shared symbolic values of landscapes and habitats thereof. These cognitive outcomes could be strengthened through educative and celebratory events that entrench a sense of pride, common identity as custodians of cranes and enjoyable collective memories for the communities. Such events could either coincide with specific phases in the Wattled Cranes' breeding and flocking cycles or be tied to specific conservation successes such as the successful fledging of chicks. It is also logical to have simple rewarding techniques (e.g., certificates of appreciation; prizes; educational trips for children; festivals to celebrate cranes) to acknowledge individuals and groups that champion pro-crane conservation behaviour. These approaches, which lead to collective inspiration of communities, have been used to protect threatened species in human-dominated landscapes (e.g., Bowen-Jones and Entwistle 2002; Van der Ploeg *et al.* 2011; DeWan *et al.* 2013).

Having defined two entry points, the next step is to focus on defining ways to addressing factors contributing to the degradation of crane habitats. In this regard, one pertinent issue that warrants attention is the lack of social capital to address common environmental problems. Although evidence of social capital in village-based fire management was documented, communities were not united in

action to address dam wall erosion. Although they attached the same socioeconomic values to dams, the initiative to take collective responsibility to repair the eroded walls or put in place mitigating measures in anticipation of possible erosion was lacking. Evidence of conservation projects, facilitated by non-governmental organisations, successfully triggering social capital building processes at community level leading to positive livelihoods and conservation outcomes, have been documented (Lansig 2009; Nath *et al*. 2010). The thrust of such processes is on creating platforms for communities to appreciate benefits that accrue from collective action in natural resource management. In the Driefontein Grasslands, it would entail working with the communities to demonstrate the success of community-driven solutions to local environmental problems (self-efficacy) while at the same time opening new communication lines among relevant actors identified during the analysis. Acceptability and effectiveness of ecosystem restoration projects are both enhanced if the initiatives are designed to tangibly restore declining ecosystem services that are collectively valued by local stakeholders (Clewell and Aronson 2005; Aronson *et al*. 2006). To address dam wall erosion, it is important to facilitate unity and common purpose among local communities (bonding social capital) and create platforms for connecting communities to relevant service providers (bridging social capital).

Given that some of the threats to cranes documented in this study can be attributed to common practices by individuals and households from different villages, it is important to place the community (cluster of villages) as the broad social unit around which conservation interventions are planned. However, experiences from some field projects have shown that greater conservation impact is attained through intentional targeting of specific primary actors behind threats to species and habitats (Hermans 2008; Jepson *et al*. 2011). In this case, engaging individuals, households and sub-groups within the community behind threats identified through the actor-based analysis is imperative. Engaging the right actors provides a sound basis to linking actions to threat reduction, making conservation impacts trackable, generating evidence-based lessons. Already, two community gardening projects established in Daviot and Shashe are widely cited by the communities as their desirable options for balancing livelihoods and conservation. This acknowledgement of compatibility between specific livelihood interventions and conservation actions could form the basis of species and habitat stewardship ethic which spurs communities to exercise restraint to avoid harm to species and avoid practices that degrade habitats collectively (Roach *et al*. 2006; Raymond *et al*. 2016). It would also be logical to consider targeting specific clusters of households to address specific threats that emanate from their collective use of wetland resources (e.g., households using one dam site). Active involvement of primary actors to enable them to appreciate and track the linkages between their collective environmental actions and species conservation is critical in line with emerging community-based monitoring principles (Conrad and Hilchey 2011; Sheil *et al*. 2015). To this end, community-based monitoring of simple but specific conservation impact indicators such as nesting success, chick survival and fledging success could be promoted.

Competition between cranes and humans for space in wetlands will remain a challenge in the Driefontein Grasslands, as the demand for arable escalates due to human population increase. While it makes sense to invest in conservation interventions that leave or maintain suitable habitats for cranes as elaborated earlier, it is worthwhile to promote innovation in land use and water utilisation to chart new pathways for securing crane habitats. Actor-based analyses revealed that households make decisions on wetland gardening after considering the availability of raw materials, labour requirements and market-related factors. Unfortunately, the decisions they make regarding wetland utilisation have negative impacts on cranes and their habitats. This points to the need to explore innovative technological solutions to not only reduce pressure on the wetlands but reduced excursions into wetland areas. Technological innovations to improve water use efficiency are a practical option that farmers could adopt. Cost-benefit analyses of four gardening options showed that switching to homestead gardens would translate into increased disposable time for households. Although the initial cost would be high, if drip irrigation technologies were introduced in homestead gardens, for instance, the annual operational costs of gardening would be significantly reduced. The process of introducing such technologies would inherently entail changing mindsets about gardening (social innovation) for local communities to realise a wide spectrum of livelihoods currently overdriven by traditional practices and beliefs. Such innovative approaches that contribute to improved resource use efficiency, increased productivity and reduced human footprint on ecosystems as a response to environmental change are gaining prominence globally (Kitzes *et al*. 2008; Scherr and McNeely 2007). These innovations would need to be promoted across the landscapes where cranes are found through the promotion of participatory social learning and experimentation.

The conservation interventions proposed above are, by no means, exhaustive. They illustrate the general gist of actions that typically emanate from the actor-based approach. The proposed actor enjoyment approaches provide platforms for building on incremental site- or village level successes in a cost-effective manner and creating room for external project facilitators and communities to

adapt, build trust and develop common long-term visions for creating a multifunctional landscape that meets the needs of communities and secures the future of cranes. This is in line with recommendations by Zanen and De Groot (1991), Bouwen and Tailleu (2004) and Armitage *et al*. (2008) for enhancing participation and shared learning in natural resource management in rural communities.

3.5. Conclusions

Since the early 2000s, when the Driefontein Grasslands were targeted for resettlement, patterns of direct and indirect interactions between Wattled Cranes and people have evolved. The interactions have spatial and temporal dimensions that are mainly influenced by livelihood practices (gardening and livestock rearing routines), conservation values and attitudes towards species (liked BirdLife Zimbabwe's conservation outreach) and local resource management institutions (rooted in customary and political systems). Evidently, species is not associated with any negative phenomena that may create negative attitudes among local communities. However, the species' survival is impinged upon by poor land management practices (unregulated grazing), negative environmental behaviour (setting fires recklessly) and community inaction (no dam maintenance and rehabilitation) that contributes to habitat degradation during the nesting and chick-rearing stages.

This chapter presents an integrated conservation research and planning approach, the first to be applied in a landscape that supports nationally significant Wattled Crane populations, to gain a better contextual understanding of the social causation chains behind threats to the species and its habitats. The methodological approach provides a platform for stakeholders (primary actors and relevant agencies) to define key tenets of conservation interventions, building on existing social capital and acknowledging the role of government agencies and other external organisations. The findings demonstrate that gaps in conservation programmes and, by extension, actions that may not be properly aligned with the required threat reduction processes for effective species and habitat conservation can be identified through the approach. The chapter also highlights some of the methodological disconnects that may arise if species and habitat conservation planning are solely rooted in theory-based approaches without taking due cognisance of the local context. The findings point to the need for framing conservation actions in such a way that they are linked to processes for reducing threats to species and habitats, leveraging inherent opportunities in local institutional frameworks and communities' conservation attitudes. As this study demonstrates, all these insights for evidence-based conservation planning can be drawn from rich narratives provided by primary and secondary actors.

One central methodological contribution of this study is that it confirms that isolating each interface mechanism exposes a broad spectrum of opportunities, requirements, costs, expectations, risks and constraints, thereby giving project planners and implementers a rich picture that informs the design of a community-based crane and wetland conservation programme. Taking into consideration the need to prioritise practical actions to reduce threats to cranes and wetlands and acknowledging the need to integrate human dimensions into the conservation interventions, five strategic thematic areas that could form the basis upon which community-based conservation action should be based can be discerned. They are: (1) strengthening attitudes towards cranes and values attached to wetlands, (2) supporting inherent local resource management institutions that are positively contributing to the maintenance of wetlands as suitable crane habitats, (3) facilitating collective actions to maintain ecosystem services provided by wetlands for sustaining livelihoods and habitats, (4) promoting appropriate technologies and practices to reduce community reliance on wetland-based crop production and (5) creating platforms for shared learning among local communities and supportive agencies for ownership and sustainability of conservation interventions.

References

Adams, W. M. and Hutton, J. (2007). People, parks and poverty: Political ecology of biodiversity conservation. Conservation and Society 5(2): 147–183.

Armitage, D., Marschke, M., and Plumer, R. (2008). Adaptive co-management and the paradox of learning. Global Environmental Change 18(1): 86–98.

Aronson, J., Clewell, A. F., Blignaut, J. N., and. Milton, S. J. (2006). Ecological restoration: A new frontier for nature conservation and economics Journal for Nature Conservation 14: 135–139.

Bebbington, A. (1999). Capitals and capabilities: A framework for analyzing peasant viability, rural livelihoods and poverty. World Development 27(12): 2021–2044.

Beilfuss, R. D., Dodman, T. and Urban, E. K. (2007). The status of cranes in Africa in 2005. Ostrich 78(2): 175–184.

Bennett, N. J., Whitty, T. S., Finkbeiner, E., Pittman, J., Bassett, H., Gelcich, S., and Allison, E. H. (2018). Environmental stewardship: A conceptual review and analytical framework. Environmental Management (2018) 61: 597–614.

BirdLife International. (2013). Species factsheet: Balearica regulorum. http://www.birdlife.org/datazone/speciesfactsheet.php?id=2785.

Bouwen, R. and Taillieu, T. (2004). Multi-party collaboration as social learning for interdependence: Developing relational knowing for sustainable natural resource management. Journal of Community and Applied Psychology 14: 137–153.

Bowen-Jones, E., and Entwistle, A. (2002). Identifying appropriate flagship species: the importance of culture and local contexts. Oryx 36(2): 189–195.

Carter, N. H., Shrestha, B. K., Karkic, J. B., Pradhan, N. M. B., and Liua, J. (2012). Coexistence between wildlife and humans at fine spatial scales. PNAS 109(38): 15360–15365.

Childes, S. and Mundy, P. J. (2001). Zimbabwe. In Fishpool, L. D. C. and Evans, M. (eds)., Important Bird Areas in Africa and Associated Islands: Priority Sites for Conservation. Pisces Publications, Cambridge.

Chirara, C. (2011). The status of the Wattled Crane in the Driefontein Grasslands of Zimbabwe. Honeyguide 57(1): 10–14.

Clewell, A. F. and Aronson, J. (2005). Motivations for the Restoration of Ecosystems. Conservation Biology 20(2): 420–428.

Colding, J., and C. Folke. (1997). The relations among threatened species, their protection, and taboos. Conservation Ecology [online]1(1): 6. http://www.consecol.org/vol1/iss1/art6.

Conrad, C. C. and Hilchey, K. G. (2017). A review of citizen science and community-based environmental monitoring: issues and opportunities. Environ Monitoring Assessment 176(1–4): 273–291.

De Groot, W. T. (1992). Environmental Science Theory: Concepts and methods in a one-world, problem-oriented paradigm. Elsevier Science Publishers. Amsterdam.

De Groot, W. T. and Tadepally, H. (2008). Community action for environmental restoration: a case study on collective social capital in India. Environment, Development and Sustainability 10(4): 519–536.

Dearborn D. C. and Kark, S. (2009). Motivations for conserving urban biodiversity. Conservation Biology 24(2): 432–440.

Elster, J. (1989). Nuts and bolts for the social sciences. Cambridge University Press, New York.

Fabricius, C., Folke, C., Cundhill, G. and Schultz, L. (2007). Powerless spectators, coping actors, and adaptive co-managers: A synthesis of the role of communities in ecosystem management. Ecology and Society 21(1): 29. http://www.ecologyandsociety.org/vol12/iss1/art29/.

Fischer, J., Abson, D. J., Butsic, V., Chappell, M. J., Ekroos, J., Hanspach, J., Kuemmerle, T., Smith, H. G., and von Wehrden, H. (2014). Land sparing versus land sharing: Moving forward. Conservation Letters 7(3): 149–157.

Fishpool L. D. C. and Evans, M. (eds). (2001). Important Bird Areas in Africa and Associated Islands: Priority Sites for Conservation. Pisces Publications, Cambridge.

Foli, S., Ros-Tonen, M. A. F., Reed, J., and Sunderland, T. (2018).Natural resource management schemes as entry points for integrated landscape approaches: Evidence from Ghana and Burkina Faso. Environmental Management 62: 82–97.

Haggith, M., Muetzelfeldt, R. I. and Taylor, J. (2003). Modelling decision-making in rural communities at the forest margin. Small-scale forest economics. Management and Policy 2(2): 241–258.

Hardin, G. (1968). Tragedy of the commons. Science 162(3859): 1243–1248.

Hare, D., Blossey, B., Reeve, H. K. (2018). Value of species and the evolution of conservation ethics. Royal Society Open Science 5: 181038. http://dx.doi.org/10.1098/rsos.181038.

Hausmann, A., Slowton, R., Burns, J. K. and Di Minini, E. (2015). The ecosystem service of sense of place: benefits for human well-being and biodiversity conservation. Environmental Conservation 43(2): 117–127.

Hermans, L. M. (2008). Exploring the promise of actor analysis for environmental policy analysis: lessons from four cases in water resources management. Ecology and Society 13(1): 21. http://www.ecologyandsociety.org/vol13/iss1/art21/.

Hill, C.H. (2004). Farmers' Perspectives of Conflict at the Wildlife–Agriculture Boundary: Some lessons learned from African Subsistence Farmers. Human Dimensions of Wildlife 9(4): 79–286.

Hockey, P. A. R., Dean, W. R. J. and Ryan, P. G. (eds.). (2005). Roberts birds of Southern Africa, 7th Edition. The Trustees of the John Voelcker Book Fund, Cape Town.

Hulme, D. and Murphree, M. (1999). Communities, wildlife and the 'new conservation' in Africa. Journal of International Development 11(2): 277–285.

Irwin, M. P. S. (1981). The birds of Zimbabwe. Quest Publishing, Salisbury.

Jepson, P., Barua, M. and Buckingham, K. (2011). What is a conservation actor? Conservation and Society 9(3): 229–235.

Kabii, T. and Horwitz, P. (2006). A review of landholder motivations and determinants for participation in conservation covenanting programmes. Environmental Conservation 33(1): 11–20.

Kitzes, J., Berlow, E., Conlisk, E., Erb, K., Iha, K., Martinez, N., Newman, E. A., Plutzar, C., Smith, A. B. and Harte, J. (2017). Consumption-based conservation targeting: Linking biodiversity loss to upstream demand through a Global Wildlife Footprint. Conservation Letters 10(5): 531–538.

Lansing, D. (2009). The spaces of social capital: Livelihood geographies and marine conservation in the Cayos Cochinos Marine Protected Area, Honduras. Journal of Latin American Geography 8(1): 29–54.

Madden, F. (2004). Creating coexistence between humans and wildlife: Global perspectives on local efforts to address human–wildlife conflict. Human Dimensions of Wildlife 9: 247–257.

Manfredo, M. and Dayer, A. (2004). Concepts for Exploring the Social Aspects of Human–Wildlife Conflict in a Global Context. Human Dimensions of Wildlife 9(4): 1–20.

Marchini, S. (2014). Who's in conflict with whom? Human dimensions of the conflicts involving wildlife. In Verdade, L. M., Lyra-Jorge, M. C., and Piña, C. I. (eds.), Applied Ecology and Human Dimensions in Biological Conservation. doi: 10.1007/978-3-642-54751-5_13.

Nath, T. K., Inoue, M., and Pretty, J. (2010). Formation and function of social capital for forest resource management and the improved livelihoods of indigenous people in Bangladesh. Journal of Rural and Community Development 5(3): 104–122.

McNeely, J. A., and Scroth, G. (2006). Agroforestry and biodiversity conservation – traditional practices, present dynamics, and lessons for the future. Biodiversity and Conservation 15: 549–554.

Meine, C. D. and Archibald, G.W. (eds.). (1996). The Cranes: Status survey and conservation action plan. IUCN, Gland and Cambridge.

Miller, J. R. (2005). Biodiversity conservation and the extinction of experience. Trends in Ecology and Evolution 20(8): 430–434.

Mundy, P.J., Morris, A. and Hougard, P. (1984). Aerial survey for Wattled Cranes, 1983. Honeyguide 30: 98–104.

Nyhus, P. J. and Tilson, R. (2004). Characterizing human-tiger conflict in Sumatra, Indonesia: implications for conservation. Oryx 38(1): 68–74.

Ostrom E. (1990). Governing the commons: The evolution of institutions for collective action. Cambridge University Press, New York.

Pahl-Wostl, C., Sendzimir, J., Jeffrey, P. Aerts, J. Berkamp, G. and Cross, K. (2007). Managing change toward adaptive water management through social learning. Ecology and Society 12(2): 30. http://www.ecologyandsociety.org/vol12/iss2/art30/.

Paterson, B. (2006). Ethics for wildlife conservation: Overcoming the human–nature dualism. BioScience 56(2): 144–150.

Raymond, C. M., Bieling, C., Fagerholm, N, Martin-Lopez, B. and Plieninger, T. (2016). The farmer as a landscape steward: Comparing local understandings of landscape stewardship, landscape values, and land management actions. Ambio 45(2): 173–184.

Reyers, B., Roux, D. J., Cowling, R. M., Ginsburg, A. E., Nel, J. L, and O' Farrell, P. (2010). Conservation planning as a transdisciplinary process. Conservation Biology 24(4): 957–965.

Riley, E. (2007). The human-macaque interface: Conservation implications of current and future overlap and conflict in Lore Lindu National Park, Sulawesi, Indonesia. American Anthropologist 109(3): 473–484.

Roach, C. M., Hollis, T, I., McLaren, B. E. and Bavington, D. L. Y. (2006). Ducks, bogs and guns. A case study of stewardship ethics in Newfoundland. Ethics & The Environment 11(1): 43–70.

Shackelford, G. E., Steward, P. R., German, R. N., Sait, S. M., and Benton, T. G. (2015). Conservation planning in agricultural landscapes: Hotspots of conflict between agriculture and nature. Diversity and Distributions 21: 357–367.

Sheil, D., Boissière, M. and Beaudoin, G. (2015). Unseen sentinels: local monitoring and control in conservation's blind spots. Ecology and Society 20(2): 39. http://dx.doi.org/10.5751/ES-07625-200239.

Scherr, S. J. and McNeely, J. A. (2007). Biodiversity conservation and agricultural sustainability: towards a new paradigm of 'ecoagriculture' landscapes. Philosophical Transactions of the Royal Society 363: 477–494.

Sutherland, W. J., Dicks, L. V., Ockendon, N. and Smith, R. K. (2015). What works in conservation. Open Book Publishers, Cambridge.

Sutherland, W. J., Pullin, A. S. Dolman P. M. and Knight T. M. (2004). The need for evidence-based conservation. Trends in Ecology and Evolution 19(6): 305–308.

Treves, A., Wallace, R.B., Naughton-Treves, L. and A. Morales. (2006). Co-managing human-wildlife conflicts: a review. Human Dimensions of Wildlife 11: 383–396.

Van der Ploeg, J., Cauilan-Cureg, M., van Weerd, M and De Groot, W. T. (2011). Assessing the effectiveness of environmental education: mobilizing public support for Philippine crocodile conservation. Ecology Letters 4: 313–323.

Vayda, A. (1983). Progressive contextualisation: Methods for research in ecology. Human Ecology 11: 265–281.

Vayda, A. and Walters, B. (1999). Against political ecology. Human Ecology 27(1): 167–179.

Walters, B. and Vayda, A. P. (2009). Event ecology, causal historical analysis, and human-environment research. Annals of the Association of American Geographers 99(3): 534–553.

Weeks, R., Pressey, R. L., Wilson, J. R., Knight, M., Horigue, V., Abesamis, R. A., Acosta, R. and Jompa, J. (2014). Ten things to get right for marine conservation planning in the Coral Triangle. F1000Research 3. doi: 10.12688/f1000research.3886.3.

White, P. C. L. and Ward, A. I. (2011). Interdisciplinary approaches for the management of existing and emerging human–wildlife conflicts. Wildlife Research 37(8): 623–629.

Whitehead, A. M., Kujala, H., Ives, C. D., Gordon, A., Lentini, P. E., Wintle, B. A., Nicholson, E. and Raymond, C. M. (2011). Integrating biological and social values when prioritizing places for biodiversity conservation. Conservation Biology 28(4): 992–1003.

Zafirovski, M. (2003) Human rational behaviour and economic rationality. Electronic Journal of Sociology 7(2): 1–33.

Zanen, S. M. and De Groot, W. T. (1991). Enhancing participation of local people: Some basic principles and an example from Burkina Faso. Landscape and Urban Planning 20(1–3): 151–158.

4

Community members assessing the condition of a section of the Saiwa Wetland used by cranes for breeding

Twenty-five years of community-led crane and wetland conservation: Learning from social processes in western Kenya

Abstract

This chapter presents results of an analysis of the social dimensions of a crane and wetland conservation project spearheaded by local communities in western Kenya. It presents narratives of approaches used to prompt local action to curb the degradation of wetlands and save cranes over 25 years. Lessons on the effectiveness of community-led conservation are drawn from the analysis, with a focus on the role of transformational leadership in conservation, approaches for building and sustaining local institutions for species and habitat stewardship and ways to align community-led project interventions with desired conservation impacts.

4.1. Introduction

4.1.1. Conservation in human-dominated landscapes

Conservation in human-dominated landscapes is a challenge because, in most cases, it entails dealing with complex social issues, including finding alternatives to livelihood activities causing habitat degradation, regulating resource extraction patterns and introducing new conservation agendas into the day-to-day routines of local communities (Western 2000; Miller and Hobbs 2002; Chazdon *et al*. 2009). These actions, often driven by external facilitators, are not always aligned with prevailing land use priorities, practices and preferences (Kaimowitz and Sheil 2007; Game *et al*. 2011). This predicament leads to the contemporary question: How can threatened species and ecosystems be conserved in a way that addresses the needs of local communities while meeting the ecological requirements of species targeted for conservation? (Ban *et al*. 2013; Brooks *et al*. 2013). Gathering empirical evidence to learn from conservation initiatives in human-dominated landscapes where species of conservation concern are found is one way of generating answers to the question. The overall objective of this chapter is to draw evidence-based lessons on the effectiveness of community-led conservation approaches through an analysis of field experiences from the Kipsaina Crane and Wetland Conservation Project (hereafter referred to as the project), a community-led initiative started in 1990. The primary goal of the project is to prevent local extinction of the Grey Crowned Crane *Balearica regulorum* and maintain the ecological integrity of wetlands that provide breeding habitats to the species. This evaluative study was conducted to contribute to the generation of knowledge on the merits and shortcomings of conservation approaches that emphasize local community participation in project planning, implementation, monitoring, evaluation and adaptation.

4.1.2. Community participation as a condition for project success

Conservation projects that are initiated and primarily led by local communities are receiving attention as efforts to halt biodiversity loss across the globe intensify. Since the 1980s, community participation has increasingly been recognised as one of the preconditions for effective conservation of natural resources (Drijver 1991; Pomeroy and Carlos 1997; Brooks *et al*. 2013). Community participation is generally conceptualised as a continuum defining the degree of involvement of social groups (e.g., users of shared natural resources) in decision-making and practical action to address problems that affect them (Drijver 1991; Beaumont 1997; Cornwall 2008). One form of participation, often placed at the desired end of the continuum, is signified by cases of communities that identify problems impacting the environment and their well-being and take the initiative to develop and implement solutions to the problems. This is defined as self-mobilisation (Pretty 1995; Evely *et al*. 2011).

Decades after the term "community participation" became a buzzword in conservation and development, the role of communities in project planning, implementation and evaluation continue to receive research scrutiny (Gezon 1997; Cleaver 1999; Luyet *et al*. 2012). The contentious issue has been whether conservation projects can be designed, monitored and evaluated effectively by communities without the technical guidance of external facilitators working for NGOs or governmental agencies (Brown 2002; Campbell and Vainio-Mattila 2003). In recent decades, however, successful projects primarily initiated and led by local communities have been acknowledged. These community-led projects have been documented in the community development sector (e.g., Korten 1980; Mansuri and Rao 2004; Harvey and Reed 2006), with some examples emerging in the conservation sector too (e.g., Bray *et al*. 2004; Porter-Bolland *et al*. 2011; Colquhoun 2015). Though some of them receive financial and technical support from external organisations, community-led projects remain highly autonomous in terms of management and decision making and are, in most cases, led by influential members of the community (Kontogeorgopoulus 2005; Dasgupta and Beard 2007). The leadership, management and activities of the Kipsaina Crane and Wetland Conservation Project reflect strong elements of community self-mobilisation.

4.1.3. Community-led conservation

Community-led conservation falls under the umbrella of community-based conservation, as they are principally aimed at empowering resource user communities to take charge of the management of natural resources to maintain ecosystem values, functions and benefits derived thereof (Brown 2002). Community-led conservation has been brought into the spotlight because it provides opportunities to address conservation challenges in landscapes that lie outside formally protected areas (Kaimowitz and Sheil 2007; Chazdon et al. 2009; Evely *et al*. 2011). Diverse merits and demerits of community-based projects have been put forward by researchers. Arguments in support of such projects include the creation of platforms for: (1) shaping institutions for improved resource conservation (Pretty and Smith 2004; Tai 2007), (2) motivating communities to appreciate the value of species and take action to resolve human-wildlife conflict (Treves *et al*. 2006; Dickman 2010), and (3) improving communities' environmental knowledge, attitudes and behaviour (Mehta and Heinen 2001; Lepp and Holland 2006). On the other hand, the downsides cited in literature include the challenges of attaining collective agreement on resource use and joint environmental action since communities comprise individuals and groups with divergent interests (Songorwa 1999; King 2007), pitfalls of prioritising human welfare over wildlife conservation issues (Brown 2002; Chan *et al*. 2007), and complexities of enforcing regulations for species and habitat protection under common property resource management systems (Agrawal 2001; Berkes 2004). These positive and negative arguments highlight the importance of contextualising and gaining a sound understanding of the social dimensions of conservation.

4.1.4. Conservation as a social process

Globally, conservation is now recognised as a social process, involving interactions, collective decision making, prioritisation processes and commitment to actions by natural resource users and other actors (Brechin *et al*. 2002; Wilhusen 2009). There is common agreement among conservation researchers that these factors, that may enhance or reduce the effectiveness and sustainability of conservation projects, can only be well understood if the social processes are well documented and analysed (Knight *et al*. 2010; Wadley *et al*. 2010). Analysing the social process entails taking a closer look at how, when and why individuals and community groups interact and how their interactions lead to institutional and conservation outcomes (Brechin *et al*. 2002, Richie *et al*. 2012; Chapman 2014). Analysing social processes also helps untangle complexities associated with the interface between communities and the concerned resources (Gottret and White 2000; Blaikie 2006). Ultimately, conservation initiatives can only be said to be sustainable if they are successfully embedded into the social processes of local communities (Shrestha and McManus 2007; Wadley *et al*. 2010). Evaluation of social processes to understand how species and habitat conservation outcomes evolve and identify factors that either enable or constraint project success is an approach used in contemporary species and habitat conservation research (Clark and Wallace 1998; Brechin *et al*. 2002, Richie *et al*. 2012; Chapman 2014).

4.1.5. An overview of the Kipsaina Crane and Wetland Conservation Project

The remainder of the present section gives a broad overview of the Kipsaina Crane and Wetland Conservation Project. The overview is a consolidation of information drawn from unpublished project reports, verbal accounts of the history of the project provided by the leader of the project (Maurice Wanjala, hereafter referred to the Project Leader) and field observations by the author (see the next section). The Project Leader and his team of advisors maintain records of field activities, events and achievements, some dating back to the early 1990s.

Since 1990, project activities were implemented in western Kenya under the auspices of the Kipsaina Crane and Wetland Conservation Group. The group was registered as a community-based organisation in 1991. The group's initial aim was to raise awareness of the need for the local community around Saiwa Swamp National Park to take action to address environmental problems that were impacting negatively on wetland functions and species. The group adopted the Grey Crowned Crane as their flagship species but also advocated the protection of the Sitatunga *Tragelaphus spekii* and the DeBrazza's Monkey *Cercopithecus neglectus*. They lobbied for community action to address the degradation of wetland ecosystems as a result of agricultural encroachment, planting of eucalyptus in wetlands, and overharvesting of wetland plants, uncontrolled fires and deforestation of riverine forests. Between 1990 and 2003, the group's outreach activities were focused on the communities around Saiwa Swamp National Park. After 2003, the project focal area expanded to include seven other districts (now referred to as counties). Over the years, the group's main activities have revolved around (*i*) environmental education outreach targeting schools and community groups, (*ii*) promotion of income-generating projects as alternatives to wetland utilisation, (*iii*) wetland ecosystem restoration through re-introduction of indigenous trees and, (*iv*)

community-enforced regulations and monitoring of the three species stated above. The clustering of the main project activities into these four intervention areas is based on the common themes that emerged during interviews with project members. Most of the funding the group has to date received came from the International Crane Foundation. A timeline showing major achievements and notable developments over the 25 years is shown in Table 4.1.

Table 4.1. Timeline showing project milestones since 1990

Year	Milestone
1990	Kipsaina Crane and Wetland Conservation Group formed
1991	Kipsaina Crane and Wetland Conservation Group registered as a self-help group
1993	Tree nursery established at Kipsaina Village
1997	Success in halting wetland encroachment at the Kipsaina Section of Saiwa Wetland
2002	Funds received from Disney Wildlife Conservation Fund
2006	Kipsaina Crane and Wetland Conservation Group wins Equator Award (first runner up)
2009	Beginning of annual financial support from ICF ($10,000 annually for the next three years)
2012	Expansion of project focal area to include Kingwal Swamp

Since its inception, Maurice Wanjala has led the project. His main responsibilities include taking the lead in activity planning and supervision of all project activities. Apart from leading community engagement and collective actions, he also acts as the project's liaison with government officials, donors, researchers and technical supporters. Under the group's constitution, the Project Leader is assisted in making decisions by a five-member steering committee. The committee members are elected by the community, with individuals that have participated in projects for at least five years being eligible for election. The steering committee approves budgets of field activities and meets once every three months to assess project progress. Occasionally, the committee members provide field support to the Project Leader during routine crane monitoring activities, visits to livelihood project sites and environmental education and awareness outreach in schools. Technical support and advice on conservation action have, over the years, been provided by staff from the International Crane Foundation (ICF), working in partnership with the Endangered Wildlife Trust (EWT). The Project Leader and the steering committee have also benefitted from technical training and capacity building programs by organisations such as the Kenyan Government, World Wildlife Fund (WWF) and the United Nations Development Programme (UNDP).

The project is Africa's pioneering Grey Crowned Crane conservation initiative in human-dominated landscapes (Archibald[22] *pers comm*). Since it has been running for over 25 years, it provides opportunities for research to generate insights on how community-led conservation fares in ensuring the survival of species and maintenance of suitable habitats outside formally protected areas. It also provides an opportunity to evaluate the effectiveness of community-led projects under a myriad of unfavourable contextual factors, including limited external funding, no cultural and economic incentives for species conservation and minimal support from state agencies. It has received international awards, including the first runner-up position in the Equator Award contest in 2006. It has attracted research teams comprising ecologists, botanists and hydrologists from local and international universities. It has been described in the media locally and internationally as a model that provides lessons for other communities (e.g., British Broadcasting Corporation documentary produced in 1996 and profiling on the United Nations Development Programme Equator Initiative portal).

Despite the publicity and interest from ecological researchers, not much attention has been paid to the social dimensions of the project. Linkages between the social processes and conservation outcomes had not been documented and analysed. This chapter, therefore, fills the knowledge gap. Elaborating on the basic research question posed in Chapter 1, this chapter addresses this knowledge gap by answering the following questions:

1) What social processes unfolded as the project evolved over 25 years?
2) What were the notable environmental impacts (species and habitat conservation) linked to the social processes?
3) What social and institutional factors contributed to the realisation of the ecological impacts?
4) What lessons can be drawn from the case study on ways to integrate social dimensions into conservation project planning processes?

4.1.6. Characteristics of the project area

[22] Dr. George Archibald is the co-founder of the International Crane Foundation. An avian biologist by profession, he spearheaded the identification of individuals who led crane conservation projects in Africa and Asia over a 40-year period. He has been instrumental in raising funds for the Kipsaina Crane and Wetland Conservation Project since 1993.

The project area straddles five counties in the Lake Victoria Basin: Bungoma, Busia, Nandi, Trans Nzoia and Uasin Gishu. All five counties are located in the western region of Kenya (Fig 4.1). Despite the extensive transformation of wetlands into agricultural fields, the area still provides breeding habitats for cranes. Conservation actions are targeted at three large wetland systems (Busia Swamp, Kingwal Swamp, Saiwa Wetlands) as well as isolated wetlands on privately owned farms. These wetlands provide breeding habitats for cranes, especially where sedges, rushes and typha still predominate. Though fragmented remnants of riverine forests are found, eucalyptus plantations are increasingly becoming a dominant feature at the wetland edges. Due to reliable rainfall patterns and fertile soils, most farmers grow maize and wheat for home consumption and sale. The area experiences bimodal rainfall patterns with the wettest period being March-May, and a shorter season between September and November. The average annual rainfall is 1100 mm.

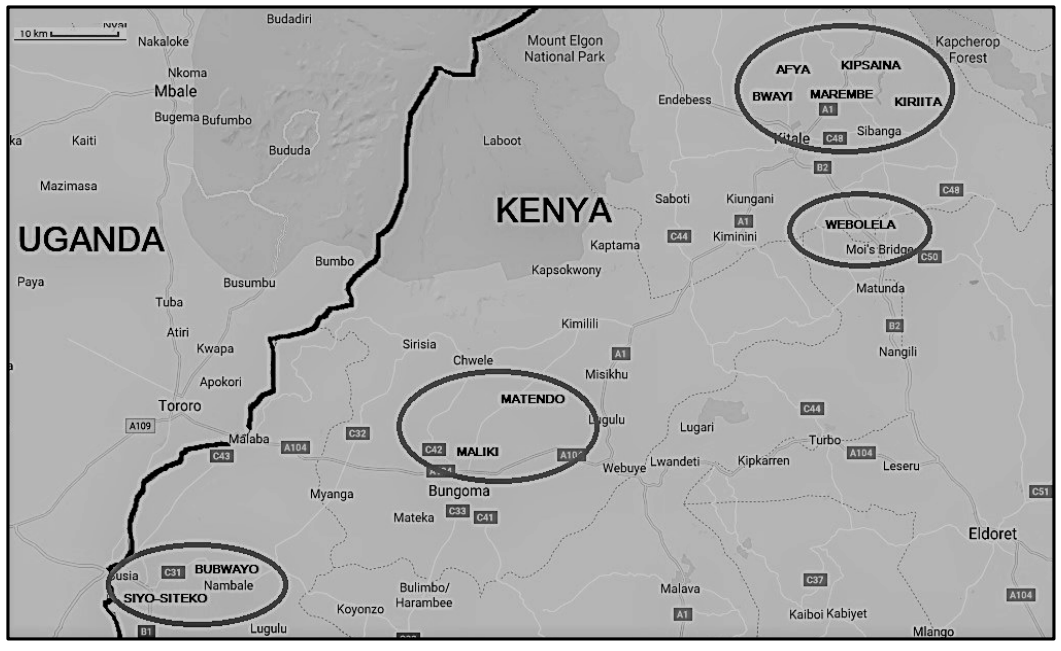

Fig 4.1. Location of village clusters (encircled) covered by the project

Historically, the project area was inhabited by the Kalenjin, Luhya and Bukusu people. Migration into the area by other tribal groups in the early years after independence (1963–1973) led to the ethnic diversity in the villages that form part of the project area. Generally, households fall into three socio-economic classes: (1) an upper class comprising the rich households residing in towns, owning businesses and large farms, (2) a middle class usually owning small farms and engaged in small-scale trading, and (3) the poor landless families and generated income through petty trading and working as labourers.

The area was previously administered by district councils, which were delineated into counties following the new constitution in 2012. Human settlements can be categorised into villages and residential zones around rural business centres and towns. Management of natural resources is governed by state-based environmental regulations as well as customary institutions, with chiefs and village heads playing a major role. Much of the land is subdivided into privately owned farms, but patches of communal land remain as well. Rain-fed crop production and cattle production (mainly dairy cows) are the common farming systems. Household food gardens on wetland fringes and riverbanks are common. Cattle provide draught power and manure and are used as an investment that can be converted to cash when the need arises. Employment opportunities and markets for agricultural products are found at the business centres and towns. Village elders and politically appointed chiefs are responsible for maintaining social order in the community.

Land transfer is done through transactions between owner and prospective buyer and is registered with the administrative authority. Modern institutions such as burial societies, production identities, credit and collective saving groups and women groups have emerged. Women were previously marginalised and with limited opportunities to form groups for income generation or other purposes. The last two decades have seen the promotion of gender equality in the project area, leading to an increase of platforms for social interaction and collective projects aimed at empowering women.

The Saiwa Swamp National Park is part of the greater Saiwa wetland system. Surveys undertaken in 2012 by the Project Leader revealed that 12 Grey Crowned Crane breeding pairs utilised the Saiwa wetland system. Large crane flocks, numbering hundreds of individuals, have been recorded at Moi and Ziwa Farms (both in Trans Nzoia County), Moi Barracks (Uasin Gishu County) and Baraton University Farm (Nandi County). Kingwal Swamp is home to more than half of the 250 Sitatungas left in Kenya (Kenya Wildlife Service *unpublished data*) and supports over 25 breeding pairs of cranes (Wanjala *unpublished data*).

4.2. Methods

A qualitative research approach was used to retrospectively analyse social processes that characterised the project implementation between 1990 and 2014. To facilitate the collection of comprehensive data from the field, a mixed method approach, involving a combination of semi-structured interviews, focus group discussions, researcher observation and content analysis, was used. Field data collection was conducted in three phases. Following initial visits to collect data on human-crane interactions in 2011, data collection as part of this evaluative study started in 2012. First, a week-long reconnaissance trip to the study area was undertaken in October 2012 to better understand the project thematic focus, map the geographical focal area and the profile of target community groups. During the trip, background information on the evolution and operations of the project was collected through informal discussions with project steering committee members, traditional leaders, agricultural, forestry and environmental officers. The second phase, completed within the first six months of 2013, involved the perusal of project progress reports (compiled by the Project Leader and ICF technical advisors). Technical reports and scientific publications on the project featured on international organisations' websites (e.g., UNDP, ICF) were also reviewed.

The reconnaissance trip and content analyses revealed that social processes and their influence on project impacts and pathways had not been critically analysed. Inspired by a generic social process analytical framework initially developed by Clark and Wallace (1998) and subsequently modified by Clark *et al*. (2009) and Richie *et al*. (2012), a semi-structured questionnaire was designed to provide a structured way of collecting data on social processes that unfolded as the project was being implemented. The generic social process framework enables a researcher to document and analyse community interactions and actions and associated social and environmental outcomes of environmental projects. The framework factors in the embeddedness of conservation in social systems, allowing the determination of social explanations behind project impacts. The explanations include pursuing the "who", "why" and "how" aspects of environmental decisions and actions at community level which enable researchers and practitioners to discern community responses to locally-driven resource management agendas. This also enables the identification of individuals driving change, a range of motivations for community actions, opportunities for and constraints to community-driven agendas.

Based on the generic social process framework described above, data were collected under the following categories: (i) participants and their motivations, (ii) strategies for bring participants together and mobilising action, (iii) decision-making, interaction and action platforms, (iv) social outcomes of interactions and actions, (v) impacts on social relations, cranes and wetlands and (vi) elements of resilience and sustainability. This was done through the questions that are presented in Box 4.1.

Box 4.1. Key questions that guided interviews with respondents during field data collection

1. Who drove the process of community interactions, who was involved, what was the motivation for their involvement, what criteria was used for selecting participants?
2. What strategies were used to bring communities together and promote individual and collective actions? What were the actual actions undertaken?
3. What were the platforms for decision-making, participant interactions and mobilisation of actions by participants?
4. What were the social outcomes (e.g., social relationships, livelihood benefits, social costs, new institutions, evolving social agendas, flow of behaviour)?
5. What were the environmental (general natural resource management) impacts associated with the actions and social outcomes?
6. How were the environmental and social outcomes linked to crane and wetland conservation?
7. Does evidence exist of successful mainstreaming of environmental conservation agendas into social dialogue platforms, social learning and action arenas? Does evidence of resilience of project impacts over time exist?

The seven questions were used as a guide during data collection, targeting villages from which project participants were drawn between 1990 and 2014. The set of questions was transformed into a list of topics for flexible semi-structured interviewing following a qualitative data collection approach articulated by Edwards and Holland (2013). The topics were: (1) Origins, social drivers and motivations of community interactions, (2) Strategies for collective decision-making and actions, (3) Nature and levels of participation, (4) Social outcomes of community interactions and actions, (5) Environmental impacts of community decisions and actions, and (6) Linkages between social outcomes and environmental impacts, and (7) Evidence of project sustainability.

There were 10 community groups affiliated to the Kipsaina Crane and Wetland Conservation Project, namely Afya, Bwayi, Bubwayo, Kipsaina, Kirita, Maliki, Marembe, Matendo, Siyo-Siteko and Webolela. A community group clustering system developed by the Project Leader when planning, implementing and monitoring project activities, was used to stratify and select respondents. Because a cluster was the unit around which project activities were planned and implemented, different group members belonging to one cluster had opportunities to interact and undertake activities jointly. They, therefore, had common knowledge about the various elements of the social processes associated with the project emanating from their shared project experiences. As shown in Fig 4.1, the groups were combined to form four clusters. Afya, Bwayi, Kipsaina and Marembe formed Cluster 1. Clustered 2 comprised Kirita and Webolela. Maliki and Matendo formed Cluster 3. Bubwayo and Siyo-Siteko fell under Cluster 4. The affairs of each cluster were overseen by a five-member committee.

Using the seven topics listed above as departure points for framing questions, interviews were conducted with project committees and non-committee members in each cluster. Cluster committee members holding positions of chairperson, secretary and a non-designated committee member for each cluster were interviewed. Four non-committee members were then randomly selected from a list of project participants (provided by the cluster leaders) and also interviewed. This was done for each of the four clusters. In total, 28 active project members (all adults representing households) were interviewed.

Twenty key informants, defined as individuals holding leadership positions in the community and having knowledge about the project were interviewed. They included two chiefs, five village leaders, ten teachers, the warden of Saiwa National Park and two environmental officers, were interviewed. The project area falls under the jurisdiction of two chiefs and both were interviewed. Five leaders of the villages under which the project area lied were interviewed. Ten primary schools had been engaged in environmental education and awareness activities since the project started. Teachers, one per school, responsible for coordinating the education and awareness activities were chosen as respondents. At the time of this research, there were two environmental officers providing extension services in the project area. The set of seven questions were used as a guide for key informant interviews.

Cluster committee and non-committee members formed the first category of respondents broadly defined as those that intimate knowledge of the project activities and impacts by virtue of having participated actively in the project activities over the years. The second category consisted of villagers that, save for occasionally attending crane conservation awareness meetings, had not actively participated in other project activities over the years. In consultation with cluster leaders, households that were not actively involved in the project were interviewed. Seven households per cluster were randomly selected from a list of non-active households drawn in consultation with cluster leaders. In total, 28 respondents (all adults) under this category were interviewed. Although the set of seven questions were again used as a guide during the interviews, the intention was to elicit their observations and perceptions as non-participants. They were asked to inform the interviewer if they did not have answers to specific questions.

The two-dimensional stratification of the respondents was designed to ensure qualitative data richness, capturing diverse observations and perspectives of project participants and passive households. Since the main goal was to piece together local communities' experiences and observations regarding the project to generate coherent narratives of social processes that had unfolded over the years, the sampling criteria was, by no means, intended to attain quantitative representativeness.

Four focus group discussions, attended by five project members per cluster, were conducted. For each cluster, the chairperson, one committee member and three ordinary project members were

invited. The ordinary members were selected after an initial review of responses captured during face-to-face interviews. Those that had given several responses that were considered notably divergent from the rest were selected. Involving them was therefore in group discussion was a strategy to verify facts and gain a deeper understanding of the unique responses they had given. During the group discussions, each of the seven questions was posed to trigger a discussion, allowing debate and consensus-building on changes that project members had observed over the years. The group discussions took up to two hours.

Interview questions were posed in a way that allowed respondents to narrate their experiences and views on the implementation process and results (short, medium and long term). Semi-structured interviews lasted 40–60 minutes. Questions were posed in English and, when necessary, translated to Kiswahili by a local interpreter. Each interview started with an explanation about the research goal (evaluating the project to improve its performance and impacts) to respondents, with consent to participate in the interview being sought first. Respondents were also informed that about the benefits (from a community perspective) of providing honest responses and were given the assurance that their views and observations would remain confidential.

At the end of each day, the main author would confer with the translator to go through the responses and check for clarity. This process was instrumental in constructing common narratives about the project. Personal observations were recorded during visits to established project infrastructure (tree nurseries, fishery ponds, pottery kilns, beekeeping sites, wetland restoration sites) and transect walks along and across wetlands. Quotations that substantiated specific field observations were also recorded. Trends in crane distribution and population dynamics and observed changes in wetland extent and vegetation structure were used as proxies for ecological conservation impacts. These ecological indicators were then matched with descriptions and explanations for observed changes derived through interviews and group discussions to help understand causality (attribution).

As a first step towards qualitative data analysis, a project timeline was developed and used to chronologically organise project activities and identify key milestones (events marking key successes and strategic decisions). Data were then categorised into common themes and patterns, by intervention, that emerged from responses to the seven questions. The themes and patterns were integrated to form narratives that reflected the local communities' common understanding of the project, highlighting characteristics of social processes that unfolded and contributed to the project's social and ecological impacts. This made it possible to identify key achievements and associated success factors from a social perspective. Since the gist of the research was to discern lessons for conservation planning, project failures were analysed, to identify failure factors.

In the next section, the results are reported through these themes under different interventions.

4.3. Results

Key elements of social processes, as well as the institutional and environmental outcomes of the project between 1990 and 2014, were synthesised. They are presented in this section under four thematic project interventions (tree planting, environmental education and awareness, livelihood interventions and regulation of wetland utilisation). These four themes were discerned from explanations given when respondents were asked to explain the key focal areas over the 25-year period.

4.3.1. Tree planting

Tree planting was a well-recognised aspect of the project, with the narratives by respondents confirming that over the years, the community had grown to associate the project and the Project Leader with tree planting. "*He is the tree man, and everyone associates him with tree planting. Some have even forgotten that he is also a crane man*", explained one teacher from one of the six schools that were engaged over the entire project duration. Tree planting was used as an entry intervention (technology) to generate interest in nature conservation and win the support of target communities and schools. Two factors made it possible for tree planting to be a prominent feature of the project. First, when the project started, the Project Leader was already a tree planting enthusiast, having been trained as a forester and as a tree nursery assistant in the 1980s. Secondly, tree planting had been on the national environmental agenda since the 1970s, with the Kenyan government providing incentives for tree planting around homesteads, farms and degraded open spaces. By including a tree planting agenda, the project facilitators believed they would receive technical support and recognition from the government.

Tree planting activities had three goals: restoration of riverine forests through the planting of indigenous trees on degraded sections of riverine wetlands, improving food household security and incomes through fruit production, and production of hardwood to meet energy needs and timber for crafts and construction. A 500 m^2 tree nursery, located on a piece of land owned by the Project Leader and used a tree propagation demonstration site, was established on the edges of Saiwa wetlands in 1993. An assortment of trees, including fast-growing exotic and indigenous hardwoods, were propagated. Tree propagation was one activity that was undertaken consistently over the years, inspired by the target of "one million trees by 2015".

The nursery provided a platform for local community interaction as school children, youths, and community members met at the site and took part in maintenance work at the nursery. The nursery also became a centre of attraction and learning as visitors were often taken on a tour of the site, with government officials also using it as a venue for demonstrating reforestation activities. Tree seedlings were given to interested individuals and groups for free. Social units that formed the distribution chain of the tree seedlings included individual households, schools, community group centres, churches and government offices. Interviews and visits to sites where trees were planted revealed two contrasting developments. There was evidence that schools took the initiative to ensure high tree survival rates resulting in the emergence of a network of schools that proudly identified themselves as affiliates of the project. Tree seedlings distributed to households and community project sites were meant to have a symbolic value, confirming the household's affiliation to the project. However, the mechanism for tracking survival rates, highlighting benefits that trees could generate and building social connections was not as effective as envisaged. As one steering committee member lamented, giving seedlings to individuals may not have been a good idea because it did not result in collective identity and shared learning among tree seedling recipients. Plans to establish nurseries at other wetland sites did not materialise. This was attributed to the fact that the project had failed to identify individuals with the passion and spirit of volunteerism to establish similar community-managed nurseries in other villages.

As part of wetland restoration, trees were planted on the edges of a river that formed part of the Saiwa wetland system, on a 500 m long stretch previously degraded after the removal of the indigenous riverine forests. Planting was done by pupils from five schools located within 1 km of the wetland and some community volunteers. The aim was to create a 30 m wide buffer zone to improve vegetation cover and reduce erosion on the edges of the wetland. Trees planted in the mid-1990s created collective benefits since the wood harvested from the buffer was used to construct social infrastructure (a school and venue for community events) in 2012. Planting trees to restore indigenous forests was not without social challenges. Due to the prevailing land tenure system, individual households had ownership rights over sections of wetland edges on which trees were planted. This meant that if they choose not to participate in the project, no trees would be planted on their properties. The other challenge was that seedlings were prone to trampling by livestock. On several occasions, replanting had to be done when the seedlings were either uprooted or trampled by livestock. By 2014, an estimated 20,000 seedlings had been planted in various parts of the project area.

The nursery project had some notable social impacts. Individuals from the locality and other counties as well as foreign visitors came to learn about tree planting at the nursery. On average, 50 individuals visit the nursery per annum to learn and receive tree seedlings. As much as tree planting has helped raise the profile of the project, the landscapes where trees are planted, were mostly detached from wetlands. Over the years, tree seedlings have been given for free. The Project Leader often used his own resources (money and vehicle) to ferry trees to schools and community centres.

4.3.2. Environmental awareness in schools and communities

Environmental awareness was introduced because founders of the project believed that the low conservation value attached to cranes and limited knowledge on the importance of wetlands among community members were contributing to threats to cranes and wetlands. As a former youth leader and church organiser, the Project Leader used his influence within local community structures and knowledge of popular platforms for community interactions to identify the entry points and targets of the outreach. This enabled him and his team to build an extensive network of awareness outreach targets. These included primary and secondary schools, church groups, women's self-help groups and volunteer households that were willing to become local ambassadors of crane and wetland conservation. The expectation was that these affiliate groups would not only spread conservation messages but ultimately be empowered to influence decision making environmental conservation matters. They were guided by the motto "touch one, touch all", which, according to the Project Leader, meant that "*if one community member was exposed to conservation message, they would spread it to their peers, relatives and neighbours*".

The awareness outreach targeted at school children and the public was meant to introduce positive attitudes towards cranes and prompt action to address threats to wetlands. To this end, emotive facts about cranes, wetlands and common environmental challenges in the area (wetland degradation, soil erosion, deforestation, loss of habitats of animal species) were disseminated. The outreach activities in schools included environmentally-themed film shows, lectures, drama, poetry, song and dance and drawing competitions. Crane-specific messages were mainly disseminated through factsheets, posters and a documentary on the project made by the British Broadcasting Corporation in 1996. Engagement of the general public was *ad hoc*, with community social events (village meetings, church sessions, national days, weddings) used as platforms for environmental awareness raising. Environmental awareness also took place during farmer field days and environmental events when the Project Leader was given the opportunity to speak about soil erosion control, fire management and tree planting and rotational grazing. These were some of the land management practices that would reduce wetland degradation for the benefit of cranes and community livelihoods. Starting with an outreach coverage of two villages and eight schools within a 5 km radius of the Saiwa Swamp National Park between 1991 and 2001, the coverage expanded to 14 schools and seven village clusters in 2002. This was done to incorporate other villages and schools in areas where isolated crane populations were found.

Communities and schools located near the project headquarters were exposed to more awareness events than the ones located in the other counties. The Project Leader explained that he had observed a positive trend in attitudes since the late 1990s. He described the trend as a change from a time when community members viewed cranes "as any other birds" to the prevailing situation where community members were now consciously avoiding being near crane breeding sites and reporting cases of injured or dead cranes. The role that project had played in spreading crane and wetland conservation messages was particularly recognised by like-minded organisations. He was asked to deliver presentations at environmental events organised by WWF, UNDP, National Museums of Kenya, among others. On numerous occasions, project sites were selected as venues for events such as World Wetlands Day, World Environment Day and National Tree Planting Day. Teachers interviewed agreed that the project had provided opportunities for environmental learning for schoolchildren, filling a crucial gap as the schools were poorly equipped to handle environmental learning activities. One key development showing successful mainstreaming of project-initiated activities into school programmes was the willingness, confirmed at all the eight schools at Saiwa, to provide opportunities for Maurice to interact with school children at designated times during school terms.

One noteworthy disconnection between environmental knowledge imparted to learners and expected participation in crane and wetland conservation was highlighted by teachers. When learners graduated from high school, most of them left the area to pursue further education or skills training away from their villages. As one teacher summarised: "Once they leave the area, they tend to forget about cranes and wetlands, making it impossible to track the fruits of our environmental education efforts". Furthermore, teachers also noted that careers in conservation were not lucrative and as a result, most of the successful youngsters opted to pursue other careers that did not allow them to directly add value to the project.

4.3.3. Livelihood interventions

Group-based livelihood interventions only became a component of the project in 2002 when funding was received from the Disney Conservation Fund (DCF), through ICF. The diverse livelihood projects (Table 4.2) were introduced to win the support of the communities by demonstrating the project was not just about cranes and trees but was also about relieving hunger and improving household incomes. Ten groups that were engaged had been formed when the government promoted village-based self-help cooperatives in the 1980s. Owing to a lack of funds, these cooperatives were generally operating below capacity. The project's thrust was to provide appropriate inputs and develop the groups' technical skills to enable the cooperative enterprises to realise their full production potential. The idea was to start with ten groups first, as pilot cases, and then set up similar group-based projects when more funds became available. As the Project Leader noted, "*the livelihood interventions were not initially tied to specific community actions or conservation impacts"*. The main goal was to set up demonstration models of alternative livelihood options that households could adopt without degrading wetlands. The general criteria (in no particular order) for selecting target areas and beneficiaries were: (1) presence of already-existing community groups, (2) beneficiaries' willingness to be affiliated to the project and (3) presence of crane breeding and flocking sites around target villages.

Table 4.2. Details and operational status of groups that participated in livelihood interventions in 2014

Name of group	County	Livelihood activity	Membership in 2002	Membership in 2014	Operational (OP), Dormant (DO), Defunct (DE)
Afya	Trans Nzoia	Fishery	20		DE
Bubwayo	Busia	Fishery	30		DE
Bwayi	Trans Nzoia	Poultry, Fishery, Gardening	20	15	OP
Kiriita	Trans Nzoia	Fishery	12	8	OP
Kipsaina	Trans Nzoia	Beekeeping, Crafts	30	27	DO
Maliki	Bungoma	Fishery	15	9	OP
Matendo	Bungoma	Fishery	30	20	DO
Merembe	Trans Nzoia	Fishery	25	25	DO
Siyo-Siteko	Busia	Fishery, Crafts	30	23	DO
Webolela	Uasin Gishu	Pottery	30	20	OP

Most beneficiaries acknowledged that through the support from the project, they were able to increase production and undertake joint activities more regularly. They largely attributed successful revival and enhancement of their operations to improved sense of common purpose and inspiration from the Project Leader. He made bi-monthly visits to the livelihood project sites to provide technical support during the two years of financial support from Disney Wildlife Conservation Fund. At the peak of the project, group members met bi-monthly to discuss progress, organise joint actions and plan for future activities. Narratives by group representatives interviewed and minutes of meetings revealed that agendas for discussions by group members were largely centred on the livelihood issues, with crane and wetland conservation matters receiving peripheral attention, mostly rhetorical.

The group-based projects followed progression pathways with trends in operational performance and membership structures changing variedly as shown in Table 4.2. Only the Bwayi, Kiriita and Maliki fisheries were stocked and operational at the time of this research. On average, they sold 15 fish monthly, at 250 Kenya Shillings (KES)[23] each. Fishponds associated with the five dormant projects were in a dilapidated state, mainly due to non-maintenance. The Afya fishery project became defunct after the group secretary's family sold land on which the pond was located, after the secretary's death. The Bubwayo fishery went defunct after the pond was flooded, resulting in siltation. They did not take the initiative to reconstruct the pond. The Bwayo chicken project was still operating though five members relocated from the village, after the 2008 post-election conflict. Though production had slumped in recent years, they sold 5 chickens per month, at 250 KES each. The pottery project was operational despite losing 10 members through death. Although they bemoaned the lack of viable market, they made 3,500 KES per month from the sale of energy-saving stoves. They also lost access to the wetland site from where they used to collect clay, after a non-member claimed ownership of the land following the post-election conflict in 2008.

Group membership decline was largely attributed to demoralisation, with some members opting to withdraw their membership citing depressed profitability of the income-generating initiatives. All the same, the groups remained registered self-help cooperatives and were recognised social units within their villages. One of the motivations for maintaining their registration status is that, should new projects arise, whether donor-funded or government-initiated, they would be strategically positioned to benefit. The influence of individuals that continued to strive to keep the projects afloat was also a major contributing factor to sustained operations for the groups. A decline in group members' morale, a common factor among the projects, was attributed to reduced motivation as visits by the Project Leader became less frequent.

As funding remained limited for the period 2004–2009, plans to set up new groups and widen the geographical reach of the project did not materialise. The frequency of the Project Leader's visits also declined after funds from the DCF ran out in June 2004. He made irregular and opportunistic visits thereafter. Funds provided by ICF between 2010 and 2014 were mainly used to sustain conservation awareness outreach (in schools and communities) and ensure regular crane monitoring.

A physical assessment of the location of livelihood project sites, distribution of wetlands used by cranes and scatter patterns of homes of individuals involved revealed social, institutional and

[23] 1USD = 100 KES (Average cconversion rate in 2014)

biophysical challenges associated with linking livelihood projects to wetland conservation. Though the groups implicitly associated their project with wetland conservation, the actual wetland patches (containing crane breeding sites) that they presumably sought to protect were widely scattered, with some patches falling under the management of households that were not members of the self-help groups. Although the livelihood interventions attained emblematic conservation status in the villages where they were located, pro-wetland conservation practices that could be directly linked to the interventions were not easily discernible. Since joining livelihood projects was voluntary, some households felt no social obligation to curb encroachment into wetlands or practise pro-crane conservation behaviour as they were not part of the cooperative network. During a group discussion at Saiwa, participants concurred that the livelihood interventions promoted by the project were only attractive to the poor and most affluent households did not actively participate in project activities. They felt that agricultural encroachment into wetlands continued at some sections of the target wetlands owned by well-to-do families. Planting of eucalyptus on wetland edges also escalated (especially in Trans Nzoia) and sugar cane was gradually introduced in wetlands (in Busia and Bungoma) between 2004 and 2014. These two plantation farming options were more lucrative than the livelihood options promoted by the project. Failure to self-sustain the group group-based livelihood interventions after the funding ended was also attributed to group members' dependence on an external facilitator, without taking ownership of their enterprises.

4.3.4. Village-based wetland management regulations

A village-based wetland management system was introduced as an institutional intervention to put an end to three practices that were degrading the Saiwa Wetland in Kipsaina Village: unregulated conversion of wetland edges into crop fields, overgrazing and overharvesting of grass. This involved the development of informal and locally enforced regulations which primarily made crop cultivation within a sedge-covered floodplain of the riverine wetland an impermissible practice. The regulations were also designed to regulate plant resource harvesting to allow the recovery of natural vegetation in sections that had already been affected by agricultural encroachment. The regulations were also aimed at preventing any privatisation (by individual households) of sections of wetlands valued as common access zones by the community and used by cranes for breeding. The vision was to create a wetland landscape managed by the community to sustain shared benefits and ensuring the spatial and temporal management patterns also befitted cranes. Ultimately, having the regulations in place would lead to the restoration and protection of wetland patches used by cranes for breeding and ensure a sustained supply of wetland plants for construction and feeding livestock.

A decision was made in 1993 to identify wetland sections worst affect by agricultural encroachment but still provided breeding habitats for cranes. Individual households that had encroached onto the wetland were engaged with a view to persuading them to stop cultivating with the sedge-covered floodplain. Between 1993 and 1996, 15 households that had dug ditches, cleared wetland vegetation and cultivated sections of a 1.7 km stretch of the wetland were successfully persuaded to stop the wetland-degrading practices. The households were given priority in the distribution of the fruit tree seedlings and were targeted in the provision of technical support on agro-forestry, crop husbandry and soil and water conservation facilitated by the Project Leader. This was then followed by the designation of zones where grazing, plant harvesting and use of fires to clear land were prohibited at certain times of the year. The Project Leader played an exemplary champion role in the process. He owned agricultural fields in the uplands but near the wetland zone governed by village-based regulations but had not encroached onto the wetland. He donated part of the land so that it could be used to establish a tree nursery. His reputation as a respectable opinion leader who was knowledgeable in land management issues was a major factor that contributed to the effective persuasion of the 15 households. Enforcement and monitoring of community adherence to the regulations were championed by the project steering committee led by the Project Leader. The local chief was also approached and provided backing for the enforcement of the village-based wetland management regulations. During village meetings, villagers were reminded of the need to adhere to the wetland management regulations and to avoid actions that would reduce breeding success (trampling of nests, collecting eggs, startling nesting cranes).

The contribution of village-based regulations to the recovery of the wetland vegetation and the return of the Sitatunga families became a well-known success story in Kipsaina Village and beyond. At the time of this research, there were four pairs of cranes breeding on the stretch of wetland governed by the village-based regulations, the same number of pairs counted during the 2004 survey. Owing to its proximity to the tree nursery and the project headquarters, the wetland section that was protected through the regulations become one of the tangible project outcomes that were showcased to visitors. It was projected to neighbouring communities and other outsiders as a successful demonstration of how individual households could voluntarily change their livelihood practices for conservation gain.

The success story at Kipsaina was a bright spot but a patchy project impact since attempts to introduce village-based regulations upstream and downstream of the village were not successful. Given that the project depended on voluntary participation and, to some extent, social pressure, some households simply chose not to be part of the project. Inequitable access to land also triggered wetland encroachment as some community members (12 households), locally referred to as "squatters", continued to grow crops on wetland edges because they did not own any other land in the uplands. These households fell under the category of groups that did not participate in project activities. Despite encouraging levels of adherence to the regulations over the years, there were instances when the project steering committee members were rebuked for enacting restrictions in Kipsaina and yet there were not successful in doing the same in other villages. Some committee members expressed their frustration at being questioned by some encroachers about their legitimacy given that the government was not taking action to address wetland encroachment. Other concerns raised included failure to provide matching alternatives to wetland cultivation for the households that had agreed to stop wetland encroachment. This was a source of disillusionment but as one committee member put it, "*they were adhering to the regulations because they did not want to disappoint Maurice and everyone who had worked hard for so long to conserve the wetland*".

4.4. Lessons for integrating social dimensions into conservation project planning processes

As exemplified by Clark and Wallace (1998), Richie *et al*. (2012) and Chapman (2014), analyses of social processes generate evidence-based insights on how community interests, interactions and actions can be integrated in practice to achieve stewardship of natural resources. In this section, factors that influenced local communities' decisions and actions, leading to positive social and environmental outcomes and lack thereof over 25 years, are discussed. The aim is to discern factors that can aid or inhibit the linkages between social processes and the desired environmental outcomes under community-led projects. This analysis is geared towards generating project design and field methodological insights for effective community-led conservation, to identify predictors for project effectiveness and sustainability. The gist of the discussion in the following sub-sections is to identify "bright spots", defined as decisions in the project design and steps in the implementation of project activities that led to the desired social and environmental outcomes, based on broad-based evaluative criteria used by Clark *et al*. (1998), Richie *et al*. (2002) and Chapman (2014). The criteria include the human and social aspects that are critical when promoting community stewardship of natural resources, including community environmental awareness, conservation-livelihood linkages, locally-enforced site protection mechanisms, community participation and social learning in conservation. Apart from focusing on the bright spots, reference is made to some of the notable bottlenecks to social processes.

In drawing the overall project lessons, mention must be made of the project resourcing and operating environment constraints that inherently bottlenecked the project implementation process over the period covered in this evaluation. However, this represents the situation in the real world characterised by struggles to get financial, social, institutional and material support.

4.4.1. Lessons on bridging the environmental information-behaviour gap

Through environmental awareness outreach, the project facilitators sought to inculcate a new conservation ethic (resource values, use patterns and restoration actions) among community members which they envisaged would lead to the protection of cranes and sustainable utilisation of wetland resources. The effectiveness of environmental outreach is influenced by the criteria for selecting the target audience and the methods used to reach out to the audience, as studies by Trewhella *et al*. (2005) and Meadows (2011) show. Based on their recommendations, it is important to take an analytical look at the audience targeting criteria and outreach platforms. There were some positive attributes associated with both the selected target audience and outreach platforms. The project presented collective learning opportunities for enhancing community understanding of environmental issues in the project area. The platforms were rooted in the community systems, with popular social events being used to disseminate environmental information and calls for environmental action. This resulted in crane and wetland conservation issues being gradually embedded into community social dialogues and problem-solving arenas. This was a strategic approach in that it helped communities to internalise and prioritise an agenda of crane conservation that was previously peripheral in their day-to-day affairs. Positive spinoffs of embedding new agendas, which may otherwise be viewed as external by communities, into community dialogues and action arenas, resulting in the uptake of desired environmental behaviours, practices and technologies have been documented (Jacobson and McDuff 1997; Seyfang and Smith 2007). The approach presents opportunities for triggering environmental attitude and behaviour change when

the target individuals or groups are inspired by influential individuals, peers or opinion-makers within a community, defined as a normative social influence (Beedell and Rehman 2000; Steg and Vlek 2009). This was the case for the 25-year period under consideration as the project leader was exemplary and influential.

The approach used to reach out to the target audience fits into an old linear model of pro-environmental behaviour, based on the assumption that dissemination of information leads to knowledge gain, translating into positive attitude change and ultimately triggering the desired behaviour (Kollmuss and Agyeman 2002). To a great extent, the conveyance of relevant information helped build a good understanding of the environmental challenges at hand, but the question is whether that in itself would lead to the desired environmental outcomes. Recent research findings have highlighted the need to look beyond information dissemination and placing emphasis on encouraging the adoption of practical and sustainable actions that are linked to notable environmental outcomes (Monroe *et al*. 2008; Steg and Vlek 2009). Building on this proposition for bridging the information-behaviour-impact gap, the outcomes of the project outreach could have been enhanced through the inclusion of practical and interactive approaches to conservation awareness. These could have been in the form of practical actions to protect crane pairs and community participation in crane and wetland monitoring as an avenue to promote environmental learning and enhance emotional attachment to the species. Participatory monitoring is also gaining popularity in community-based conservation as it enables local communities to appreciate trends in species and habitats and contextualise the linkage between threats and local resource and land management (Van Rijsoort and Jinfeng 2005; Sekercioglu 2012). The project could have benefitted from a multi-faceted approach to environmental awareness, integrating information dissemination, community interactions involving practical environmental actions and participatory monitoring.

4.4.2. Lessons on linking alternative livelihoods to conservation targets

The project attempted to balance local communities' socio-economic needs with wetland ecosystem conservation and crane habitat protection. In recent years, this has become a common approach, adopted to give conservation a human face and enhance community acceptance of conservation project interventions (Knight *et al*. 2010; Mariki 2013). From a community engagement point of view, there were some positives regarding the strategic entry points for introducing livelihood interventions. The project was built on already-existing community groups to develop social structures supportive of conservation goals, an approach known to facilitate quick acceptance and provide primers for wider adoption of desired institutions and practices for resource management (Pomeroy and Carlos 1997; Thompson *et al*. 2003; Brooks *et al*. 2013). However, the livelihood interventions were not immune to the disconnection between livelihood and conservation aims, a situation whereby the provision of livelihood support to local communities does not lead to clear and measurable conservation impacts. This dilemma is a common challenge that warrants research attention, as calls for the justifiability of investment in conservation grow globally (Salafsky *et al*. 2001; Wright *et al*. 2015). In their contribution to addressing the disconnection, Salafsky *et al*. (2001) and Wicander and Coad (2014) recommend that linkages between the livelihood intervention and the desired conservation outcomes be defined explicitly first. They describe these linkages in terms of regulated rights to resources, practical actions by beneficiaries to mitigate specific threats to resources or habitats targeted for conservation, and restorative efforts to regenerate lost ecosystem services. Failure to acknowledge these linkages at the beginning of the project may result in the livelihood interventions being viewed as mere opportunities for livelihood diversification detached from conservation (Wright *et al*. 2015).

Livelihood-conservation linkage remained fuzzy in the minds of beneficiary community groups. Emerging insights on ways to address the disconnection at project design and implementation could have been valuable for the project. The disconnection was exacerbated by internal factors that hindered the viability and profitability of the interventions. The experiences across the sites where livelihood interventions were implemented show that bridging the livelihood-conservation divide is a complex social process that calls for careful consideration of social equity, the influence of community groups in resource management, land tenure systems and other factors that influence the human-landscape interactions. The beneficiary community groups lacked the power to enforce new wetland management systems, especially in zones they had no control over due to tenure complexities. Inequitable access to and distribution of livelihood inputs and technical support can breed a sense of exclusion among non-beneficiaries and therefore derail the evolution of collective values and social capital crucial for sustainable resource management. If the livelihood interventions fail to generate tangible benefits or if the benefits become erratic, participants become demotivated and the development of livelihood enterprises as a platform for community action may falter.

Acknowledging that livelihood interventions were pilot initiatives intended to act as learning platforms, the fact that beneficiaries were selected from established cooperatives added complexities to linking livelihoods to conservation. The beneficiaries were not necessarily the primary actors behind the practices causing wetland degradation and crane habitat loss. They were also not necessarily the households most dependent on the wetlands in question. These are some of the complexities associated with aligning livelihood interventions with conservation goals when working with communities that have already defined livelihood priorities and social structures. Project experiences also highlight some of the dilemmas encountered when building on already-existing community livelihood systems. Whilst the already-existing livelihood options that represent the desired practices compatible with resource conservation can be identified easily, nurturing them so that they are effectively linked to conservation calls for persuasive skills on the part of project facilitators to change mindsets. This involves inculcating new attitudes among communities so that the livelihood interventions are not viewed as mere opportunities for improving household incomes and food security but community platforms for prompting environmental action. New innovative approaches that stress the need to identify actors behind threats and targeting them in the quest to ensure linkages between livelihoods and conservation are gaining popularity (Wicander and Coad 2014; Wright *et al*. 2015). This also involves the identification of actions that beneficiaries of livelihood interventions can perform that contribute to reducing threats to resources or species in question. Without discounting the benefits of building on existing community structures, the livelihood interventions could be strongly aligned to conservation impacts if the households or community groups behind threats to wetlands and cranes are identified. An effective way to achieve that, which also allows the conservationist to understand the underlying motivations and underlying drivers of the problem is to use the Action-in-Context framework (see preceding chapters). Recognising that individuals leading community-led projects may not have the technical skills to conduct these initial social causation analysis, external organisations could play that role as part of the technical support to the projects.

4.4.3. Lessons on community cognition of project interventions and impact pathways

Tree planting, initially introduced as an entry intervention, helped the project team win the hearts of local communities and government officials, with its reputation spreading beyond the boundaries of the county where the project was headquartered. Over the years, its popularity resulted in local stakeholders associating the project thrust and facilitators with "trees", thereby overshadowing "cranes" and "wetlands" in the minds of the stakeholders. This should not be viewed as a project failure. In communities where the quest to address socio-economic problems supersedes environmental conservation, it is necessary to promote practices that have a positive appeal to local communities. Local relevance of entry points (technologies, individuals, social platforms) provides a sound footing for successful projects (Schenk *et al*. 2007; Ruiz-Mallen *et al*. 2015). Ideally, the entry interventions should generate tangible benefits and have the high potential to effectively mitigate known environmental problems. This is also a practical way to gradually inculcate land management and stewardship ethics among local communities whilst winning community trust in the project area. The entry points act as stepping stones for embedding desired conservation actions into community agendas and practices in a socially acceptable manner (Chan *et al*. 2007; Chazdon *et al*. 2009; Bryan *et al*. 2010). Tree planting was a strategic intervention as it was geared towards creating resource units (trees and plantations) that the communities would value, gradually embedding it in the crane and wetland conservation agenda.

The fervent pursuit of the tree planting agenda by the project team was indicative of a common dilemma in community-based conservation projects whereby the quest to secure protracted support from the community may be at odds with the efficient delivery of conservation targets, in spatial and temporal terms. The inherent challenge associated with it is that for the project to follow the desired conservation pathway, the facilitators may need to timely act to avoid needlessly allocating resources on an intervention that is weakly linked to the conservation goals. Whilst popular entry strategies may be relatively easy to identify, knowing when and how to make entry interventions be aligned with conservation goals can be problematic and calls for an understanding of how to deal with the delicate and gradual alignment process. The project facilitator should therefore look for the right social networks or benefit chains that help highlight the cognitive and practical connections between the entry intervention and conservation impacts. The project approach was inherently appropriate as the social units targeted in the distribution of tree seedlings (e.g., schools, churches, community development groups) were recognised platforms for social interactions, learning and opinion-making. However, the tree planting would have translated into more recognisable land management and conservation impacts had some of the trees been primarily planted to address common environmental problems, especially in the uplands where soil erosion was a major issue. To enhance practical species conservation relevance, trees used by cranes for roosting could have been planted too.

Despite the complexities associated with linking tree planting to crane and wetland conservation, reintroduction of trees on the edges of the Saiwa wetlands represented a simple approach of ensuring that practical action by grassroots communities leads to tangible environmental impacts. The logic behind the approach, as the project experiences show, is to carefully create a common vision among community members, highlighting tangible benefits that accrue to the community as a result of the practical action. Community knowledge of the ecological history of riverine wetlands (in this case, past vegetation structure) was leveraged to create a common vision of desired landscape attributes that would gradually revive lost ecosystem services. The shared memory about wetland ecosystem changes that took place due to the removal of wetland vegetation and how restorative action would bring about tangible benefits made community mobilisation for participation in tree planting on wetland edges easier. Trees planted on wetland edges generated collective socioeconomic benefits in the form of wood, used in the construction of community infrastructure. Enhancing social values attached to landscape patches and shared resources is recognised innovative approach for sustainable habitat protection (Shafer 1999; Leigh 2005). The restoration process through tree planting involved active participation by locals which creates collective motivations for territorial protection of landscape patches and resources by community groups, contributing to habitat protection.

4.4.4. Lessons on habitat protection and restoration

Through local regulations, a section of the Saiwa Wetlands that contained crane breeding sites was successfully protected, paving way for a natural restoration process to unfold. This was a tangible conservation outcome, directly attributable to a project intervention purposefully designed to address agricultural encroachment, unsustainable harvesting of plants and overgrazing. It confirms that if clear species and habitat conservation targets (e.g., specific wetland sections) and the required actions by local communities are defined at the initial project design stage, the desired conservation outcomes can be attained. Spatial targeting of conservation focal areas and matching with desired land use, which may require cessation of specific land uses for restorative purposes is a novel approach in conservation planning (Redford *et al*. 2003; Bryan *et al*. 2010).

Delineating boundaries of specific wetland sections where the regulations would be applied, as opposed to focusing on the entire wetland, made the focal conservation area and the resource units therein manageable (i.e., could be effectively monitored and policed by the locals). This inherently also meant that a smaller target community, which had direct vested interests, possessed experiential knowledge of the problems affecting the wetland section and interacted regularly, was carved out of the larger community in the catchment. This wetland-connected sub-community was small enough to allow the quicker building of consensus on specific rules and norms for wetland management for common benefits. Outsiders could easily be differentiated as part of the enforcement of common property resource regime at the target patch for regulated wetland access and resource harvesting. These are known to be conducive conditions and considerations for successful community management of shared resources (Ostrom 1990; Agrawal 2001). This implies therefore that if appropriate entry strategies could be identified and an effective facilitation process put in place, a network of wetland patches governed under similar village-based regulations would emerge. This would ultimately form a network of social units responsible for regulating ecosystem conservation driven and enforced through local arrangements. Such institutional arrangements, uniting resource user groups and rooted in common values (socioeconomic, cultural, leadership, etc.), are important for the effectiveness and sustainability of ecosystem conservation (Dixon 2008). A combination of project design factors, demonstrating the conceptual linkages between actors, actions and outcomes for effective species and habitat conservation, resonate with pertinent methodological considerations to achieve landscape stewardship beneficial to species of conservation concern defined by Bennett *et al*. (2018).

The process of developing wetland management regulations calls for a good understanding of contextual factors that may enable or hinder the success of the intervention. In the case of the project under consideration, the presence of an influential process facilitator helped much in the initiation and informal enforcement of regulations, but such facilitators or leaders may not exist in other areas and communities targeted under conservation projects. The other challenge encountered was the lack of group empowerment exacerbated by the fact that there were diverse interests among community members, with some members even opting not to be part of the project. If not nested in or supported by relevant environmental policy frameworks and effective local enforcement mechanisms, village-based regulations may be hampered by exclusivity emanating from private land tenure, as some households opt to maintain certain practices degrading the resource for economic benefit.

4.4.5. Lessons on transformational leadership as a driver of social processes

Overall, effective group leadership was a notable success factor that largely contributed to the effective delivery of project outcomes over the 25 years. The Project Leader was the social driver whose outstanding abilities and reputation gave the project its unique public image. Innovative and reputable leadership within communities is a success factor in environmental and community development projects (Brooks *et al*. 2013; Guttierrez *et al*. 2011). The Project Leader's commitment and charisma were instrumental in keeping the project going despite limited funding and minimal support from local administrative and environmental extension agencies. Holding influential group leadership and honorary positions helped him play multiple roles which he successfully leveraged to promote the project's conservation agenda. To have a marked impact, the leadership should be transformational, implying that the leader should possess skills to clearly define a vision and benefits for working together to achieve the vision, be a hands-on person and stimulate new collective thinking to solve common problems (Bass and Steidlmeier 1999; Black *et al*. 2011). Undoubtedly, the Project Leader demonstrated these attributes and capabilities. As the project experiences revealed, transformational leadership can prod communities towards action pathways to generate solutions to problems. The experiences also illustrate that transformational leadership is not only important for social mobilisation and technical guidance but can also provide social motivations for the adoption of pro-environmental and pro-social behaviour.

The presence of exceptional leadership was a key strength for the project, no succession plans or emergence of equally competent leaders within the ranks of the affiliate groups was documented. Although the leader had remained steadfast in driving project activities for 25 years, it did not mean perpetual sustainability. Like any other initiative, the project would, at some stage, need someone to not only perpetuate the remarkable leadership legacy but introduce innovative ideas in response to emerging challenges and opportunities. The question is how and when such a person to lead would emerge. Expecting another leader who matched the leadership standards already set to just emerge would be too optimistic. In reality, the groups could add a clause in their constitution, outlining how the issue of leadership succession could be handled. This could entail creating opportunities for the project members to define the desired qualities of the future leader and articulate an election process. To avoid conflicts, power struggles and voids if the project leader was no longer available, the groups could adopt a managed leadership transition process, whereby a leadership talent pool could be nurtured and mentored gradually (Gothard and Austin 2013). This is not to suggest though that the project loses the self-less transformational leadership model. Assuming that the project would remain community-led, the elected leader would need to be aware of the implications and personal obligations of assuming such a demanding position, including being prepared to bear the financial and social costs and no direct economic benefits. The elected leader would also need to act positively to win local support and earn the respect of not just the project members but the community as a whole.

4.5. Conclusions

In this chapter, social processes associated with a long-running community-led conservation initiative were analysed using a qualitative research approach. With a focus was on platforms, drivers and outcomes of the social processes over a 25-year period, insights on field methodological approaches and key considerations for addressing threats to cranes and wetlands in rural landscapes were generated. The findings shed light on factors that may aid or hinder the success of community-led conservation initiatives in landscapes undergoing human-driven transformation.

Demonstrable habitat and species protection through village-based wetland regulations were attained at Saiwa. The lesson from this intervention is that such positive conservation outcomes can be achieved through delineation of manageable zones for targeted conservation and defining locally agreeable and enforceable regulations to protect the zones. As project experiences revealed, the presence of a respected and dedicated local conservation champion can enhance adherence to locally-enforced regulations for years, cultivating a recognisable conservation ethic that benefits species of conservation concern. The study showed that if the linkages between alternative livelihoods and intended conservation outcomes are not clearly defined and internalised by beneficiaries of the livelihood interventions, the desired conservation impacts may not be realised. This points to the need for the analysis of actors and actions behind an environmental problem (e.g., wetland degradation). Such analysis could be used to identify specific individuals or households that should primarily adopt the desired practical conservation actions to reduce threats to either species or habitats. The disconnection between livelihoods and conservation exposed through this study highlights the need for conceptual pathways on how project facilitators can work with communities to translate livelihood interventions into conservation impacts over time.

Findings from this study show that transformational leadership plays a significant role in protracted social mobilisation and persuasion required for community groups to adopt pro-environmental and pro-social behaviour that leads to conservation outcomes. Given the meagre resources (financial, human and material) allocated to conservation in developing countries, transformational leadership can effectively fill gaps in conservation extension. The experiences from the project brought to the fore some of the key attributes of leadership under community-led conservation, including selflessness, dedication, leading by example, maintenance of good reputation and disposition to practical action.

Identification of appropriate platforms for disseminating conservation messages, rooted in the community's interaction networks, is an important step in the process of embedding conservation into social dialogues and problem-solving arenas. Popular entry interventions (environmental practices and technologies) and entry points (social platforms) can effectively give projects local relevance and contribute to widespread acceptance of the projects. However, there is a need for periodic reflection to ensure that the interventions meant to win the support of the community proceed on a pathway that is not tangential to the desired conservation targets. The environmental information-behaviour gap unearthed through this study could have been bridged more effectively through the adoption of more practical and interactive approaches to conservation awareness, including capacity building for action to address threats and enhancing emotional attachment to the species and habitats targeted for conservation.

Apart from guiding crane conservationists, these findings are relevant for similar community-led and NGO-facilitated conservation projects.

References

Agrawal, A. (2001). Common property institutions and sustainable governance of resources. World Development 29(10): 1649–1672.

Ban, N. C., Mills, M., Tam, J., Hicks, C.C., Klain, S., Stoeckl, N., Bottrill, M.C., Levine, J., Pressey, R. L., Satterfield, T., and Chan, K. M. A. (2013). A socio-ecological approach to conservation planning: Embedding social considerations. Frontiers in Ecology and the Environment 11(4): 194–202.

Bass, B. M., and Steidlmeier, P. (1999). Ethics, character, and authentic transformational leadership behaviour. Leadership Quarterly 10(2): 181–217.

Beaumont, J. (1997). Community participation in the establishment and management of marine protected areas: A review of selected international experience. South African Journal of Marine Science 18(1): 333–340.

Beedell, J., and Rehman, T. (2000). Using social-psychology models to understand farmers' conservation behaviour. Journal of Rural Studies 16(1): 117–127.

Bennett, N. J., Whitty, T. S., Finkbeiner, E., Pittman, J., Bassett, H., Gelcich, S., and Allison, E. H. (2018). Environmental stewardship: A conceptual review and analytical framework. Environmental Management (2018) 61: 597–614.

Berkes, F. (2004). Rethinking community-based conservation. Conservation Biology 18(3): 621–630.

Black, S. A., Groombridge, J. J., and Jones, C. G. (2011). Leadership and conservation effectiveness: Finding a better way to lead. Conservation Letters 4: 329–339.

Blaikie, P. (2006). Is small really beautiful? Community-based natural resource management in Malawi and Botswana. World Development 34(11): 1942–1957 .

Bray, D. B., Merino-Perez, L., Negreros-Castillo, P., Segura-Warnholtz, G., Torres-Rojo, J. M., and Vester, H. F. M. (2003). Mexico's community-managed forests as a global model for sustainable landscapes. Conservation Biology 17(3): 672–677.

Brechin, S. R., Wilshusen, P. R., Fortwangler, C. L., and West, P. C. (2002). Beyond the square wheel: Toward a more comprehensive understanding of biodiversity conservation as social and political process. Society and Natural Resources 15(1): 41–64.

Brooks, J., Waylen, K. A., and Borgerhoff Mulder, M. (2013). Assessing community-based conservation projects: A systematic review and multilevel analysis of attitudinal, behavioral, ecological, and economic outcomes. Conservation Evidence 2: 1–34.

Brown, K. (2002). Innovations for conservation and development. The Geographical Journal 168(1): 6–17.

Bryan, B. A., Raymond, C. A., Crossman, N. D., and Macdonald, D. H. (2010). Targeting the management of ecosystem services based on social values: Where, what, and how? Landscape and Urban Planning 97: 111–122.

Campbell, L. M., and Vainio-Mattila, A. (2003). Participatory development and community-based conservation: Opportunities missed for lessons learned? Human Ecology 31(3): 417–437.

Chan, K. M. A., Pringle, R. M., Ranganathan, J., Boggs, C. L., Chan, Y. L., Ehrlich, P. R., Haff, P. K., Heller, N. E., Al-Khafaji, K., and Macmynowski, D. P. (2007). When agendas collide: Human welfare and biological conservation. Conservation Biology 21(1): 59–68.

Chapman, S. A. (2014). A framework for monitoring social process and outcomes in environmental programs. Evaluation and Program Planning 47: 45–53.

Chazdon, R. L., Harvey, C. A., Komar, O., Griffith, D. M. Ferguson, B. G., Martinez-Ramos, M., Morales, H., Nigh, R., Soto-Pinto, L., Van Breugel, M., and Philpott, S. M. (2009). Beyond reserves: A research agenda for conserving biodiversity in human-modified tropical landscapes. Biotropica 41(2): 142–153.

Clark, T. W., and Wallace, R. L. (1998). Understanding the human factor in endangered species recovery: An introduction to human social process. Endangered Species Update 15(1): 2–14.

Cleaver, F. (1999). Paradoxes of participation: Questioning participatory approaches to development. Journal of International Development 11(4): 597–612.

Colquhoun, I. C. (2015). Community-managed conservation efforts at Tsingy Mahaloka/KOFAMA, northern Madagascar: Right place at the wrong time? Madagascar Conservation and Development 10(S1): 35–41.

Cornwall, J. (2008). Unpacking 'participation': Models, meanings and practices. Community Development Journal 43(3): 269–283.

Cummings, F. J. (1997). Role of participation in the evaluation and implementation of development projects. Knowledge and Policy: The International Journal of Knowledge Transfer and Utilization 10(1-2): 24–33.

Dasgupta, A. and Beard, V. A. (2007). Community-driven development, collective action and elite capture in Indonesia. Development and Change 38(2): 229–249.

Dickman, A. J. (2010). Complexities of conflict: the importance of considering social factors for effectively resolving human–wildlife conflict. Animal Conservation 13: 458–466.

Dixon, A. B. (2008). The resilience and sustainability of local wetland management institutions in Illubabor and Western Wellega, Ethiopia. Singapore Journal of Tropical Geography 29(3): 341–356.

Drijver, C. A. (1991). People's participation in environmental projects in developing countries. Landscape and Urban Planning 20(1-3): 129–139.

Edwards, R., and Holland, J. (2013). What is qualitative interviewing? Bloomsbury Academic, London and New York.

Evely, A. C., Pinard, M., and Reed, M. S. (2011). High levels of participation in conservation projects enhance learning. Conservation Letters 4(2): 116–126.

Game, E. T., Lipsett-Moore, G., Hamilton, R., Peterson, N., Kareseka, J. Atu, W., Watts, M., and Possingham, H. (2011). Informed conservation planning in the Solomon Islands. Conservation Letters 4(1): 38–46.

Gezon, L. (1997). Institutional structure and the effectiveness of integrated conservation and development projects: Case study from Madagascar. Human Organisation 56(4): 462–470.

Gothard, S., and Austin, M. J. (2013). Leadership succession planning: Implications for non-profit human service organizations. Administration in Social Work 37(3): 272–285.

Gottret, V. M., and White, D. (2000). Assessing the impact of integrated natural resource management: Challenges and experiences. Ecology and Society 5(2): 17. http://www.consecol.org/vol5/iss2/art17/.

Guitierrez, N. L., Hillborn, R., and Defoe, O. (2011). Leadership, social capital and incentives promote successful fisheries. Nature 470: 386–389.

Harvey, P. A. and Reed, R. A. (2006). Community-managed water supplies in Africa: Sustainable or dispensable. Community Development Journal 43(3): 365–378.

Jacobson, S. K., and McDuff, M. D. (1997) Success factors and evaluation in conservation education programmes. International Research in Geographical and Environmental Education 6(3): 204–221.

Kaimowitz, D., and Sheil, D. (2007). Conserving what and for whom? Why conservation should help meet basic human needs in the tropics. Biotropica 39(5): 567–574.

King, B. (2007). Spatialising livelihoods: resource access and livelihood spaces in South Africa. Transactions of the Institute of British Geographers 36(2): 297–313.

Knight, A. T., Cowling, R. M., Difford, M., and Campbell, B. M. (2010). Mapping human and social dimensions of conservation opportunity for the scheduling of conservation action on private land. Conservation Biology 24(5): 1348–1358.

Kollmuss, A., and Agyeman, J. (2002). Mind the Gap: why do people act environmentally and what are the barriers to pro-environmental behavior? Environmental Education Research 8(3): 239–260.

Kontogeorgopoulus, N. (2005). Community-based ecotourism in Phuket and Ao Phangnga, Thailand: Partial victories and bittersweet remedies. Journal of Sustainable Tourism 13(1): 4–23.

Korten, D. C. (1980). Community organisation and rural development: A learning process approach. Public Administration Review 40(5): 480–511.

Leigh, P. (2005). The ecological crisis, the human condition, and community-based restoration as an instrument for its cure. Ethics in Science and Environmental Politics 2005: 3–15.

Lepp, A., and Holland, S. (2006). Comparison of attitudes toward state-led conservation and community-based conservation in the village of Bigodi, Uganda. Society and Natural Resources 19(7): 609–623.

Luyet, V., Schlaepfer, R., Parlange, M. B., and Butler, A. (2012). A framework to implement Stakeholder participation in environmental projects. Journal of Environmental Management 111: 213–219.

Mansuri, G., and Rao, V. (2004). Community-Based and -Driven Development: A Critical Review: The World Bank Research Observer 19(1): 1–39.

Mariki, S. B. (2013). Conservation with a human face? Comparing local participation and benefit sharing from a National Park and a State Forest Plantation in Tanzania. SAGE Open

October-December 2013: 1–16.

Meadows, A. (2011). Wildlife conservation education and international programmes. The Journal of Animal and Plant Sciences 21(2 Suppl.): 305–316.

Mehta, J. N., and Heinen, J. T. (2001). Does community-based conservation shape favorable attitudes among locals? An empirical study from Nepal. Environmental Management 28(2): 165–177.

Miller, J. R., and Hobbs, R. J. (2002). Conservation where people live and work. Conservation Biology 16(2): 330–337.

Monroe, C. M., Andrews, E., and Biedenweg, K. (2008). A framework for environmental education strategies. Applied Environmental Education and Communication 6(3-4): 205–216.

Ostrom, E. (1990). Governing the commons: The evolution of institutions for collective action. Cambridge University Press, Cambridge.

Pomeroy, R. S., and Carlos, M. B. (1997). Community-based coastal resource management in the Philippines: A review and evaluation of programs and projects, 1984-1994. Marine Policy 21(5): 445–464.

Porter-Bolland, L., Ellis, E. A., Guariguata, M. R., Ruiz-Mallén, I., Negrete-Yankelevich, S., and Reyes-García, V. (2011). Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics. Forest Ecology and Management 268: 6–17.

Pretty, J. (1995). Participatory learning for sustainable agriculture. World Development 23((8): 1247–1263.

Pretty, J., and Smith, D. (2003). Social capital in biodiversity conservation and management. Conservation Biology 18(3): 631–638.

Redford, K. H., Coppolillo, P., Sanderson, E. W., Da Fonseca, G. A. B., Dinerstein, E., Groves, C., Mace, G., Maginnis, S., Mittermeier, R. A., Noss, R., Olson, D., Robinson, J. G., Vedder, A., and Wright, M. (2003). Mapping the conservation landscape. Conservation Biology 17(1): 116–131.

Richie, L., Oppenheimer, J. D., and Clark, S. (2012). Social process in grizzly bear management: Lessons for collaborative governance and natural resource policy. Policy Science 45(3): 265–291.

Ruiz-Mallen, I., Schunko, C., Corbera, E., Ros, M., and Reyes-Garcia. (2015). Meanings, drivers, and motivations for community-based conservation in Latin America. Ecology and Society 20(3): 33. http://dx.doi.org/10.5751/ES-07733-200333.

Salafsky, N., Cauley, H., Balanchander, G., Parks, C.J., Margoluis, C., Bhatt, S., Encarnacion, C., Russell, D., and Margoluis, R. (2001). A systematic test of an enterprise for community-based biodiversity conservation. Conservation Biology 15(6): 1585–1595.

Sekercioglu, C. H. (2012). Promoting community-based bird monitoring in the tropics: Conservation, research, environmental education, capacity-building, and local incomes. Biological Conservation 151(1): 69–73.

Shafer, C. L. (1999). US national park buffer zones: Historical, scientific, social and legal aspects. Environmental Management 23(1): 49–73.

Schenk, A., Hunzike, M., and Kienast, F. (2007). Factors influencing the acceptance of nature conservation measures: A qualitative study in Switzerland. Journal of Environmental Management 83(1): 66–79.

Shrestha, K. K., and McManus, P. (2007). The embeddedness of collective action in Nepalese community forestry. Small-scale Forestry 6(3): 273–290.

Songorwa, A. N. (1999). Community-based wildlife management (CWM) in Tanzania: Are the communities interested? World Development 27(12): 2061–2079.

Steg, L., and Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. Journal of Environmental Psychology 29(3): 309–317.

Syefang, G., and Smith, A. (2007). Grassroots innovations sustainable development: Towards a new research and policy agenda. Environmental Politics 16(4): 584–603.

Tai, H-S. (2007). Development through conservation: An institutional analysis of indigenous community-based conservation in Taiwan. World Development 35(7): 1186–1203.

Thompson, P. M., Sultana, P., and Islam, N. (2003). Lessons from community-based management of floodplain fisheries in Bangladesh. Journal of Environmental Management 69: 307–321.

Treves, A., Wallace, R. B., Naughton-Treves, L., and Morales, A. (2006). Co-managing human–wildlife conflicts: A review. Human Dimensions of Wildlife 11: 383–396.

Trewhella, W. J., Rodrigues-Clark, K. M., Corp, N., Entwistle, A., Garrett, S. R. T., Granek, E., Lengel, K. L., Raboude, M. J., Reason, P. F., and Sewall, B. J. (2005). Environmental education as a component of multidisciplinary conservation programs: Lessons from conservation initiatives for critically endangered fruits bats in the western Indian Ocean. Conservation Biology 19(1): 75–85.

Van Rijsoort, J., and Jinfeng Z. (2005). Participatory resource monitoring as a means for promoting social change in Yunnan, China. Biodiversity and Conservation 14(11): 2543–2573.

Wadley, R. L., Colfer, C. J. P., Dennies, R., and Aglionby, J. (2010). The 'social life' of conservation: Ecology and Society 15(4): 39. http://www.ecologyandsociety.org/vol15/iss4/art39/.

Western, D. (2000). Conservation in human-dominated world. Issues in Science and Technology 16(3): 53–60.

Wicander, S., and Coad, L. (2014). Learning our lessons: A review of alternative livelihood projects in Central Africa. ECI, Oxford and IUCN, Gland.

Wilshusen, P. R. (2009). Social process as everyday practice: The micro politics of community-based conservation and development in southeastern Mexico. Policy Sciences 42(2): 137–162.

Wright, J. H., Hill, N. A. O., Roe, D., Rowcliffe, M., Kumpel, N. F., Day, M., Booker, F., and Milner-Gulland, E. J. (2015). Reframing the concept of alternative livelihoods. Conservation Biology 30(1): 7–13.

5

Nyamuriro community members inspecting a wetland buffer zone

Community-based crane and wetland conservation: Lessons for institutional development from a decade of project experiences in south-western Uganda

Abstract

This chapter draws linkages between local institutional development and crane and wetland conservation outcomes based on field experiences from three sites in Uganda. Narratives of how community groups adopted new agendas and re-aligned their activities to successfully protect cranes and wetlands are presented. Social, economic and institutional challenges that can inhibit the effectiveness of local institutional arrangements for crane and wetland conservation are elaborated. Appropriate entry points and approaches for identifying and nurturing social and economic motivations for institutional development are discerned from the findings.

5.1. Introduction

5.1.1. A species in decline

According to an unpublished report[24] by the then Government of Uganda in 1962, Uganda adopted the Grey Crowned Crane *Balearica regulorum* as its national bird owing to its beauty and widespread occurrence across much of the country. Little is known about the species' population size in the East African country before the 1960s but renowned ornithologist Derek Pomeroy, who started studying the species in the late 1960s, put the population at no more than 50,000 individuals (Pomeroy *pers. comm*). Recent reviews of this wetland-dependent species revealed a sharp decline across the country since the 1970s. Beilfuss *et al*. (2007), estimated that Uganda supported 35,000 individuals in 1984 but the population declined by 50% over the next decade. Results of the most recent review, undertaken in 2013, suggests the species' population in Uganda stands at approximately 8,000 individuals, the second largest population after Kenya's, which is equivalent to 23% of the global population (Morrison 2015). It suffered a 79% global decline over a 45-year period and as a result, was listed to Endangered on the IUCN Red List in 2012 (BirdLife International 2016). It is regarded as the world's fastest declining crane species (Morrison 2015).

The distribution of the key populations of Grey Crowned Cranes in Uganda coincides with human-dominated landscapes detached from formally protected areas (Pomeroy 1987; Olupot *et al*. 2009). A habitat suitability modelling study carried out by Stabach *et al*. (2009) showed that only 12% of the landscapes that contain suitable habitats for cranes coincide with the country's protected area network. The small crane populations found in protected areas may not be ecologically viable (Pomeroy 1987, *pers. comm*). These factors highlight the importance of conservation measures to secure crane populations and their habitats in human-dominated landscapes.

[24] The report is archived at the National Museum in Kampala and was accessed by the author in October 2011.

5.1.2. Cranes in transformed and shrinking wetlands

The major cause of the decline of Grey Crowned Cranes, cited by Pomeroy (1987) and Beilfuss *et al*. (2007), is habitat loss due to the extensive conversion of wetlands to agricultural fields. Uganda has a history of wetland conversion dating back to the colonial period (Richardson 1993; Turyahabwe *et al*. 2013). The areal extent of wetlands is estimated to have already shrunk by 30% between 1994 and 2009, mainly due to agricultural encroachment (Wetlands Management Department *et al*. 2009). With Uganda's human population growing at 3.2% annually (World Bank 2016), farmers are increasingly compelled to cultivate new areas, including the wetlands that support crane populations. The increased wetland encroachment and harvesting of wetland plants projected in recent studies (Turyahabwe *et al*. 2013; Kakuru *et al*. 2013) spell a dire future for the cranes. Habitat shrinkage results in more frequent and closer human-crane interactions, which creates leeway for escalation of threats such as direct persecution on farmlands as documented by Olupot *et al*. (2009) and capture of chicks for illegal trade and domestication (Morrison 2015).

The Grey Crowned Crane appears on various national symbols, including the coat of arms and national flag. This visibility has not translated into species protection, however. There are various reasons why the species is vulnerable. First, Grey Crowned Cranes (hereafter referred to as cranes) have no economic significance to local communities and the nation at large, while the wetland systems that support significant crane populations are recognised as production landscapes with great importance for the country's agro-based economy. For instance, valley bottom wetlands in Kabale District support over 50 crane breeding pairs (Muheebwa *pers. comm*.) but (50–60) % of the potatoes consumed in the country are produced on farms located in the same landscapes (Bonabana-Wabbi *et al*. 2013). Second, as Olupot *et al*. (2009) found out, non-economic values (e.g., totems and taboos) attached to cranes by some tribes, which previously acted as deterrents of harmful actions towards the species, appear to have eroded and succumbed under the local communities' quest to satisfy their

socio-economic needs. Third, Uganda's wildlife main conservation focus, and resource allocation priorities are skewed towards protected areas and surrounding landscapes as confirmed in literature on research conducted around these areas (Chhetri *et al*. 2003; Harrison *et al*. 2015). As stated earlier, these areas do not coincide with landscapes that support key crane populations. The species has not been benefitting from wildlife protection mechanisms accorded to other animals in protected areas.

On the other side of the coin, there is a noteworthy ray of hope for the species, its ability to adapt and survive in transformed landscapes (Pomeroy 1987; Meine and Archibald 1996). Habitat suitability studies have shown that the country's southwest region contains wetlands that provide the most suitable habitats for Grey Crowned Cranes (Stabach *et al*. 2009). As reported by Olupot *et al*. (2009), the region is a key stronghold for the species. There is a need therefore for research aimed at determining tenable conservation interventions and conditions under which cranes can continue to thrive in human-dominated landscapes in this region. Against this background, this chapter addresses two general questions. First, what conservation strategies (institutional arrangements and resource use behaviour) are required to ensure the cranes' long-term survival in Uganda's rural landscapes? Second, what are the contextual factors that make crane conservation strategies work in human-dominated landscapes? To answer these two questions, the chapter draws on insights from a decade of field experiences under the Uganda Crane and Wetland Conservation Project (UCWCP). The project was implemented in the southwestern region of the country, with a focus on three wetland systems: Kaku, Nyamuriro and Mitooma (Fig 5.1).

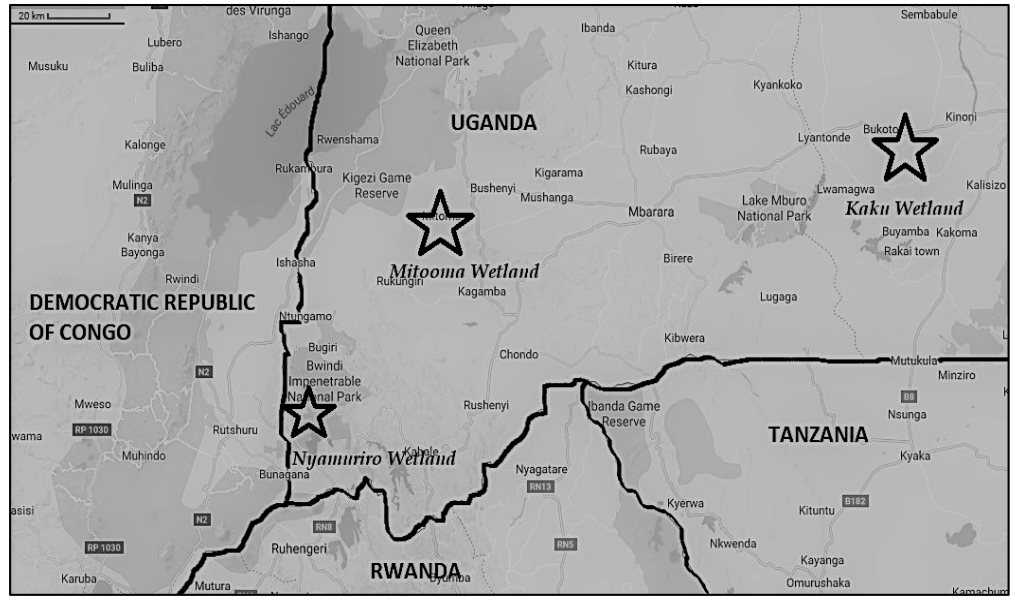

Fig 5.1. Location of the three project sites (depicted by stars) in relation to national boundaries

5.1.3. Evolution and evaluation of community-based conservation

The UCWCP (hereafter referred to as 'the project') was inspired by the global paradigm shift from fortress conservation (state-led, top-down and people-exclusive approaches) to people-centred and community-participatory approaches that call for the prioritisation of local community needs and values. This is usually referred to as community-based conservation (Hackel 1998; Adams and Hulme 2001; Brooks *et al*. 2012). Though the theory of community-based conservation evolved through analyses of cases of communities and wildlife around protected areas and their environs (e.g., Hulme and Murphree 1999; Wells and McShane 2004; DeGorges and Reilly 2009), a body of literature acknowledging that the concept could be extended to projects beyond protected area boundaries is growing (Chazdon *et al*. 2009; Mora and Sale 2011). Whether it is applied in protected areas or rural landscapes, community-based conservation projects share a common trait: enhancing a resource stewardship ethic among local communities characterised by collective actions driven by shared values (Gibson and Koontz 1998). This section discusses the general approach to the evaluation of community-based conservation projects, producing the research questions of the present chapter.

Evaluative frameworks which link the biophysical and socio-economic context with resource management institutions and social and environmental impacts in a defined landscape setting have been developed for use in evaluating community-based conservation projects. Using these frameworks, previous research has shown that in general, the success of community-based conservation projects largely hinges on: (1) enhancing or leveraging local attitudes and values attached to target species and habitats (DeCaro 2008; Van der Ploeg *et al*. 2011) and (2) developing, nurturing and strengthening resource management institutions for balancing natural resource utilisation and conservation (Ostrom 1990; Yami *et al*. 2009).

It has also been shown, however, that the outcomes of community-based conservation projects are context-dependent (Waylen *et al*. 2010; Brooks *et al*. 2012). This has led researchers to conceptualise community-based conservation as an evolving approach that could be improved through extensive documentation of lessons from the field (e.g., White and Vogt 2000; Thompson *et al*. 2003; Measham and Lumbasi 2013). A common approach used to carry out evaluative research focuses on key lessons and factors contributing to success (Brooks *et al*. 2012). As stated by Lyons (2013), labelling community-based conservation projects as mere "successes" or "failures" through an analysis of outcomes of one dimension (e.g., ecological impacts) may not paint a full picture of the social dynamics that shape attitudes, behaviours and resource management institutions. To address this challenge, alternative evaluation methods have been proposed which enable the researcher to gain contextual insight through the analysis of rich stories about site-level developments rooted in local contextual factors (individual or household-level, community level, supra-national) (Pomeroy *et al*. 2001; Brooks *et al*. 2012). This approach of narratives-in-context will also be followed in the present chapter.

The essence of community-based conservation is to put resource user communities at the centre of environmental decision-making, for the dual goal of maintaining the natural resource base for sustaining livelihoods while at the same time protecting habitats and species (Hulme and Murphree 1999; Brooks *et al*. 2013). This is achieved through social processes that empower communities to design rules and regulations for resource use and shared strategies for collective action to curb unsustainable resource use (Chazdon *et al*. 2009; Mora and Sale 2011). These collective bundles of rules, regulations and strategies are defined as institutions (Ostrom 1990; Rahman *et al*. 2012). In natural resource management, institutions create incentives for socially acceptable resource use, empower local structures to enforce resource use rules, and create a regulatory framework that legitimises the institutions in the eyes of all stakeholders (Ostrom 1990; Imperial and Yandle 2005). The concept of institutions was popularised by scholars researching the common property resource management systems evolving over long periods without external interventions (Ostrom 1990; Imperial 1999). In recent years, the focus has been broadened to also include local resource management institutions emanating from facilitator-driven processes, including government- or donor-funded conservation projects (Morrow and Hull 1996; Gezon 1997; Platteau 2004). Institutionalisation of natural resource management, a process of making collective decision-making and environmental practices regular and socially acceptable within community groups that share resources (Saravanan 2002; Pimbert 2004; Gatzweiler 2009) is now a common approach adopted by many conservation agencies. The UCWCP is an example of an initiative with a strong component of institutionalisation, largely facilitated by a conservation non-governmental organisation (NGO). For this reason, the narratives of the present chapter will be largely institutional.

Program evaluation based on the analyses of local institutions is now a common practice in the quest to draw linkages between social and environmental outcomes of conservation projects. In addition to discerning whether there has been institutional success or failure (Acheson 2006), evaluative research has also been focused on the evolution of these institutions, to identify success factors and bottlenecks to institutional development. Furthermore, a common trait of institutional analyses is the consideration of contextual factors such as biophysical setting, community attributes, socio-economic setting and regulatory frameworks (Imperial and Yandle 2005; Ostrom 2009). These analytical approaches have been used to develop theories on the functions, performance and sustainability of institutions while at the same time generating practical insights for the conservation practitioner. In the present chapter, the Institutional Analysis and Development (IAD) framework (Imperial 1999; Andersson 2006; Ostrom 2011) is used to draw lessons on how to nurture local institutional arrangements for sustaining community livelihoods and ensure survival of cranes in wetland landscapes. Details on the structure, integral elements and utility of the framework are presented in Section 5.2.

Thus, integrating the two general questions presented in the previous section and the basic research question posed in Chapter 1, this chapter addresses the following specific questions:

- What were the institutional and environmental outcomes that resulted from the project?

- What project design and contextual factors contributed to the positive outcomes?
- What were the expected institutional and environmental outcomes that did not materialise?
- What project design and contextual factors hindered the attainment of desired outcomes?
- How can local institutions be developed and nurtured to effectively protect cranes and secure their habitats?

Following these questions, the chapter is structured as follows. In the next section, a brief outline of the evolution and thrust of the project is presented. This is followed by a description of the biophysical and socio-economic characteristics of the study sites. A description of the methodological framework and data collection procedure then follows. In the results section, site-specific institutional development (process and outcomes) and environmental impacts over the period 2004–2014 are presented. The discussion section covers lessons for institutional development to attain species and habitat conservation, including factors identified as having influenced project successes and failures.

5.1.4. National initiative to conserve cranes and wetlands

This subsection provides a general description of the project based on unpublished documents compiled by Nature Uganda, including funding proposals, project reports, crane survey reports and species action planning reports. These reports represent the institutional memory of the organisation's efforts to conserve the Grey Crowned Crane since the 1990s.

The Uganda Crane and Wetland Conservation Project (UCWCP), hereafter referred to as the project) was initiated in the early 2000s. It evolved in the wake of discoveries (national and global) on the decline of cranes and national developments in the wetland conservation sector in the 1990s. An international conference, held in Maun, Botswana, in August 1993 and funded by the International Crane Foundation, brought to the fore social and ecological issues affecting cranes and wetlands across Africa. One of the key recommendations of the workshop was the need to initiate country-level crane conservation programs and the importance of engaging local communities and government agencies in addressing direct and indirect threats to cranes. By that time in Uganda, there were government-backed consultative processes aimed at addressing wetland degradation through local interventions and national legislation, which culminated in the enactment of a national wetlands policy in 1995. The wetlands policy and the ensuing national wetland sector strategic plan unveiled in 2001 prioritised the involvement of local communities in the planning and implementation of wetland conservation activities (Wetlands Management Department *et al*. 2009).

Previous ecological studies (e.g., Pomeroy 1987) had highlighted some human-induced threats to cranes in rural landscapes but conservation of the species had remained a low priority for both state and non-governmental entities. Findings from a Master of Science degree research undertaken by Jimmy Muheebwa–Muhoozi between 1997 and 2000 provided an overview of the status and distribution of cranes across the country at the turn of the century. The study revealed a major decline in the crane population since the 1970s and the prevalence of threats to the species emanating from human activities. A major recommendation of the study was to engage local communities through a broad-based conservation outreach programme focusing on the cranes' geographic stronghold, the southwestern region of Uganda. The recommended activities included education and awareness raising targeting local resource users and national decision makers, the development of locally-developed and enforced crane protection and wetland management systems and the forging of partnerships with relevant government environmental and community development agencies.

During his studies, Jimmy Muheebwa-Muhoozi facilitated the formation of school environmental clubs in the catchment of Mitooma and Nyamuriro wetlands as an entry strategy to promote local custodianship of cranes. This marked the beginning of community engagement, which would become the cornerstone of the project. His liaison with the then Africa Program Director of the International Crane Foundation, Richard Beilfuss and his supervisor, Derek Pomeroy, between 2000 and 2002, led to discussions that defined the strategic focus of the project, with a resolution that recommendations from his thesis would guide the initial phase of the project.

A $20,000 grant secured from the Disney Wildlife Conservation Fund in July 2002 through the International Crane Foundation became the seed funding for the project. Jimmy Muheebwa-Muhoozi assumed the responsibility of full-time coordinator with the project falling under the auspices of the Wildlife Clubs of Uganda. The project goal was to develop models for integrating crane and wetland conservation with community development, which would inspire individuals and community groups within the cranes' range. The funding made it possible to expand the thematic focus of the project from outreach activities involving school environmental clubs to include other community actions involving the broader society (leaders, wetland users, government agencies and district authorities). It also made it possible to introduce livelihood projects designed to demonstrate tangible benefits as alternatives to wetland-based livelihood options that were detrimental to wetland integrity. When the Disney Wildlife Conservation Fund-funded project ended in 2004, the

proponents realised the need to consolidate its success by incorporating the national crane and wetland conservation under the portfolio of Nature Uganda, a well-established nature conservation organisation. Placing the project under the administration of Nature Uganda would translate into tangible benefits, including leveraging funding and improving the project profile among the conservation community between 2004 and 2007. Table 5.1 shows the funding timeline for the project between 2003 and 2013, including the names of the three target wetlands.

Table 5.1. Funding timeline of the Uganda Crane and Wetland Conservation Project

Name of funder	Amount received (USD)	Funding duration	Target sites	Main project focus during funding period
Disney Wildlife Conservation Fund	20,000	2002–2004	Mitooma Nyamuriro	Alternative livelihoods, education and awareness, crane monitoring, wetland management planning, institutional development
IUCN Netherlands	10,000	2004–2006	Kaku Mitooma Nyamuriro	Alternative livelihoods, education and awareness, crane monitoring, wetland management planning, institutional development
USAID (as a component of the PRIME West Project)	5,000	2000–2007	Nyamuriro	Alternative livelihoods, education and awareness, crane monitoring, wetland management planning, institutional development
Whitley Fund for Nature	48,000 48,000 56,000	2008–2009 2010–2011 2013–2014	Kaku Mitooma Nyamuriro	Alternative livelihoods, education and awareness, crane monitoring, wetland management planning, institutional development
Parc des Oiseaux	5 000	2010	Kaku	Alternative livelihoods, education and awareness, crane monitoring
North Carolina Zoo	5 000	2012–2013	Kaku Mitooma Nyamuriro	National crane surveys and crane conservation outreach
Dohmen Family Foundation	5 000	2012–2013	Kaku Mitooma Nyamuriro	National crane surveys and crane conservation outreach

Between 2004 and 2014, the project had six major elements:

- environmental education and awareness,
- promotion of alternative livelihoods,
- formation of and capacity building for site conservation groups,
- community-based wetland management planning,
- wetland restoration activities,
- and community-based monitoring of cranes and wetlands.

Environmental awareness was aimed at prompting conservation action through the dissemination of information on the plight of cranes through presentations at community workshops, drama and choir competitions involving schoolchildren in target wetlands' catchment areas. The project introduced "Adopt a crane" initiatives with an initial focus on schools as a way of promoting practical action in protecting cranes and their breeding habitats. Educational and promotional materials with crane and wetland conservation messages (t-shirts, posters and pamphlets) were disseminated at school and community events. The environmental education and awareness and the "Adopt a crane" initiative were geared towards promoting personal and community attachment to cranes and wetlands. Pilot initiatives for demonstrating livelihood options (fodder and fruit tree planting, bee-keeping, fish farming, small stock production, vegetable gardening) inspired by the wise-use concept were introduced. At each site, the project facilitated the formation of wetland management committees whose responsibility was to enforce community-developed regulations and undertake bi-annual wetland monitoring. This was aimed at developing grassroots conservation leadership comprising local champions, committed volunteers, who would then spearhead both awareness and all practical actions at the sites. Members of the wetland management committees were also involved in the informal collection of data on cranes, including keeping records of breeding pairs, breeding events, causes of mortalities, crane activities and flock sizes. In implementing the project, the thrust was on promoting collective action in addressing social and environmental challenges affecting cranes and wetlands since cranes moved across fields and also because some of the wetlands that supported crane breeding pairs were managed as common pool resources. There were, however, cases when individual and particular households were engaged if the matters at hand were largely linked to actions of respective individuals and households (e.g., cranes breeding on wetlands located on fenced and privately owned plots).

Since 2005, the project has been managed by Nature Uganda. The organisation's role includes financial management, supervisory support and fundraising. As the project coordinator, Jimmy

Muheebwa-Muhoozi has been responsible for the overall implementation of field activities, reporting as well as monitoring and evaluation. Three field assistants, one per site, were engaged to assist with collating crane data and organizing site-focused events such as meetings, field days and collective actions such as monitoring and restoration activities. The International Crane Foundation, in partnership with the South African-based Endangered Wildlife Trust, provided technical support and also assisted with fundraising.

At the national level, the project has operated in collaboration with government agencies responsible for wetland management and local administrative authorities (districts and lower county structures). The Uganda Wetlands Management Department, a body mandated with the responsibility of implementing the national wetland policy and enforcing regulations governing wetland management, was involved in activities such as awareness raising, wetland management planning and delineation of utilization zones. District-based officers from the National Agricultural Advisory Services (NAADS) provided training and technical support in the implementation of livelihood projects. Local government authorities represented by district administrators and lower county officials were also engaged and played a key role in ratifying project activities. The Uganda Wildlife Authority had a peripheral role in the implementation of project activities but was consulted during project planning workshops.

5.2. Methods

5.2.1. The study areas

The study area is defined by the three project sites where crane conservation has been underway since the early 2000s. They are located in the Lake Victoria Basin, a biogeographical region known to have some of the highest population densities in Africa (Odada *et al*. 2004). Fig 5.1, presented earlier in this chapter, shows the geographical location of the study sites.

Over the past century, the region experienced environmental problems, which include deforestation, water pollution, soil erosion, and wetland loss (Odada *et al*. 2004). The focal wetlands form part of what used to be an extensive system of papyrus swamps that have, over the years, been encroached and extensively transformed into agricultural lands. Remnants of these wetlands in the southwestern region support at least 70% of the country's total population of cranes. Table 5.2 summarises the biophysical characteristics, socio-economic factors, ethnocultural traits of communities and resource management institutions at the three study sites.

Table 5.2. Biophysical characteristics, socio-economic factors and institutional arrangements at the three study sites

Attribute	Kaku	Mitooma	Nyamuriro
Description of wetland(s)	Pan-shaped wetland comprising sections covered by open water, papyrus and shorter sedges	Network of extensively converted wetlands associated with streams interspersed by small hills	High altitude valley-bottom papyrus-dominated peatland fed by water from steep-sided hillslopes
Size of focal wetland (km^2)	2.4	0.8	3.6
Annual rainfall (mm)	840	1230	1200
Main land use within 500 m of focal wetland(s)	Vegetable gardening, wet season crop production (beans and maize), livestock grazing	Livestock grazing, eucalyptus plantations, vegetable gardening, crop production (beans and maize)	Crop production (Irish potato rotated with beans and maize)
Land use in the broader catchment	Rain-fed crop production on gently sloping fields, banana plantations, livestock grazing, human settlements	Crop production on hill sides, eucalyptus, banana plantations and human settlements	Crop production, eucalyptus plantations and human settlements on steep-sided hill slopes
Agricultural potential	High for pastoralism and low for crop production	High for crop production (rain-fed cropping system and wetland edge cultivation)	High for crop production (rain-fed cropping system and wetland edge cultivation)
Main resources derived from wetlands	Papyrus, Water for domestic use and irrigation, Fish	Papyrus, Water, Fodder grass	Papyrus, Water
Size of target communities	350 households 6 schools	250 households 5 schools	400 households 6 schools
Tenure patterns	Common access to all resources for locals	Private ownership and management of fenced plots	Common access to papyrus and water for locals
	Household-owned plots on wetland fringes	Common access to resources in main wetland	Household-owned plots on wetland fringes
Ethnic diversity	Baganda but mixed with other tribes especially Bakiga, Banyankole, Bafumbira and Banyarwanda. High ethnic diversity due to large scale in-migration in the 1950s	One dominant ethnic group (Banyankole)	One dominant ethnic group (Bakiga) and significant populations of migrants from Congo and Rwanda
Population density (district level) (inhabitants/ km^2)	240	357	401
Conservation status	No recognized protection status	No recognized protection status	Recognised as an *Important Bird Area* under the BirdLife International criteria
Status of cranes at the site between 2003 and 2013)	6 breeding pairs Average flock size = 250 individuals	8 breeding pairs Average flock size = 20 individuals	5 breeding pairs Average flock size = 30 individuals

5.2.2. Methodological framework

Data collection and analysis was guided by the Institutional Analysis and Development (IAD) framework originally developed by Elinor Ostrom and other scholars researching community organisation and natural resource governance (Ostrom 1990; Imperial 1999; Ostrom 2011; Whaley and Weatherhead 2014). The IAD framework has been modified over the years and has since evolved into an adaptable analytical tool for analysing the functionality and effectiveness of institutions in addressing resource depletion and degradation challenges emanating from community activities (Ostrom 2011; Whaley and Weatherhead 2014). The core of the framework comprises four elements: the context (biophysical environment, socio-economic conditions, and rules), the action arena (actors, action situations), the patterns of interaction (collective actions, platforms for decision making, rule-making and enforcement) and the outcomes (new resource use behaviour, ecosystem integrity and species survival), as shown in Fig 5.2.

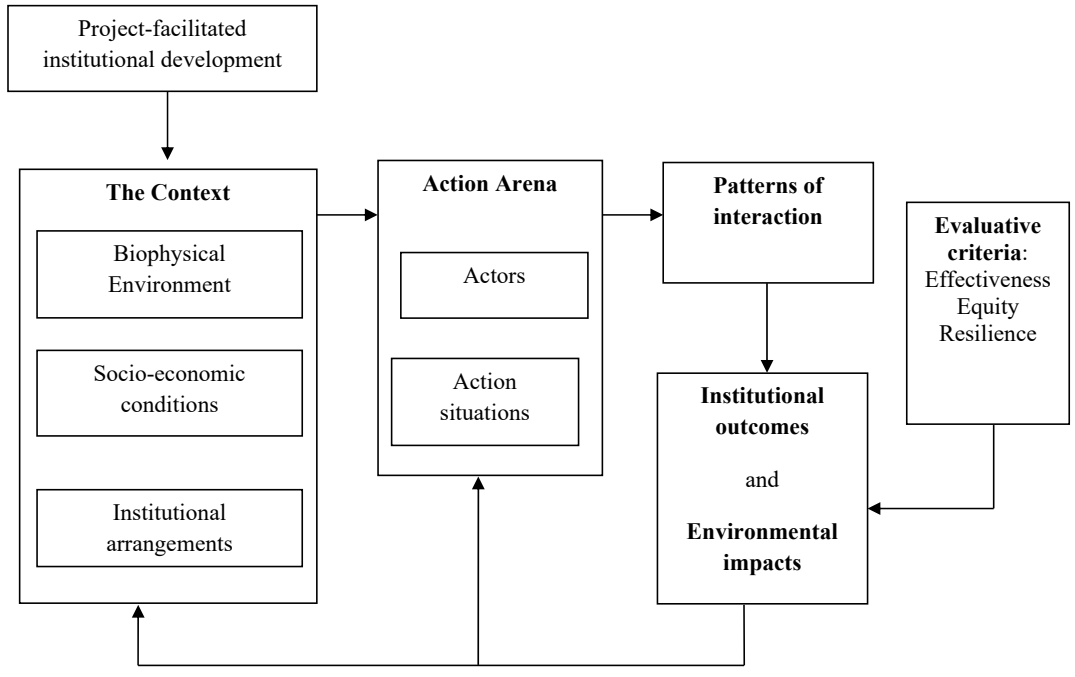

Fig 5.2. Elements of the IAD framework (adapted from Imperial 1999 and Andersson 2006)

The use of the IAD framework starts with the identification of the action arena, which defines the platform or geographical zone where resource users and other stakeholders interact in a defined landscape or site of conservation concern. In our case, the actors in the action arena were the wetland user community and external administrative units that influence the management of the wetlands, including environmental agencies and district authorities. Since the action arena is largely influenced by external contextual factors, it is critical is include these external factors (social structures, rules, culture, etc.). The next step involves assessing factors and opportunities that enable the stakeholders identified in the action arena to interact at various temporal and spatial scales. These include collective actions, rules, regulations, programmes and policies. In this case, the interaction patterns included community-facilitator meetings, community norms, national wetland management regulations and policies. One aspect considered critical in IAD-based analyses is incentives (broadly defined as motivations, values, material or social sanctions and preferences) which shape the actors' behaviour and decision making. Interactions between stakeholders produce institutional outcomes and environmental impacts. As shown in Fig. 5. 2, diverse evaluation criteria can be used to determine the effectiveness of the institutional arrangements under review. The criteria can include, among others, aspects such as resilience and adaptability in the face of internal and external challenges, nature and level of environmental impacts (e.g., size of habitat enhanced or created and survival of target species). The institutional outcomes and environmental impacts are linked back to the action arena and the context. IAD analyses can be undertaken at different levels of decision-making (Ostrom 2011). In this study, the main focus is on community or decision-making at site-level.

The key strength of the IAD framework is its adaptability and robustness, which allows researchers to modify and include the relevant variables depending on the situation at hand. The IAD framework has therefore been used in a wide range of socio-ecological scenarios and environmental problem analyses; including collective action in commons (Ostrom 1990; Rahman *et al*. 2012), mainstreaming of decentralisation policies (Andersson 2006), environmental policy experiments (Rudd 2004), co-management arrangements (Whaley and Weatherhead 2014), and ecosystem-based natural resource management (Imperial 1999). IAD-inspired institutional analysis enables a researcher to discern and analyse rules, interaction patterns, incentives and environmental outcomes in a given socio-ecological setting (Ostrom 1999; Imperial and Yandle 2005; Ostrom 2011). Acknowledging the adaptability of the IAD framework, we formulated our data collection template in such a way that it would capture the pre-project scenario, the institutional development process, outcomes of the institutional development process, environmental impacts and performance of the institutional arrangements against socially-relevant evaluation criteria, including indicators of institutional resilience and desired biophysical

attributes. Table 5.3 shows key variables that we used in the data collection process, with particular reference to the socio-ecological situation at the three sites. One of the advantages of the IAD framework is its adaptability, which allows evaluators to modify it to suit various contexts. In this regard, the contextualisation of the IAD framework as shown in Table 5.3 was achieved through adaptation of the key elements of the original framework presented in Ostrom (2011) but inspired by similar adaptations by Rudd (2004) and Rahman *et al*. (2012).

Table 5.3. IAD criteria used for data collection and analysis

Universal elements of IAD framework	Key considerations for data collection and analysis in this study
The Context: Biophysical conditions, socio-economic scenario and community attributes	Drivers of past wetland transformation
	Wetland conditions and status of cranes
	Environmental problems affecting wetlands and cranes
	Prevailing management regime (tenure and resource use rules)
	Characteristics of wetland users
	Wetland resource use patterns and motivations
The Action Arena: Action situations and patterns of interaction	Entry strategies for promoting new institutional arrangements
	Community engagement methods for institutional development
	Incentives for participation and acceptance of new institutions
	Practical conservation action at the sites
	Opportunities generated for community interactions
The Outcomes: Institutional changes and environmental impacts	Outputs of institutional development process (e.g., management plans)
	Conservation and resource use rules (made and enforced)
	Evidence of collective action
	Change in land management and wetland resource use
	Impact on wetland ecological and hydrological characteristics
	Impact on crane populations
	Change in wetland access and use rights
Evaluation Criteria: (effectiveness, equity, resilience of institutions)	Effective enforcement of resource use and access rules
	Evidence of self-organisation by community groups
	Ability of community groups to withstand external threats
	Ability to resolve wetland resource management conflicts
	Legitimacy of community groups in the eyes of the locals
	Stability of community group membership
	Level of equity in access to wetland resources
	Success in securing support and recognition by government agencies

5.2.3. Field data collection

The first lap of this research, conducted in 2011, focused on local rules, collective actions for wetland management and successful protection of crane breeding sites, all linked to the project, as well as evidence of failure to attain the envisaged wetland protection. This exposed a research need to conduct detailed analyses of site-level institutional dynamics and environmental impacts of the project. A decision was then made to carry out this research in June 2013. Data presented in this paper is about project experiences between 2003 and 2013. It was collected by the author in October 2013.

Data collection methods were predominantly qualitative, primarily guided by the IAD themes and variables summarised in Table 5.3. To complement and reinforce the IAD data, quantitative data (e.g., numbers of cranes, numbers of families, incomes, size of land, production levels) were also collected. The main stakeholder group consulted during the data collection process were community members, recognising that they interacted with cranes almost daily, that the integrity of wetlands depended upon their actions and livelihood practices and that they had been actively involved in the project between 2003 and 2013. A register of households that were engaged during project implementation was provided by Nature Uganda. A review of project reports compiled by Nature Uganda over the 10 years revealed different categories of project participants: (1) individuals who had consistently been forerunners in site-based project activities, (2) ordinary community members that were consistently involved in the project, (3) individuals that joined the project during the initial phases but dropped out at some stage as the project progressed. This information was used to ensure that participants that had participated in various capacities and phases were involved during the data collection process. During the data collection process, reasons for non-participation and relationships between participants and non-participants were discerned through conversations with respondents.

Focus group discussions with community group members generated the bulk of primary data required for IAD-based analyses. At Kaku and Nyamuriro, where the focal wetlands were common access resources, project participants were grouped into three clusters (based on their village locations) for focus group discussions. At Mitooma, three focus group discussions were held, two were held with users of the Rwebicere (a large common access wetland) and one with crane custodians on whose plots cranes bred.

Records of project participants kept by project leaders were used to select respondents. Households and individuals that had consistently participated in project activities since 2003 were intentionally invited to the group discussions. The invitation to participate in the focus group discussions was

made open to ensure inclusivity and allow diverse experiences to be captured. Invitations to participate in the focus group discussions were conveyed through the project leadership at each site as per the village protocol. Project leaders at each study site were aware of households that had participated at some stage over the 10 years but were no longer actively involved at the time of this research. These households, that dropped out along the way, were interviewed individually to elicit their views on the project's institutional dynamics. Semi-structured interviews were held with six key informants at each of the three sites. The informants included District Environmental/Wetlands Officer and two randomly selected village leaders and three local county leaders. The objective in selecting these key informants was to capture the views of community leaders and relevant environmental officers that had worked with the project participants. Questions that were used in group discussions (See Box 5.1) were also used as a guide during interviews with key informants. They also provided contextual information on the target wetlands' environmental history, land ownership structures, community power dynamics, influence of government agencies and general perceptions about the project.

A total of 46 and 53 community members (active project participants) were engaged during data collection at Kaku and Nyamuriro, respectively. At Mitooma, 23 Rwebicere wetland users and 16 crane custodians attended the group discussion sessions. Numbers and gender of focus group discussion participants and interview respondents are presented in Table 5.4.

Table 5.4. Numbers of focus group discussion participants and interview respondents

	Kaku	**Mitooma**	**Nyamuriro**
Focus group participants (active project members)	Group 1: 7 men, 3 women Group 2: 10 men, 4 women Group 3: 8 men, 7 women	Group 1: 8 men, 4 women Group 2: 8 men, 3 women Group 3: 10 men, 6 women	Group 1: 13 men, 5 women Group 2: 11 men, 7 women Group 3: 14 men, 6 women
Non-active /drop out households	3 men, 5 women	6 men, 3 women	6 men, 3 women
Key informants	1 Wetlands Officer (male) 2 Village leaders (both male) 3 County leaders (1 female, 2 males)	1 Wetlands Officer (male) 2 Village leaders (both male) 3 County leaders (all male)	1 Wetlands Officer (male) 2 Village leaders (both male) 3 County leaders (1 female, 2 male)
Percentage of households engaged during data collection	60%	63%	56%

Building on IAD criteria presented in Table 5.3, a semi-structured questionnaire was designed for use as a guide in focus group discussions and interviews with drop-out households and key informants. The criteria were transferred into a topic list for semi-structured focus group discussions, following the standard methodology of the semi-structured interviewing (Edwards and Holland 2013). The questions provided points of departure to explore institutional development and its social and conservation impacts, with follow-up questions being asked to ensure that the broad spectrum of issues presented in Fig 5.3 was covered. A list of general questions used is presented in Box 5.1. Questions were posed to participants in such a way that a story about the evolution of institutions and environmental changes (wetland conditions and crane survival) that took place as a result of the project could be documented. Local languages were used during the group discussions, assisted by individuals contracted to provide translation support. In some cases, respondents expressed themselves in English. On average, group discussions took between 60 and 120 minutes. Interviews with key informants were aimed at verifying facts raised during group discussions. Key informants provided data on the wetlands' environmental history, land ownership structures, community power dynamics, the influence of government agencies and general perceptions about the project. All key informant interviews took less than an hour.

Box 5.1. Key questions that were used to guide group discussions semi-structured and interviews

1. How has wetland use and users changed over the years?
2. What were drivers of wetland degradation before the project started?
3. What are the specific human actions that have affected cranes and their habitats over the years?
4. How were community groups established and how have they evolved since the project started?
5. What practical conservation actions were implemented by groups and what were the incentives?
6. What has been the impact of the community groups on the community cohesion and collective action?
7. How has wetland access, use and protection changed as a result of the institutional interventions introduced by the project?
8. What challenges have the community groups involved in the project encountered and how have they solved them?
9. What are the notable conservation impacts of the institutional interventions on cranes and wetlands?
10. What has been the role of the government, district authorities and other stakeholders in the project?

Results of focus group discussions and key informant interviews were complemented by personal observations and desktop analysis of pictures depicting evidence or absence of project impacts. Transect walks through the wetlands enabled the observation of vegetation cover and associated water retention and flow regimes that could be attributed to project interventions. Evidence of wetland degradation, wetland restoration, land use change, wetland vegetation and crane breeding sites was captured photographically for subsequent content analysis. A review of project reports compiled over the 10-year project duration also provided an overview of developments at each site. Quantitative data on crane and wetland attributes were obtained from reports compiled by Nature Uganda during the project implementation period.

The use of the IAD framework and the variables in Table 5.3 allowed data collection and analysis to be done in a systematic way, which in turn, made data aggregation, cross-site comparison and identification of commonalities possible. Interview responses were then synthesised as part of an inductive analytic process to discern data patterns, themes and implications of the findings. This enabled the formulation of site-based narratives of institutional development process and outcomes

and environmental impacts. The overall aim was to discern the institutional outcomes at each site and the impact on wetland conditions and crane survival. The evaluation of the ecological outcomes was based on an intuitive extrapolation of the pre-project situation ('outlook'), thus approaching a "with/without" comparison as recommended by Baker (2000) and Bull *et al*. (2014).

5.3. Results

In this section, the results of the IAD-based evaluation of the social and ecological impacts are presented on a site-by-site basis. They are presented under four themes: the pre-project situation, site-specific institutional development processes, site-level behavioural and institutional outcomes and notable environmental impacts. Data presented in this section were primarily generated through focus group discussions and semi-structured interviews. During data collection, some project leaders and ordinary project participants would refer to project records they had kept over the years.

5.3.1. The Kaku story

Pre-project situation and outlook

As of 2004, Kaku was a common access resource shared by livestock owners, plant harvesters, fishers, wetland edge farmers, hunters of small mammals and water users (including residents from the nearby town of Kyazanga). The prevailing open access regime, rooted in local tradition, allowed individuals from villages outside the wetland's catchment boundaries to access plant and water resources. Whereas the patches and points from which water and plants were harvested were open access, cultivators had gradually turned wetland edges (approximately 70% of the wetland's 30 m buffer zone according to Nature Uganda's baseline assessment) into household-managed patches for all-year-round crop production. Five households established small eucalyptus plantations to supplement their income from the sale of timber and to covertly create a sense of territoriality and long-term exclusive access rights over the wetland edges. The pursuit of short-term private benefits, regardless of the impact on wetland integrity, dominated resource use patterns in sections of the wetland where a common access regime prevailed.

Two phenomena were noted to have driven wetland encroachment. Two severe droughts that occurred in 1982–1983 and 1991–1992 caused a recession of water levels and triggered unprecedented waves of wetland-edge farming. Community members interviewed concurred on

the existence of a loosely defined customary management rule, weakly enforced by tribal leadership structures, prohibiting plant harvesters, fishers and hunters to harvest resources for commercial reasons. Previous government policies, which encouraged wetland reclamation had created an enabling environment for uncontrolled encroachment. Though the Uganda Wetlands Policy had already been enacted, no officer had been deployed in the area to enforce the policy provisions. In the words of one community member, "previous governments gave permission to use wetlands in any way to reduce poverty so the mentality that they could still do anything in wetlands prevailed". There were neither community-level platforms for wetland users to deliberate on wetland management issues nor mechanisms for monitoring use and condition of the wetland.

Since the community mainly valued the wetland as a source of livelihood, there were no purposeful actions to protect species that did not have utilitarian values, such as cranes. Human-crane interactions occurred when community members undertook activities such as fishing on wetland edges as well as using canoes, water abstraction at points dotted on the wetland edges, agricultural activities on wetland edges and grazing and plant harvesting. Constant human presence on wetland edges affected cranes through disturbance during the breeding season. In 2003, six crane breeding pairs were recorded at the site and smaller wetlands within a 2km radius of the main site. The largest flock ever recorded in Uganda (300 individuals) was also sighted at the wetland the same year, making it one of the most critical crane sites in the country. Patches of deep open water interspersed with stands of sedges generally limited human access to middle sections of the wetlands where the cranes bred and foraged. In spatial terms, this created a safe haven for cranes. However, because of the ongoing encroachment, weak wetland management institutions, low conservation values attached to cranes and rising number of wetland users due to population growth, the outlook for the cranes was not encouraging.

Community-based wetland management planning

Crane and wetland conservation awareness outreach during the first five years (2002–2007), was instrumental in sensitising the community on the need for them to collectively develop mechanisms to reduce human-induced pressures on the wetland. This culminated in a multi-stakeholder process to develop a community-based wetland management plan for the site. The wetland management planning process, which took place between June 2008 and July 2009, was facilitated by Nature Uganda and the Uganda Wetlands Management Department. At the community level, lower county leaders and community leaders were consulted and tasked with the role of promoting the wetland management planning process to the broad spectrum of wetland users. The process provided interactive platforms for joint analysis of threats to the wetland, stakeholder analysis, qualitative valuation of wetland resources, solution-seeking to address threats and allocation of roles among wetland stakeholders. The product of the process was a community vision of how the wetland would be managed, with themes for conservation action that were categorised into technical interventions (e.g., wetland boundary delineation, catchment rehabilitation and rehabilitation of degraded sections), adoption of alternative livelihoods to relieve pressure on the wetland, wetland and species monitoring and conservation awareness outreach. Five wetland management committees, each comprising five members, were formed to oversee the implementation of the plan. The committees comprised representatives of the wetland user groups, holders of political and administrative leadership positions at local level, key informants (teachers, retired civil servants) and politically influential leaders (county leaders, local councillor, ruling party youths).

After the final version of the plan was approved by the stakeholder groups, it was submitted to the Wetlands Management Department (national office) for technical editing and mandatory legal review in 2010. The expectation was that once the plan was approved by the department and ratified by the district authority, it would guide the management of the wetland for five years. Independent of the long-awaited ratification of the plan, project activities implemented between 2010 and 2014 was geared towards fulfilling the resolutions made under the various themes covered in the plan. This included crane and wetland conservation awareness and the introduction of alternative livelihoods. Alternative livelihoods were used as an incentive to address poverty and strengthen community cohesion through the introduction of group-based projects (piggery, market gardening and poultry production), with an average group membership size of 12 households.

Site-level behavioural and institutional outcomes

The expectation that the wetland management plan would usher in new and effective local institutional arrangements for curbing wetland encroachment and unsustainable resource harvesting did not come to fruition. Although Nature Uganda submitted the plan to the national office of the Wetlands Management Department, the ratification process was bottlenecked. The plan was supposed to be reviewed by senior technical officers, including a legal expert before it would be signed by the Minister. By 2014, the review had not been completed. The result was a

period of uncertainty and suspense on the part of the local community and the district authorities, during which the energies for an improved wetland management regime began to wane.

Acknowledging that ratification of the plan was delayed, this research sought to discern changes in community interaction patterns, wetland resource use behaviour and community acceptance and functionality of wetland management committees by assessing site-level developments during the post-planning period (2010–2014). This analysis enabled the identification of design weaknesses (in the planning process) and setbacks imposed by the external environment. For instance, the demarcation of a buffer zone (50 m from the wetland edge) was agreed upon in principle during the planning process but there was no clarity on how to deal with the conscientious issue of cultivators that already had plots within the buffer zone. Although alternative livelihoods were popular among the beneficiaries, two major weaknesses were identified. First, households and community groups receiving start-up inputs for livelihood improvement were not bound by any conditions to perform any conservation actions to reduce pressure on the wetland. Flaws in the targeting criteria, which also translated into a disconnection between the livelihood projects and mitigation of wetland encroachment, were identified, with 67% of beneficiaries interviewed not owning plots on the edges of wetland. Generally, the livelihood options introduced did not become alternatives to wetland-degrading practices but options for complementing food production and income generation. Some households that owned plots of wetland edges opted not to join the livelihood projects and continued cultivating in the wetland buffer defined in the management plan as no-cultivation zones. Flaws in the targeting criteria, that resulted in some households benefitting at the expense of those that had plots on wetland edges, was linked to elite capture. This was exemplified by households that benefitted from the project mainly because they had social connections to political leadership and because they were opinion leaders and champions in community development projects. Using their privileged positions and influence over donor-funded projects, they would access project benefits before the rest of the community did. This inherently made the task of linking livelihoods to conservation challenging.

Despite being recognised by the district authorities as community-based organisations, the wetland management committees lacked the power to effectively enforce simple rules such as the prohibition of hunting and wetland edge farming. This, coupled with the absence of community-defined sanctions for offenders meant that the committees had to pass on cases to the state enforcement agencies (e.g., the police), as was the case when poachers were apprehended in 2011. On several occasions, they reprimanded individuals involved in prohibited activities, but this did not deter community members from engaging in activities that degraded the wetland. One committee member lamented the lack of enforcement mechanisms and action from the Wetlands Management Department, which created leeway for wetland users to flatly refuse to be bound by the wetland management regulations. The work of the committee was also undermined by politically connected individuals. A typical example was that of an elite member of the community who, despite being confronted by the wetland management committee, claimed to have received permission to harvest wetland plants from a local district official for his brick-making and tree nursery project located on the edges of the wetland. During a group discussion, one participant alluded to the fact some households (who he described as the elites) dissociated themselves from the project simply because they were not directly dependent on wetland resources. Twelve households, who were active during the planning period, were said to have "silently" decided not to be active in the project after their expectations of receiving livelihood inputs did not materialise.

Protracted flooding of the wetland due to heavy rains in 2011 and the following two seasons added a new dynamic in terms of wetland utilisation regime, escalating utilisation pressure on the wetland. It added a new complexity that the wetland management committees had not handled before. Flooding increased the size of the fishing grounds, thereby attracting more fishers and an upsurge in the number of canoes in use. This led to the establishment of three landing sites for canoes and two fish marketing points on the edges of the wetland. Realising the new threat to the wetland, the wetland management committees attempted to regulate fishing access but without success. Between 2011 and 2014, unregulated fishing became a major livelihood activity for the local community, with buyers travelling long distances to come and buy the fish at the site.

Environmental impacts

To a great extent, the wetland management plan was not implemented effectively. The envisaged reduction of threats to the wetland, emanating from unregulated use of wetland resources was therefore realised. The desired scenario whereby the community would purposefully mainstream new management rules and regulate their actions to meet their livelihood needs while maintaining the functions of the wetland remained elusive. As a result, the prevailing management system as of 2014 was not positively contributing to the improvement of the ecological health of the wetland. All the while, however, the wetland zones used by cranes for breeding largely remained unaffected owing to their location in the centre of the wetland surrounded by deep waters, which was not

navigable. The sections where cranes bred and raised their chicks were also inaccessible to humans and livestock due to stands of sedges. Breeding records collected by Nature Uganda between 2004 and 2014 showed that, on average, six pairs bred successfully at the site. There was a common agreement among respondents that the community exercised conscious restraint when interacting with cranes and generally avoided sections containing breeding sites and pointed out that this was a notable impact of the protracted environmental conservation outreach. Grassed patches of the wetland, some only accessible by canoe, provided refuge for hundreds of cranes that flocked at the site during the non-breeding season.

Concluding, the lack of institutional success caused the wetlands to generally follow the negative pre-project trend. However, owing to their isolation from wetland zones used by local communities for their livelihoods, crane breeding sites were not significantly affected by the negative trend. This, coupled with a positive attitudinal change of the community towards cranes, contributed to the protection of breeding pairs and flocks. Thus, the fate of the cranes compares positively with the pre-project outlook. Noteworthy, this success resulted from the pro-conservation outreach of the project and not from its institutional or livelihoods work. It might be thought, however, that the institutional and livelihood work contributed indirectly, because they created a positive reputation of the project, making the community inclined to listen and give something back.

5.3.2. The Mitooma story

Pre-project situation and outlook

One common historical phenomenon discernible from the interviewees' narratives was that the Mitooma area experienced a drastic change in land use and tenure in the 1970s. This happened when individual households subdivided the then public commons (open spaces on hillsides and wetlands) into private farming plots. Coupled with this landscape transformation was the weakening of the influence of traditional authority in land management. By 2004, the greater part of the extensive network of riverine wetlands, previously a common sight in the area, had been subdivided into vegetable gardens, farms for crop and livestock production and eucalyptus plantations. Since most of the plots were fenced, and because the government's environmental agencies had a merely peripheral influence in land management, land use decision-making rested with households that owned the plots, and the general goal of these decisions was to sustain agricultural productivity for crop and livestock production. The only part of the landscape that was still managed as commons was the 0.85 km^2 papyrus-covered Rwebicere wetland. It was used as a source of plants for fuel, raw materials for making crafts (baskets, mats, trays, hats) and construction of roofs, ceilings, ropes and fences. Self-regulation, which was part of a system of internalised institutions, dissuaded the community from pursuing private interests in this area. This generally curbed overharvesting, starting uncontrolled fires and harvesting of immature papyrus.

On most plots, the wet sections were strategically left unconverted to maintain good pastures. However, some plot holders drained the wetland through ditching to make soil conditions suitable for crop production. Interviews with plot holders revealed that no interaction and rules for cross-property collaboration existed to ensure sustainable wetland management. Though the middle sections of the Rwebicere wetland were relatively intact, seasonal agricultural encroachment was prevalent on its edges. The occurrence of the thick papyrus stands made large sections of the wetland unsuitable for nesting by cranes. Three breeding pairs were recorded there in 2004. Cranes benefitted from the clearance of papyrus in favour of shorter fodder grass, mostly sedges, as well as the persistence of grass cover due to failure by plot holders to drain excess water from some wetland patches. Seven pairs bred on the household-owned plots on scattered wetlands that, together with Rwebicere, are referred to as the Mitooma Wetlands. Nesting success and the survival of crane chicks were therefore largely influenced by the plot-level management regime. The outlook for the cranes was negative especially on the private plots because it could be expected that plot owners would become ever more effective, and motivated due to population growth, to fully concert them to croplands.

Community engagement to influence land use decisions

The project's process of engaging the community to influence land use decisions for improved wetland management started when the project facilitator was conducting crane monitoring in 2004. The monitoring process involved surveying wetlands located in agricultural plots, 22 in total, and consulting the owners so that they could provide information on breeding events and crane movements based on their day-to-day observations. Given that cranes were highly dependent on these plots for breeding and foraging, a strategy was adopted to promote the concept of crane custodianship. This entailed identifying plots on which cranes were breeding and asking the owners to voluntarily devise a farm management system that would leave the nesting sites undisturbed, while also committing to protect pairs and chicks. The custodianship approach was adopted, acknowledging that households operated as independent social units in managing their plots. Collective custodianship involving a group of wetland users was promoted for the Rwebicere wetland. Custodians were encouraged to document their observations and report to the locally-

based crane monitors, employed By Nature Uganda on a part-time basis. Alternative livelihoods were introduced as an incentive, with 75 households receiving goats, 15 households provided with beehives, 12 households forming a vegetable gardening cooperative. These incentives were popular among community members as they represented tangible motivations for the households to associate themselves with the crane conservation agenda. In selecting beneficiaries, priority was given to households owning plots where cranes bred but others that had shown willingness to be part of the project also benefitted. Under the custodianship arrangement, households were asked to rotate pastures to minimise trampling of sites and reduce human presence near sites. Beehives were placed on the communally managed Rwebicere wetlands to add value and provide an incentive for preventing and putting out fires in the event of an outbreak. The livelihood projects provided a platform for community interaction as they met to discuss tasks and evaluate the performance of the options they adopted. The presence of organised groups also attracted the National Agricultural Advisory Services (NAADS).

Custodianship arrangements and conservation impacts

The promotion of custodianship arrangement resulted in notable and desired change in the management of plots. Evidence of conscious and purposeful actions by custodians to ensure the maintenance of crane habitat and survival of chicks was documented. One example is the case of two plot holders that agreed to regulate the grazing of their unfenced plots adjacent to each other and created suitable habitat conditions that led to successful breeding by one pair for five seasons in a row (2008–2014). Previously no cranes were breeding on their plots due to overgrazing. Cases of successful breeding at the other plots were attributed to the appreciation of tangible benefits that the holders received and because the plot holders had a sense of respect for the facilitator, who hailed from the area. The benefits of introducing a new management regime were also confirmed by 12 custodians who acknowledged that controlled grazing had resulted in the re-establishment of papyrus and sedges on their plots. Collection of breeding data between 2004 and 2007 was not consistent. However, records collated by Nature Uganda between 2009 and 2013 confirmed that eight pairs nested and fledged their chicks successfully on household-owned plots.

Another interesting development was the case of a custodian who, out of the attachment that had grown over the years, acted when chicks bred on his plot were captured by a villager, to domesticate them. He took it upon himself to confiscate the two chicks and handed them over to the project facilitator. They were later released and reunited with their parents. This incident was publicised in the community and when a meeting was convened, the community formulated a local rule making it an offence for individuals to capture chicks for domestication. Over the next five years, no similar cases were reported. Questions on whether there were negative attitudes towards cranes or the project team emanating from the fact that not all plot holders received incentives were posed. The responses can be summed up in the words of one plot holder who did not benefit: "*Those that have benefitted were lucky. If we leave space for cranes to breed, they will also come and breed at our plots*". Discussions with the community members (non-beneficiaries) also revealed that there was a common belief and understanding that livelihood projects came in phases and therefore those that had not received inputs would benefit in the future. There was therefore a sense of expectation among community members. Despite evidence of successful persuasion of plot holders to integrate crane conservation into farming systems, the proliferation of eucalyptus on wetland fringes was a major negative development that the project did not address. Earlier research findings presented in Chapter 2 revealed that the establishment of eucalyptus plantations became lucrative in the early 2000s as the demand for timber escalated in the country.

Concluding, the promotion of crane custodianship on privately-manged plots led to the adoption of the desired land management techniques that contributed to improving habitat conditions and protection of breeding pairs. This resulted in improved crane breeding success, compared to the pre-project outlook. The livelihood component of the project appears to have been a strong motivation for positive conservation-compatible farming by custodians.

5.3.3. The Nyamuriro story

Pre-project situation and outlook

Up until the mid-1970s, Nyamuriro was an open-access peatland providing papyrus for making crafts and construction, grazing space, fishing grounds and water to local communities. Increasing human population and scarcity of arable land on hillslopes triggered encroachment onto the wetland. The national government at that time encouraged the formation of agricultural cooperatives. Leaders of cooperatives formed by Nyamuriro wetland users assumed the leading role in the creation of wetland plots for crop production. It was also government policy to reclaim wetlands to boost food production. When households were allocated plots in the wetlands' floodplain, they cleared all native vegetation and dug ditches to drain excess water. The removal of native vegetation resulted in a diminished supply of papyrus and fodder grasses and inequity in access to wetland resources as households cleared, tilled and privatised wetland patches. As of the

early 2000s, most household livelihoods revolved around potato farming (in rotation with beans and maize) on wetland plots of some 400 m^2 per household and small stock production on steep hillslopes. In 2003, there were approximately 700 of these plots located in the floodplain, with 90% of the plot holders belonging to eight cooperatives.

Apart from appropriating land, the eight cooperatives also ensured that households adhered to set plot boundaries when tilling plots and mediated when conflicts among plot holders arose. They were also responsible for managing plot ownership transfer transactions, ensuring that outsiders did not gain access to land at the expense of locals. There were generally no rules as to how the wetland plots would be cultivated but households were expected to dig and maintain drainage ditches that channelled water to the river that traversed the wetland. This was meant to prevent waterlogging, which would also affect the adjacent plots.

By 2003, only 30% of the wetland was left covered with native vegetation. The four crane breeding pairs observed in that year used wetland patches that had been left unconverted. The clearance of papyrus and the creation of open agricultural fields did create foraging ground for cranes, but breeding ground being more critical for the cranes and the conversion to cropland continuing, the outlook for the cranes was negative.

Community-based wetland management planning process (2002–2003)

In 2001, Nyamuriro was recognised by BirdLife International as one of Uganda's Important Bird Areas owing to the occurrence of bird species of global conservation concern. This prompted the selection by Nature Uganda, of the wetland as a target site for conservation action. Leveraging provisions of the Uganda Wetlands Policy, Nature Uganda worked with the Kabale District Council to facilitate the development of a community-based wetland management plan for the wetland. The goal of the management planning process was to create local institutions for stopping further agricultural encroachment, restore natural vegetation cover and flooding regimes, which would benefit cranes and enhance lost ecosystem goods (especially papyrus). The process involved the promotion of the wetland planning process to ensure it was acceptable to the community, environmental problem analysis to ensure a common understanding of threats to the wetlands and joint formulation of the necessary institutional interventions needed to address the threats. The agreed provisions of the plan were: formation of five wetland management committees, development of rules on permissible land uses and resource harvesting patterns, land use zoning, restoration of native vegetation through replanting of papyrus and other sedges, and promotion of alternative livelihoods to ease pressure on the wetland. The plan was finalised in 2002, with the wetland user communities accepting that the plan would be used as a guide in the management of the wetland for the coming five years. Cooperative leaders, that already had leadership roles and influence in the community played a significant role in promoting the plan and ensuring that it was accepted by the community. They were doing so in fulfilment of their previously defined role in the utilisation and management of wetlands.

Implementation of elements of the management plan

The management plan became the foundation of all institutional development (group formation, interaction, and collective rules), wetland restoration activities and alternative livelihood projects facilitated by Nature Uganda in 2004. When initial funds were secured to fully operationalise the plan in 2005, two potential setbacks had emerged. During the management planning process, the National Environmental Management Authority (NEMA) had proposed a 10 m buffer, a national standard, as opposed to the 6m preferred by the community. Some community members were suspicious that the involvement of the NEMA in enforcing a cultivation-free buffer would lead to forceful stoppage of all wetland cultivation. Nature Uganda engaged wetland management committee members, drawn from the cooperative leadership, and district officials responsible for local government to defuse the tension. It was resolved that there would be no forced evictions, with committee members expected to act as enforcers, only after they fail would a case be forward to the district authorities. It was also resolved that given the shortage of land; the buffer would remain set at 6 m on either side of the river. It was well known in the community that a respected catholic church leader, who held various other community leadership positions, played a major role in persuading the wetland users to accept the wetland management plan since it would result in the restoration of lost ecosystem services, especially papyrus. Through his initiative, the first wetland management committee was established in his parish. He also facilitated the formation of wetland management committees in two neighbouring parishes. This resulted in leaders of cooperatives, who already had vested powers in land appropriation, supporting the acceptance of the plan by the broader community.

Institutional and environmental outcomes

One contentious issue was how to deal with households that had already owned plots in the buffer zone. They could maintain their crop until the end of the season in 2006, after which they would

not be permitted to plant in the buffer zone. The implementation of elements of the management plan had some impacts, recognised by the community. The decline in the availability of papyrus due to unregulated harvesting associated with common pool resources, was successfully stopped and acted as an entry point to generate community interest to restore the wetland's attributes and re-crated shared socio-economic values. A notable success, attributable to collective actions by the community between 2005 and 2013 was the demarcation of non-agricultural zones and re-introduction of papyrus to a 6 m wide buffer on both sides of a 0.9 km stretch of the river. A new rule to prevent people from overharvesting and harvesting immature papyrus was put in place. Wetland patches that had largely remained unconverted were declared as "reserves" for papyrus and fodder grass. There was no marked change in the number of breeding pairs at the site, with six pairs of cranes recorded in 2013, as compared to the five recorded in 2003. The breeding pairs continued to breed on wetland patches, covered by short grass, located in the designated non-agricultural zones. In 2010 and 2011, two pairs used a section that had been restored within the wetland buffer zone.

One success factor was that wetland management committees carried out monitoring activities, once every month, to identify areas where encroachment was taking place and identify culprits. Signboards were put in place to designate the eight reserve patches and rows of Sesbania *Sesbania grandiflora* were planted to demarcate the buffer zone and areas where crop production was permitted. Twelve cases of intermittent and slow encroachment were identified between 2007 and 2010, but the wetland management committees successfully handled the cases without involving district authorities. The subdivision of wetland patches to be monitored and allocation of monitoring role to committee members in their locality helped them to effectively monitor. Cases of five individuals that were known to have resisted the implementation of buffers but were gradually persuaded to join were also attributed to the use of the chairperson's influence and credentials as an opinion holder. A new rule introduced was that grazing would only be allowed outside the restoration areas, but livestock owners could cut grasses and feed their livestock in the uplands. A loose graduated sanction mechanism was put in place whereby if individuals were reprimanded but ignored the warnings twice, they would be fined 100,000 Shillings ($28). During group discussions, it was noted that the existence of a local mechanism for reprimanding individuals breaking rules and the involvement of the project facilitator in resolving disputes prevented confrontations.

The project created platforms for community interaction and collective action in the form of project review meetings, joint wetland restoration sessions, group formation to construct terraces and water harvesting structures in the catchment. The evolution of the organised groups enabled the community to be registered as recipients of technical training from the National Agricultural Advisory Services (NAADS), with households registering to undertake fish farming and beekeeping. Over the period 2008 and 2013, 30 households received goats as start-up inputs for alternative livelihoods through project funds sourced by Nature Uganda. The goats were connected to the wetland because they would graze on hillslopes as opposed to the wetland and be fed with fodder fetched from restored wetland sections. Sesbania was used innovatively to add value to the wetland and strengthen new institutions as it was used as fodder, source of firewood, agent for nitrogen fixation and as a boundary marker. Creation of the new papyrus motivated community members to join – as failure to participate would effectively mean not having access to the new thriving papyrus stands.

Some cases of wetland encroachment were reported to have been caused by individuals who were bent on frustrating the process. They would let their goats nibble on the sesbania seedlings and not attend meetings called by the wetland management committees. They also sought to maintain territoriality so that they would not be governed by the new rules. There were cases where households would undermine the project initiatives by leasing out wetland plots to non-residents who would then encroach onto the restoration zones. It appears these cases were isolated and did not derail the institutional and environmental outcomes.

Concluding, the project scored notable successes in terms of wetland restoration. Building on pre-existing institutions (e.g., the cooperatives), transformative leadership and locally acceptable livelihoods, the institutions were strengthened. This contributed to positive conservation impacts, with cases of wetland encroachment, which had decimated and fragmented the crane breeding habitats, being reduced. Pairs continued to breed on wetland patches, where conditions for successful nesting and chick-rearing were improved through designated no-encroachment zones. This was a positive development, compared to the pre-project outlook.

5.4. Lessons for institutional development

Experiences at the three sites represent distinct narratives of externally supported processes to shape institutions for wetland management and ensure crane survival in human-dominated landscapes. First, the Nyamuriro experience provides insights on how to facilitate community agreement and catalyse collective action for recreating commons in wetland landscapes for livelihood and conservation benefits. Second, institutional failures at Kaku are indicative of the possible challenges, linked to internal community dynamics and environmental factors. Third, institutional successes at Mitooma demonstrate how individual household commitment to maintaining habitats on privately owned wetland patches can be secured. The present section aims to derive practicable lessons from these cases, by way of comparative analysis. These lessons are relevant to Uganda since the country needs innovative institutional interventions to alleviate increasing pressure on wetlands emanating from high population growth and negative legacies of past environmental policies (Kakuru *et al*. 2013; Turyahabwe *et al*. 2013). More general lessons are presented in the final chapter is this dissertation.

The analysis starts from common observations at Kaku and Nyamuriro, the emergence of project-initiated platforms for collective community decision-making to address wetland degradation. This is followed by an exploration of possible reasons why these developments resulted in significant wetland resource stewardship at Nyamuriro and not much change in wetland management regime at Kaku, using the theory of collective action institutions (Ostrom 1990; Potete and Ostrom 2004; Rahman *et al*. 2012). Through this, general factors for institutional successes as well as bottlenecks to institutional development for sustainable management of wetland commons are discerned. Lessons from the quasi-private wetland management arrangements at the Mitooma wetlands are also presented. The lessons are grouped into five categories: (a) the need to look beyond community-based planning, (b) building on existing social capital within project target communities (c) valuing trade-offs and enhancing values of landscapes and species (d) nurturing and managing diverse motivations and (e) leveraging opportunities in the institutional context. These categories are broadly aligned to factors behind conservation success if planning processes are grounded in community values and motivations and supportive local institutional frameworks (Sarkar and Illoldi-Rangel 2010; Biggs *et al.* 2011).

5.4.1. The need for looking beyond community-based planning, as the process alone is not a panacea

In community-based conservation, the presence of a collective vision for sustainable resource management is essential. At both the Kaku and Nyamuriro, such visions were designed successfully, to create buffer zones and leave some undisturbed patches that would be managed as common pool resources. However, because the wetland patches were already being used intensively by some households, the households would inevitably lose some of their resource access and utilisation rights. With that, implementation of the community plan would entail that some community members might feel aggrieved by the new resource redistribution and restriction regimes (Potete and Ostrom 2004), creating a strong risk of dissent among resource users, causing *de facto* institutional failure. As Katz (2000) and Toulmin (2009) put it, navigating these complex tenure and resource use terrains is unavoidable as failure to do so gives rise to conflicts that reduce conservation success. Given the history of encroachment and privatisation of sections of wetland commons in Uganda, institutional interventions can therefore only be effective if there is clarity on how to harmoniously transition from prevailing land tenure and resource use regimes. If actions and processes to address these inherent tenure complexities are not captured, they give to rise paper plans which gloss over key issues and present challenges to the effectiveness of resource management institutions.

The challenge of community plan implementation has given rise to the concept of evidence-based consensus (Varughese and Ostrom 2001; Gruber 2010), in which much emphasis is put on the difference between the plan on paper and the plan in action. Real community consensus can be assumed only on a basis of action and cooperation evidence, to which other authors also add that social and environmental outcome should be visible (Foster-Fischman *et al*. 2001; Innes and Booher 2007). At the Nyamuriro site, such evidence is present. In Kaku, it is absent just as clearly, even though the plan had been designed with intensive community participation. In both Kaku and Nyamuriro, the government failed to ratify the community plans but only in Kaku, the absence of government backing laid bare the community's incapacity to implement. The first lesson from this is that community participation in planning is not sufficient to guarantee implementation in situations where the rights of individual households are really at stake and the government declines to add enforcement capacities to the local scene.

Acknowledging this, we pose the next question: what factors, apart from enforcement by government agencies, lead to effective collective conservation action? Commons research has revealed that transformational leadership, social cohesion, presence of resource monitoring and enforcement mechanisms, enabling state policies, tangible incentives and common aspirations are some of these success-enhancing factors (Agrawal 2001; Cox *et al*. 2010). In the following sections, lessons drawn from the IAD-based analysis, in line with these general conditions, are presented.

5.4.2. Build on existing social capital and if that is yet too weak, build social capital first

Pre-project social cohesion rooted in years of collective organisation and interaction platforms at Nyamuriro became the solid foundation for building new institutional structures for wetland management. In contrast, at Kaku, where the community did not have a similar history of group organisation, interaction and common problems, project efforts to facilitate the implementation of new institutional arrangements were ineffectual. The positive influence of pre-existing local institutional frameworks on the emergence of effective resource management institutions has been documented in a wide range of natural resource management scenarios (e.g., Pomeroy *et al.* 2001; Thompson *et al*. 2003; Rahman *et al*. 2012). Another factor that played a major role in the acceptance of new institutions at Nyamuriro was respected community leadership, in conformity with findings of Pomeroy (2001), Gutierrez *et al*. (2011) and Kontogeorgopoulus *et al*. (2005). In the Nyamuriro case, these were respected individuals that had gained a reputation as visionary and selfless organisers of the cooperative activities, playing a key role in regulating access to farming land in wetland landscapes. These cooperative leaders became integral members of the wetland management committee.

In cases where there are no pre-existing leadership structures for managing resources, facilitating the creation of new community groups becomes imperative. This was the case at Kaku where the expectation was that the new groups would gradually gain respect and authority to enforce rules and actions required to address wetland management challenges. However, as the challenges encountered at Kaku highlight, these new project-linked groups may evolve into entities that may help in various aspects such as monitoring, while being too weak to enforce management plans, even if often seen as effective groups by the donor-funded project initiators (Morrow and Hull 1996; Gezon 1997; Platteau 2004). In retrospect at Kaku, more effort and time should have been invested in the technical and local-political empowerment of these groups (*cf.* Scheyvens 1999). As suggested by De Groot and Tadepally (2008), one way to do so is to start with the implementation of something relatively easy, and then build on that success. The strength of these rules can be enhanced if they are supported by national policies and agendas of government agencies. The endorsement and backing by higher authority or external organisations translate into bridging social capital (Pretty and Smith 2003) and gives the group leadership legitimacy in the eyes of the broader community.

5.4.3. Acknowledge trade-offs and enhance values attached to landscapes and species

Developing local institutional arrangements to save habitats contained in landscapes threatened by human development gives rise to the need to acknowledge trade-offs between livelihood and conservation goals (DeFries *et al*. 2007; Dahlberg and Burlando 2009). In this study, trade-offs mainly emanated from the need to curb agricultural encroachment into wetland zones used by cranes while at the same time ensuring there was no resentment among households that were eyeing the unconverted wetland patches for agricultural use. Experiences from the three study sites revealed types of trade-off situations that may be encountered in human-dominated landscapes and lessons on factors that may enhance the acceptability of trade-offs and ways to avoid pitfalls associated with balancing conservation and livelihoods.

As the case studies show, negotiations were necessary to persuade the local communities to accept that some wetland sections would need to remain unconverted for the benefit of cranes. The success of such negotiations depends largely on creating or enhancing socioeconomic values attached to landscapes and resources thereof so that new institutional arrangements are not viewed by households and community groups as causing net livelihood losses by the communities. What makes the experiences from the three case studies complex in the trade-off debate is that they involved species survival, habitat management and sustenance of shared livelihoods in an integrated way. Inherently, conflicts and resentment of the conservation agenda could arise if mechanisms are not put in place to balance conservation and livelihoods. As exemplified by the Nyamuriro case, trade-offs were acknowledged in the sense that there was no blanket eviction of farmers from the wetland but new rules, agreeable to the community, were put in place to curb the further conversion of wetland sections into agricultural plots. In addition, the new wetland management system would make it possible to restore the lost ecosystem service required by most of the community members (papyrus). This was a case of successful management of a trade-off situation. The same cannot be said at Kaku as negotiations to stop households from cultivating in wetland buffers did not yield the desired results.

A high level of community dependence on a shared resource has been reported as a major driver for collective action in the management of that resource (Ostrom 1990; Cox *et al*. 2010). Reversely, communities tend not readily invest much in a resource that is degraded or of low value (Rahman 2012). In such cases, the observation of Imperial and Yandle (2005) becomes relevant, who noted that the process of institutional development should be viewed as sequential and incremental and when communities see change, they may invest more and revitalize the values attached to the resource. Thus, at Nyamuriro for instance, practical actions to restore degraded resources enhanced values attached to them and even enticed community members that had chosen not to be part of the project to join. Ultimately, enhancing collective values of resources may create avenues for community interaction and in the process build social capital as noted earlier.

As noted by DeFries *et al*. 2007 and Hirsch *et al*. 2010, when dealing with trade-offs in conservation, an understanding of social and economic opportunities for achieving environmental impacts without denying local communities' resource use rights. In the three cases at hand, the new institutional arrangements comprised regulations that were meant to, ultimately, maintain buffer width, regulate papyrus off-take and protect crane breeding sites. This highlights the importance of clearly defining the spatial and temporal opportunities for the success of local conservation arrangements, resonating with findings by Rodríguez *et al*. (2006). This also highlights the importance of understanding the interface between ecological science (species and habitat conditions), socioeconomics (financial and material benefits from resource utilisation) and institutions (resource management rules, regulations and policies). Mapping and valuation exercises that integrate data from these three domains are critical. This helps the conservation planner and implementer to identify and deal with pitfalls associated with trade-offs in conservation (Hirsch *et al*. 2010), especially the complex issues such as the size of habitat to trade-off and how to deal with psychological aspects such as user rights and cultural heritage. This calls for the incorporation of ecological standards in defining the spatial and temporal dimensions of trade-offs, particularly species ecological requirements and habitat connectivity (Copeland *et al*. 2007).

In human-dominated landscapes, it takes more than protecting or restoring habitats to ensure the survival of the species targeted for conservation. Even in protected or perfectly restored wetlands, for instance, cranes may be hunted to extinction or fail to breed successfully due to human disturbance. This highlights the need for incorporating species protection aspects when developing local institutional arrangements. This also implies that fostering non-economic values that aid the survival of the species at all stages of its breeding cycle could complement the positive conservation impacts of habitat protection, as highlighted in the Kaku and Mitooma cases. The success of the custodianship approach at Mitooma and documented cases of communities' conscious avoidance of crane breeding areas was encouraging. However, more could be done to enhance the values that local communities attach to cranes. One avenue to achieve this is to build pride, strengthen interest and secure commitment in saving the species using approaches modelled along the lines of the Rare Pride campaign (Butler 2000; Jenks *et al*. 2010). In the case at hand, the Grey Crowned Crane's status as the national bird of Uganda could be one entry point for promoting their protection locally.

5.4.4. Facilitate convergence of diverse interests for conservation gains

As the stories from the different sites showed when the project started households and community groups had different interests, but all were motivated by the quest to derive livelihoods from wetlands. The project implementers recognised these diverse interests and actions and noted that there was a need to facilitate the convergence of interests using the crane and wetland conservation agenda as the unifying factor. Acknowledgement of diverse interests, motivations and aspirations is known to be a foundational pillar in institutional development for improving natural resource management (Imperial and Yandle 2005; Tai 2007). The findings from the three cases show that the entry points for institutional development varied across sites and so were the ways to secure commitment from households to work individually and collectively towards management of shared wetland resources, infusing the crane conservation agenda in the process.

Understanding a wide range of household and broader community interests can shed light on social ties among households, community power dynamics and broader social networks, a critical consideration in the development of effective and sustainable local institutions (Ruiz-Mallen et al. 2015; Alexander et al. 2016). The findings from the sites show that normative social influence, evidenced by participation due to initial influence by respected community members and the quest to align with interests of fellow members of pre-existing projects, played a part in nudging community members to join the project. The project provided opportunities for some community leaders to gain new status or influence through their participation in project activities, fulfilling their role as the link between project beneficiaries and local government and political structures (e.g., political leaders at Kaku). Some community members used the project as an avenue to fulfil

pre-existing traditional or social leadership roles, including community organisation, conflict management and resource allocation. The realisation of tangible benefits from conservation action as the project progressed (e.g., improved papyrus at Nyamuriro) was a notable economic motivation. Respect and desire to please the project facilitator, which evolved through regular interaction with him over the years, also motivated some group leaders to strive to ensure project success. The diverse interests, which were managed over the years by the project team, represent psychosocial factors that may help conservation planners to align their agendas with internal motivations for joining projects and support conservation.

Apart from explaining why community members would be willing to be involved in the collective community action, these interests stated above define some of the reasons behind other underlying factors, which may solidify ties, nudge communities to adopt pro-conservation actions and commit themselves to become long-term members of community conservation groups (Brooks et al. 2013). Findings from the study demonstrate that though community groups may have shared economic values and interests that a facilitator can easily determine through stakeholder analysis at the beginning of a project, other motivations for partaking in institutional development only become discernible well into the project. Whilst some of the motivations can be taken as strategic entry points for building and strengthening institutions (e.g., social networks and relationships), as was the case in this project, others represent the constraints that militate against the acceptability of institutions (e.g. history of marginalisation of households of lower socioeconomic status) and hidden local political agendas by project participants. Although these constraints were not evident from the stories, they represent some of the inequity and power dynamics issues that the project team needs to be aware of as they may deal with them in future.

The issue of incentives in the form of alternative livelihoods adds complexity to the process of developing and nurturing institutions in communities that have to collaborate if species that move across cadastral boundaries and land units (household-managed plots and commons) are to be conserved effectively. Empirical evidence confirming that provision of household-level economic incentives may improve attitudes towards conservation efforts has been documented (Abbot *et al*. 2001). The study findings give rise to two questions. First, in a donor-facilitated project seeking to improve the management of shared resources, who qualifies to be given start-up inputs? Experiences from the sites show that rolling out the alternative livelihoods could be prone to elite capture, a contentious issue in community development (Platteau 2004). Elite capture creates an unfair advantage whereby individuals that have information about the project, wield socio-political power and may be close to facilitators benefit from project initiatives at the expense of less endowed households. In this study, households that would incur a loss of utilisation rights due to new institutional arrangements were the sensible targets for compensatory incentives.

The second question relates to ways to ensure that the incentives, given to an individual household or section of the broader community, are provided in such a way that there is individual household and community commitment to behavioural change, translating into positive outcomes of the resource management institutions. The case of custodians at Mitooma provides an interesting point of debate on how to set incentives right given a complex scenario in which sites of conservation importance are managed by individual households. Though in this case, household-based incentives encouraged positive resource use behaviour, it remains to be seen if this arrangement will, over time not derail the desired outcome of collective appreciation and responsibility for the target species. The second issue is the need to build collective responsibility and how to translate household self-interest into an obligation to sustainably manage land to meet desired collaborative management across plot boundaries. This could potentially call for a focused approach to connect custodians, recognising their contribution to shared wetlands and how their efforts translate into sustaining ecosystem services that benefit the community.

5.4.5. Leveraging opportunities and managing bottlenecks rooted in the institutional context

External contextual factors influence the evolution and effectiveness of local institutions in natural resource management (Pomeroy 2001; Brooks *et al*. 2012). These factors include environmental and administrative policy frameworks that provide the basis for stakeholder interaction, at local, district and national levels. This study unearthed a key pertinent factor with a supportive effect on the institutional development, the existence of a national wetlands policy that created a framework for the establishment of wetland management committees and platforms for interaction between wetland users and district administrative authorities. Conversely, we identified three factors that represent bottlenecks to successful institutions, which were the emergence of new socio-economic activities, the disempowerment of communities through the pursuance of self-serving interests and political patronage by the elite and limited technical capacity of government agencies. They also include community development projects that, by their very nature, operate outside the locus of control of community groups and project facilitators.

Despite the mixed results at Kaku and Nyamuriro, the community-based wetland management planning process, rooted in the Uganda Wetlands Policy (1995), provided an enabling framework for enhancing joint problem identification, community participation and dialogue between resource users and project facilitators. Leveraging this government-supported framework for developing grassroots solutions to wetland degradation, taking into consideration the local biophysical context and community interests, was a foundation to deliberate on ways to effectively mitigate the "tragedy of the commons" that could befall large wetlands under common access regimes. This favourable effect of government policies on the design of wetland management institutions was not evident in the policy implementation phase. Decentralisation of wetland management policy was partial as government agencies still have to ratify local plans before they can enter into the sphere of state-based, legally back-up implementation (Rwakakamba 2009; Oosterveer and Van Vliet 2010). This explains why the Wetlands Management Department and the respective district councils, allegedly due to limited technical capacity, did not officially ratify the wetland management plans developed at Kaku and Nyamuriro. At Kaku, this significantly hindered institutional success. At Nyamuriro, the community groups were strong enough to implement its rules without the seal of approval from the government. At Kaku, it appears therefore that institutional success could have been enhanced had it been clear beforehand that government approval and support would not be secured rapidly. Alternatively, institutional development at the site should have focused on empowering on ensuring stronger community groups, without primarily basing the success on the ratification of the plan. Possibly then, for instance, the groups would have developed local mechanisms for regulating the use of wetland resources, including the rise of commercial fishing that threatened local fishing as well as cranes. Reinforcing this possibility is the finding by Kosamu (2017), concerning small-scale fisheries globally and in Malawi, that in cases of weak government enforcement systems (typical in Africa), sustainable natural resource management can be attained without over-relying on government interventions. Overall, the key lesson here is that for community-based conservation, a supportive policy context is only really needed in cases of low social capital at the community level.

5.5. Conclusions and general implications

IAD-based analyses of project experiences at Mitooma and Nyamuriro revealed the efficacy of developing and nurturing local institutions to improve the management of landscapes containing habitats critical for cranes. Discernible species and habitat conservation impacts, attributable to the local institutions developed and sustained over a decade, were identified at the two project sites. On the other hand, evidence of institutional failure was documented at Kaku. Understanding linkages between institutional interventions and the resultant conservation impacts (or lack thereof) is important for designing or adapting conservation projects in human-dominated landscapes where collective motivations, values and actions by resource users are critical for conservation success.

Project experiences at Mitooma demonstrate that in areas where species targeted for conservation depend on habitats contained within privately-owned land, promoting the concept of species and habitat custodianship can lead to the attainment of the desired conservation outcomes. By adopting custodianship ethics, farmers purposefully adapted their plot management systems, spatially and temporally, to create and maintain suitable breeding habitat conditions for cranes, resulting in improved breeding success, compared to the pre-project outlook. Incentives provided in the form of livelihood projects were a strong motivation for the adoption of positive crane conservation-compatible farming by the custodians. The success of the crane custodianship approach is an actionable lesson for ensuring the long-term survival of cranes on private lands, applicable in other parts of Uganda where cranes are found.

Project experiences at Nyamuriro validate the efficacy of restoring landscapes, using shared ecosystem services (in this case, papyrus and fodder grasses) and pre-existing local institutional structures as entry points to win the support of the local communities. It also highlights that community-based management planning creates platforms for successful institutional development (group formation, interaction forums, collective rules, and collective actions) which can be nurtured for conservation impacts over time. Notable conservation outcomes were registered, including the demarcation of non-agricultural zones, re-introduction of papyrus to wetland buffers, regulation of grass harvesting and reserving patches as reserves for papyrus and fodder grass. Designation of wetland patches into restoration and non-agricultural zones helped maintain suitable breeding habitats for cranes. The approach used at Nyamuriro represents one way in which communities can part and parcel of a solution to address landscape transformation, which has negative implications on crane populations and wetland integrity.

At Kaku, the desired institutional success was not achieved, resulting in wetland encroachment and unregulated utilisation of wetland resources persisting despite project interventions. However, this institutional failure did not have a marked impact on wetland sections used by breeding pairs

and flocks. This was largely due to the isolation sites by cranes from wetland zones used by local communities for their livelihoods. This, coupled with a positive attitudinal change of the community towards cranes, inherently contributed to the protection of breeding pairs and flocks. Developments at the project site show that poor identification of actors or project participants, lack of empowerment of community-based organisations and limited support from government agencies can lead to institutional failure.

Overall, the findings add to the growing evidence of the benefits of grounding conservation planning process in local institutional arrangements, which creates enabling platforms for communities to tackle local threats to species and habitats, while at the same time demonstrating pathways to conservation-compatible livelihoods. This approach, as evidence from the sites shows, enables conservation planners and practitioners to focus on community factors (values, motivations, power relations, social influence, leadership, shared interests) and draw linkages between community actions and associated conservation impacts at site- or landscape level. The influence of external environmental factors (enabling policy, bottlenecks to effective decentralisation, limited financial and human capacity) in community-based conservation is evident from the case studies. In a nutshell, for community-based conservation to be impactful, the process of developing local institutions should be adaptive, allowing both project facilitators and communities to reflect and effectively deal with context-specific challenges and building on successes. This highlights the importance of effective project facilitators and local (site-based) champions.

References

Abbot, J. I. O., Thomas, D. H. L., Gardner, A. A., Neba, S. E., and Khen, M. W. (2001). Understanding the link between conservation and development in the Bamenda Highlands, Cameroon. World Development 29(7): 1115–1136.

Acheson, J. M. (2006). Institutional failure in natural resource management. Annual Review of Anthropology 35: 117–134.

Adams, W.M., and Hulme, D. (2001). If community conservation is the answer, what is the question? Oryx 35(3): 193–200.

Alexander, S. M., Andrachuk, M., and Armitage, D. (2016). Navigating governance networks for community-based conservation. Frontiers in Ecology and the Environment 14(3): 155–164.

Andersson, K. (2006). Understanding decentralized forest governance: An application of the institutional analysis and development framework. Sustainability: Science, Practice and Policy 2(1): 25–35.

Agrawal, A. (2001). Common property institutions and sustainable governance of resources. World Development 29(10): 1649–1672.

Baker, J. L. (2000). Evaluating the impact of development projects on poverty: A handbook for practitioners. World Bank, Washington DC.

Beilfuss, R. D., Dodman, T., and Urban, E. K. (2007). The status of cranes in Africa in 2005. Ostrich: Journal of African Ornithology 78 (2): 175–184.

Biggs, D., Abel, N, Knight, A. T., Leitch, A., Langston, A., and Ban, N. C. (2011). The implementation crisis in conservation planning: could "mental models" help? Conservation Letters 4(3): 169–183.

BirdLife International. (2016). Species factsheet: Balearica regulorum. http://www.birdlife.org.

Bonabana-Wabbi, J., Ayo, S., Mugonola, B., Taylor, D. B. and Kirinya, J., and Tenywa, M. (2013). The performance of potato markets in South Western Uganda. Journal of Development and Agricultural Economics 5(6): 225–235.

Brooks, J. S., Waylen, K. A., and Mulder, M. B. (2012). How national context, project design, and local community characteristics influence success in community-based conservation projects. PNAS 109(52): 21265–21270.

Brooks, J., Waylen, K. A., and Borgerhoff Mulder, M. (2013). Assessing community-based conservation projects: A systematic review and multilevel analysis of attitudinal, behavioral, ecological, and economic outcomes. Conservation Evidence 2(2): http://www.environmentalevidencejournal.org/content/2/1/2.

Bull, J. W., Gordon, A., Law, E. A., Suttle, K. B., and Milner-Gulland, E. J. (2014). Importance of baseline specification in evaluating conservation interventions and achieving no net loss of biodiversity. Conservation Biology 28(3): 799–809.

Butler, P. (2000). Promoting protection through pride: A manual to facilitate successful conservation-education programmes developed at RARE Center for Tropical Conservation. International Zoo Yearbook 37(1): 273–283.

Chazdon, R. L., Harvey, C. A., Komar, O., Griffith, D. M. Ferguson, B. G., Martinez-Ramos, M., Morales, H., Nigh, R., Soto-Pinto, L., Van Breugel, M., and Philpott, S. M. (2009). Beyond reserves: A research agenda for conserving biodiversity in human-modified tropical landscapes. Biotropica 41(2): 142–153.

Chhetri, P., Mugisaha, A., and White, S. 2003. Community resource use in Kibale and Mt. Elgon National Parks, Uganda. Parks 13(1): 28–38.

Copeland, H. E., Ward, J. M., and Kiesecker, J. M. (2007). Assessing trade-offs in biodiversity, vulnerability and cost when prioritizing conservation sites. Journal of Conservation Planning 3: 1–16.

Cox, M., Arnold, G., and Villamayor Tomás, S. (2010). A review of design principles for community-based natural resource management. Ecology and Society 15(4): 38. http://www.ecologyandsociety.org/vol15/iss4/art38/.

Dahlberg, A. C., and Burlando, C. (2009). Addressing trade-offs: experiences from conservation and development initiatives in the Mkuze wetlands, South Africa. Ecology and Society 14(2): 37. http://www.ecologyandsociety.org/vol14/iss2/art37/.

De Groot, W. T. and Tadepally, H. (2008). Community action for environmental restoration: a case study on collective social capital in India. Environment, Development and Sustainability 10(4): 519–536.

DeCaro, D. A. (2008). Social-psychological principles of community-based conservation and conservancy motivation: attaining goals within an autonomy-supportive environment. Conservation Biology 22(6): 1443–1451.

DeFries, R., Turner, B. L., Reid, R., and Liu, J. (2007). Land use change around Protected Areas: Management to balance human needs and ecological function. Ecological Applications 17(4): 1031–1038.

DeGeorges, P. A., and Reilly, B. K. (2009). The realities of community based natural resource management and biodiversity conservation in Sub-Saharan Africa. Sustainability 1(3): 734–788.

Delgado-Serrano, M. M. (2017). Trade-offs between conservation and development in community-based management initiatives. International Journal of the Commons 11(2): 969–991.

Edwards, R., and Holland, J. (2013). What is qualitative interviewing? Bloomsbury Academic, London and New York.

Foster-Fishman, P. G., Berkowitz, S. L., Lounsbury, D. W., Jacobson, S., and Allen, N. A. (2001). Building collaborative capacity in community coalitions: A review and integrative framework. American Journal of Community Psychology 29(2): 241–261.

Gatzweiler, F. W. (2005). Institutionalising biodiversity conservation - The case of Ethiopian coffee forests. Conservation and Society 3(1): 201–223.

Gezon, L. (1997). Institutional structure and the effectiveness of integrated conservation and development projects: Case study from Madagascar. Human Organisation 56(4): 462–470.

Gibson, C. C., and Koontz, T. (1998). When "community" is not enough: Institutions and values in community-based forest management in Southern Indiana. Human Ecology 26(4): 621–647.

Government of Uganda (2013). National symbols. Government of Uganda: http://www.gov.ug/about-uganda/sector/national-symbols.

Guitierez, N. L., Hilborn, R., and Dofeo, O. (2011). Leadership, social capital and incentives promote successful fisheries. Nature 470(7334): 386–389.

Gruber, J. S. (2010). Key principles of community-based natural resource management: A synthesis and interpretation of identified effective approaches for managing the commons. Environmental Management (2010) 45(1): 52–66.

Hackel, J. D. (1999). Community conservation and the future of Africa's wildlife. Conservation Biology 13(4): 726–734.

Harrison, M., Roe, D., Baker, J., Mwedde, G., Travers, H., Plumptre, A., Rwetsiba, A., and Milner-Gulland, E. J. (2015). Wildlife crime: a review of the evidence on drivers and impacts in Uganda. IIED Research Report. IIED, London

Hirsch, P. D., Adams, W. A., Brosius, J. P., Zia, A., Bariola, N., and Dammer, J. L. (2010). Acknowledging conservation trade-offs and embracing complexity. Conservation Biology 25(2): 259–264.

Hulme, D., and Murphree, M. (1999). Communities, wildlife and the 'new conservation' in Africa. Journal of International Development 11(2): 277–285.

Imperial, M. T. (1999). Institutional analysis and ecosystem-based management: The Institutional Analysis and Development Framework. Environmental Management 20(4): 449–465.

Imperial, M. T., and Yandle, T. (2005). Taking institutions seriously: Using the IAD framework to analyze fisheries policy. Society and Natural Resources 18: 493–509.

Innes, J. E., and Booher, D. E. (2007). Consensus building and complex adaptive systems: A framework for evaluating collaborative planning. Journal of the American Planning Association 65(4): 412–423.

Jenks, B., Vaughan, P. W., and Butler, P. J. (2010). The evolution of Rare Pride: Using evaluation to drive adaptive management in a biodiversity conservation organization. Evaluation and Program Planning 33(2): 186–190.

Kakuru W., Turyahabwe N., and Mugisha, J. (2013). Total economic value of wetlands products and services in Uganda. The Scientific World Journal 2013: http://dx.doi.org/10.1155/2013/192656.

Katz, E. G. (2000). Social capital and natural capital: A comparative analysis of land tenure and natural resource management in Guatemala. Land Economics 76(1): 114–132.

Kontogeorgopoulus, N. (2005). Community-based ecotourism in Phuket and Ao Phangnga, Thailand: Partial victories and bittersweet remedies. Journal of Sustainable Tourism 13(1): 4–23.

Kosamu, I. B. M. (2017). Management of small-scale fisheries in developing countries. The case of Elephant Marsh in Malawi, Phd Thesis. University of Leiden, Leiden.

Measham, T. G. and Lumbasi, J. A. (2013). Success factors for Community-Based Natural Resource Management (CBNRM): Lessons from Kenya and Australia. Environmental Management 52(3): 649–659.

Meine C. D., Archibald, G. W. (eds.) (1996). The cranes: status survey and conservation action plan. IUCN, Zurich.

Mora, C., and Sale, P. F. (2011). Ongoing global biodiversity loss and the need to move beyond protected areas: A review of the technical and practical shortcomings of protected areas on land and sea. Marine Ecology Progress Series 434: 251–266.

Morrison K (compiler). 2015. International single species action plan for the conservation of the Grey Crowned Crane *Balearica regulorum*. African-Eurasian Migratory Waterbird Agreement (AEWA) Technical Series No. 59. AEWA, Bonn.

Morrow, C. E., and Hull, R. W. (1996). Donor-initiated common pool resource institutions: The case of the Yalnesha Forestry Cooperative. World Development 24(10):1641–1657.

Muhebwa-Muhoozi, J. (2004). Assessing the status of the Grey Crowned Crane Balearica regulorum in Uganda, MSc Thesis. Makerere University, Kampala.

Odada, E. O., Olago, D. O., Kulindwa, K., Ntiba, M., and Wandiga, S. (2004). Mitigation of environmental problems in Lake Victoria, East Africa: Causal chain and policy options analyses. Ambio 33(1–2): 13–23.

Olupot, W., Mugabe, H., and Plumptre, A. J. (2009). Species conservation on human-dominated landscapes: the case of crowned crane breeding and distribution outside protected areas in Uganda. African Journal of Ecology 48(1): 119–125.

Oosterveer, P., and van Vliet, B. (2010). Environmental systems and local actors: Decentralising environmental policy in Uganda. Environmental Management 45(2): 284–295.

Ostrom E. 1990. Governing the commons: The evolution of institutions for collective action. Cambridge University Press, New York.

Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. Science 325: 419–422.

Ostrom, E. (2011). Background on the Institutional Analysis and Development Framework. The Policy Studies Journal 39(1): 7–27.

Platteau, J-P. (2004). Monitoring elite capture in community-driven development. Development and Change 35(2): 223–246.

Pimbert, M. (2004). Institutionalising participation and people-centered processes in natural resource management: Research and publications highlights. IIED, London.

Potete, A. R. and Ostrom, E. (2004). Heterogeneity, group size and collective action: The role of institutions in forest management. Development and Change 35(3): 435–461.

Pomeroy, D. E. (1987). The ecology and status of the Grey Crowned Crane in East Africa. In Archibald, G. W. and Pasquier, R. F. (eds.), Proceedings of the 1983 Crane Workshop. International Crane Foundation, Baraboo.

Pomeroy, S. R., Katon, B. M., and Harkes, I. (2001). Conditions affecting the success of fisheries management: lessons from Asia. Marine Policy 25: 197–208.

Pretty, J., and Smith, D. (2003). Social capital in biodiversity conservation and management. Conservation Biology 18(3): 631–638.

Rahman, H. M. T., Hickey, G. M., and Sarker, S. W. (2012). A framework for evaluating collective action and informal institutional dynamics under a resource management policy of decentralisation. Ecological Economics 83: 32–41.

Richardson, B. J. (1993). Environmental management in Uganda: The importance of property law and local government in wetlands conservation. Journal of African Law 37(2): 109–143.

Rodríguez, J. P., Beard, Jr, T. D., Bennett, E. M., Cumming, G. S., Cork, S., Agard, J., Dobson, A. P., and Peterson, G. D. (2006). Trade-offs across space, time, and ecosystem services. Ecology and Society 11(1): 28. http://www.ecologyandsociety.org/vol11/iss1/art28/.

Rudd, M. A. (2004). An institutional framework for designing and monitoring ecosystem-based fisheries management policy experiments. Ecological Economics 48(1): 109–124.

Ruiz-Mallen, I., Schunko, C., Corbera, E., Ros, M., and Reyes-Garcia. 2015. Meanings, drivers, and motivations for community-based conservation in Latin America. Ecology and Society 20(3): 33. http://dx.doi.org/10.5751/ES-07733-200333.

Rwakakamba, T. M. (2009). How effective are Uganda's environmental policies? Mountain Research and Development 29(2): 121–127.

Sarkar, S. and Illoldi-Rangel, P. (2010). Systematic Conservation Planning: an Updated Protocol. Natureza & Conservação 8(1): 19–26.

Saravanan, V. S. (2002). Institutionalising community-based watershed management in India: Elements of institutional sustainability. Water Science and Technology 45(11): 113–124.

Scheyvens, R. (1999). Ecotourism and the empowerment of local communities. Tourism Management 20(2): 245–249.

Stabach, J. A., Laporte, N., and Olupot, W. (2009). Modelling habitat suitability for Grey Crowned Cranes (Balearic a regulorum) throughout Uganda. International Journal of Biodiversity and Conservation 1(5): 177–186.

Tai, H-S. (2007). Development through conservation: An institutional analysis of indigenous community-based conservation in Taiwan. World Development 35(7): 1186–1203.

Thompson, P. M., Sultana, P., and Islam, N. (2003). Lessons from community-based management of floodplain fisheries in Bangladesh. Journal of Environmental Management 69: 307–321.

Toulmin, C. (2009). Securing land and property rights in sub-Saharan Africa: The role of local institutions. Land use policy 26(1): 10–19.

Tucker, C. M. (1999). Private versus common property forests: Forest conditions and tenure in a Honduran Community. Human Ecology 27(2): 201–230.

Turyahabwe, N., Kakuru, W., Tweheyo, M., and Tumusiime, D. M. (2013). Contribution of wetland resources to household food security in Uganda. Agriculture & Food Security 2(5). https://doi.org/10.1186/2048-7010-2-5.

Van der Ploeg, J., Araño, R. R., and Van Weerd, M. (2011). What local people think about crocodiles: Challenging environmental policy narratives in the Philippines. Journal of Environment & Development 20(3): 303–328.

Varughese, G., and Ostrom, E. (2001). The contested role of heterogeneity in collective action: Some evidence from community forestry in Nepal. World Development 29(5): 747–767.

Yami, M., Vogl, C., and Hauser, M. (2009). Comparing the effectiveness of formal and informal institutions in sustainable common pool resources management in sub-Saharan Africa. Conservation and Society 7(3): 153 –164.

Waylen, K. A., Fischer, A., McGowan, P. J. K., Thirgood, S. J., and Milner-Gulland, E. J. (2010). Effect of local cultural context on the success of community-based conservation interventions. Conservation Biology 24(4): 1119–1129.

Wells, M., and McShane, T. (2004). Integrating protected area management with local needs and aspirations. Ambio 33(8): 513–519.

Wetlands Management Department, Ministry of Water and Environment, Uganda, Uganda Bureau of Statistics, International Livestock Research Institute and World Resources Institute. (2009). Mapping a better future: How spatial analysis can benefit wetlands and reduce poverty in Uganda. World Resources Institute, Washington, DC and Kampala.

Whaley, L., and Weatherhead, E. K. (2014). An integrated approach to analyzing (adaptive) co-management using the "politicized" IAD framework. Ecology and Society 19(1): 10. http://dx.doi.org/10.5751/ES-06177-190110.

White, A. T., and Vogt, H. P. (2000). Philippine coral reefs under threat: Lessons learned after 25 years of community-based conservation. Marine Pollution Bulletin. 40(6): 537–550.

World Bank (2016). Data: Population growth (%). https://data.worldbank.org/indicator/SP.POP.GROW.

6

Securing the future of cranes in human-dominated landscapes in Africa: A synthesis of what works

Abstract

This chapter presents a conceptual model that can be used as a guide in the design, implementation and adaptation of crane and wetland conservation projects in rural landscapes in Africa. The model integrates five socio-institutional recommendations for community-based conservation, building on evidence of success gathered from the field and success factors identified at five study sites. Key project design considerations, field methodological approaches and contextual factors that enable and sustain social and ecological impacts (species survival and habitat protection) of projects are outlined.

6.1. Introduction

6.1.1. Looking back at research thrust and key findings

This chapter synthesises findings from the previous chapters, highlighting observed field conservation approaches and opportunities for securing the future of cranes in human-dominated landscapes in Africa. The synthesis is primarily based on field observations of human-crane interactions and lessons drawn from pioneering crane and wetland conservation projects. Five major action-oriented and practicable recommendations are grouped and presented in the form of a symbolic structure ('model'). The model summarizes how the recommendations are interlinked and can be integrated into the conservation planning process. The utility of the model is discussed, with reference being made to other conservation models developed by other researchers. It should

be noted that due to the specific focus on project- and policy-level appropriateness and practicability, recommendations to mitigate broader causal factors of crane decline such as population growth and global market shifts lie outside the scope of this chapter.

As documented in the main thesis introduction and introductory sections of the preceding chapters, the decline of cranes in East and Southern Africa is a regional environmental concern. The essence of this thesis was to analyse the direct causes and underlying drivers of the decline and discern lessons for conservation planning from pioneering crane and wetland conservation projects implemented in rural communities in Kenya, Uganda and Zimbabwe.

The first lap of this study was focused on the analysis of proximate causes and underlying drivers of the decline of cranes in human-dominated landscapes in Kenya, Uganda and Zimbabwe. Chapters 2 and 3 primarily focused on the application of an actor-oriented methodological framework to gather evidence on human-crane-wetland interactions. Habitat loss, one of the major drivers of the decline in the three study countries, is described and analysed in the two chapters. The analysis revealed how lower-level actors' (local communities in this case) decisions and actions are central in determining whether wetlands that contain crane habitats are either degraded or protected. Also documented in the same chapters were the influence of local wetland management institutions (community-based, supra-local and national) in shaping actors' wetland utilisation practices, with implications on the condition of crane habitats. At some sites, community values attached to cranes and positive attitudes towards the species were noted to influence the survival of the species.

The second lap was primarily aimed at evaluating pioneering community-based crane conservation projects implemented at wetlands that support nationally significant crane populations in the study countries. In Chapters 4 and 5, social processes and local institutional development were analysed respectively, linking them to resultant site-level conservation outcomes. Site-based narratives of how community-based conservation approaches were applied to counteract threats to cranes and wetlands in Kenya and Uganda are presented in the two chapters. Some of the notable conservation outcomes in Zimbabwe, linked to crane and wetland conservation projects, are captured in Chapter 3. The narratives reveal the interplay and influence of local actors, local institutions and national environmental policies in shaping crane and wetland conservation outcomes.

Findings from the human-crane interface analysis and evaluation of pioneering crane conservation projects represent field evidence and insights from which recommendations for conservation planning to secure crane populations in human-dominated landscapes can be discerned. The recommendations are integrated to build a general crane conservation model that can be used to guide project design, implementation and adaptation of projects. In the next section, details of how the proposed conservation model was developed and how it is grounded in contemporary conservation planning principles are presented.

6.1.2. Using field-based evidence and success factors to build a conceptual conservation model

Conservation planning can be informed by empirical evidence of successes from projects (Salafsky *et al*. 2002; Grantham *et al*. 2010) and factors enhancing species and habitat conservation success identified through analysis of social and ecological contexts in which projects are implemented (Brooks *et al*. 2013; Bennett *et al*. 2017). In that regard, the conceptual crane conservation model is essentially built upon notable conservation outcomes, acknowledging the role of the supportive social and institutional factors documented at the study sites.

The first consideration in the construction of the conceptual conservation model are lessons from project successes which can be described as 'bright spots' documented in previous chapters. 'Bright spots' comprise evidenced local conservation actions that contributed to species survival and habitat protection over time. The structuration of the model stems from the identification and piecing together of factors that contributed to the success stories, technically referred to in this chapter as bright spots. These bright spots can be described from a social perspective as individuals, households, community groups and external stakeholders that responded positively to project facilitation techniques and took concrete decisions and practical actions in support of crane and wetland conservation goals. They effectively influenced project acceptance, community participation, environmental behaviour and wetland management institutions to mitigate threats to cranes and wetlands. In ecological terms, the bright spots can be defined as patches within broader wetland landscapes where cases of crane survival and maintenance of suitable habitats were reported. Conservation projects that generate bright spots can be viewed as 'learning portfolios' that generate evidence of how, where and when conservation successes are attained. In this chapter, bright spots are the foundation of criteria to identify novel interventions that may

contribute to the desired project impacts which, in turn, provide inspiration to expand site-based project successes (Gilman 1997; Salafsky et al. 2001; McShane and Wells 2004; Noble et al. 2005).

Grounding conservation planning in data gathered from 'bright spots' is in line with the concept of evidence-based conservation (e.g., Sutherland *et al*. 2004; McShane and Wells 2004; Adams and Sandbrook 2013; Sutherland *et al*. 2015). Application of evidence-based approaches entails asking the question: What works for species and habitat conservation? Guided by this overarching question, conservation researchers and practitioners gather empirical evidence and generate knowledge on what constitutes conservation successes from field experiences and use it as the basis for conservation planning. On this basis, the crane conservation projects implemented in the three countries are treated as platforms for experiential learning, a precursor to model development.

A good understanding of contextual factors that contribute to conservation success is particularly important in projects that involve local communities (Waylen *et al*. 2010; Brooks *et al*. 2012; Muhumuza and Balkwill 2013). The factors encompass social, political, economic, institutional and cultural values, processes and conditions that act as strategic entry points in the design or enablers in the implementation and long-term sustenance of conservation projects (Knight *et al*. 2010; Moon *et al*. 2014; Raymond and Knight 2013). Identification of such factors enables the development of conservation solutions that are relevant to local contexts, acceptable to local communities, embedded in local and national environmental policy frameworks and aligned with prevailing community development discourses (Reyers *et al*. 2010; Ives and Kendal 2014). It is important to define how conservation opportunities may enable and sustain practical actions to address threats to species and habitats (Salafsky and Wollenberg 2000; Kapos *et al*. 2009; Tulloch *et al*. 2015).

A summary of conservation actions that could be described as 'bright spots' and success factors are presented in Table 6.1. Conservation actions and success factors that fall into the same categories are denoted by numbers and letters respectively. Despite the differences in context across sites, the conservation actions and success factors can be clustered into distinct categories (see Box 6.1).

Cluster of conservation actions:

1) Avoidance of wetland patches to minimise disturbance to breeding pairs
2) Regulation of access to and utilisation of wetlands to secure crane breeding sites
3) Practical action to prevent degradation of crane breeding sites
4) Restoration of native plants to improve integrity of wetland ecosystems

Cluster of success factors:

a) Active leadership by local conservation champions
b) Social ties among community members, project facilitators and environmental officers
c) Local platforms for crane and wetland conservation awareness
d) Shared wetland values and benefits
e) Supportive national wetland policy
f) Community organisation for collective action to solve environmental problems
g) Prevailing land tenure system aiding habitat protection

Table 6.1. Summary of bright spots and success-enhancing factors at the study sites

	Study sites					
	Kimondi-Kingwal	**Saiwa**	**Kaku**	**Nyamuriro**	**Mitooma**	**Driefontein**
Evidenced project-initiated conservation actions contributing to crane survival and protection of wetland used by cranes (Bright spots)	No notable project-initiated conservation actions at the time of research	Purposeful avoidance of cranes to minimise disturbance during breeding season (1) Village-enforced regulations to prevent agricultural encroachment and overharvesting of wetland plants around crane sites (2) Planting trees on wetland to restore riverine forests critical for ecological integrity of wetlands (4)	Purposeful avoidance of crane sites to minimise disturbance during breeding season (1)	Purposeful avoidance of crane sites to minimise disturbance during breeding season (1) Designation of no-cultivation areas in wetlands thereby leaving space for cranes to breed (2) Re-introduction of wetland plants to improve vegetation cover and the water retention capacity of the wetland (4)	Purposeful avoidance of crane sites to minimise disturbance during breeding season (1) Protection of breeding sites by households in fenced plots by making them inaccessible to the public (3) Adoption of farming spatial patterns and temporal routines by custodians, reducing disturbance to cranes when breeding (2)	Purposeful avoidance of crane sites to minimise disturbance during breeding season (1) Establishment of community gardening sites in designated areas to curb unregulated cultivation of wetlands containing breeding sites (2) Protection of crane breeding sites as part of fire management strategy (3)
Enabling social and institutional factors enhancing conservation outcomes (Success factors)	Cultural values attached to cranes (inherent factor not linked to externally-facilitated project activities)	Active leadership by local conservation champion (a) Social ties among villagers that own plots on wetland fringes (b) Local platforms for raising awareness on crane conservation in schools and at community events (c) Shared aspirations and socio-economic benefits of restoring riverine forests (d)	Social ties between conservation organisation staff and wetland user communities (b) Local platforms for raising awareness on crane conservation in schools and at community events (c)	Active leadership by local conservation champion (a) Social ties rooted in long-standing institutions in the form of cooperatives (b) Existence of supportive policy, legitimising wetland management plans (e) Collective action platforms for addressing common environmental problems (re-introduction of wetland plants) (f) Shared aspirations of socio-economic benefits of restoring native wetland vegetation (g)	Inherent socio-economic benefits of curbing wetland degradation accruing at household level Social ties between conservation organisation staff and wetland plot owners (custodians) (b) Private land tenure system enabling households to implement pro-crane and wetland conservation activities on their plots (h)	Social ties among conservation organisation staff, environmental and agricultural extension officers, site support groups and village committees (b) Local platforms for raising awareness on crane conservation in the communities in schools and communities (c) Communal land tenure system enabling maintenance of unconverted wetlands (h) Self-organisation to address common environmental problems (firefighting) (f) Shared values attached to wetlands as grazing areas (preventing wetland clearance for crop production) (d)

The need to place social and institutional considerations at the centre in the design and implementation of community-based conservation projects is recognised (Waylen *et al*. 2010; Ban *et al*. 2013; Bennett *et al*. 2017). As noted earlier, the essence of this chapter is to draw on lessons from the site-based narratives to develop a simplified and generic model that defines how crane and wetland conservation solutions in rural landscapes can be conceptualised and applied in the field. This study generated narratives of how social and institutional factors were successfully integrated into projects and leveraged to achieve crane and wetland conservation outcomes, taking into consideration the local contexts. To this end, recommendations for social and institutional considerations in the design, implementation and adaptation of crane and wetland conservation projects were discerned from the study findings. The recommendations were drawn through a reflective process guided by five overarching considerations in the conservation planning process in line with propositions in literature. The five considerations are summarised in Table 6.2 were selected based on their relevance to crane and wetland conservation in social and ecological contexts covered in this study.

Table 6.2. Overarching conservation planning considerations used in framing recommendations

Key considerations	**Social and institutional issues explored**	**Source**
Stakeholder buy-in for acceptance and effective collaboration	Shared understanding, stakeholder interests, stakeholder relations	Sayer *et al*. 2013; Mills *et al*. 2014; Foli *et al*. 2018
Ensuring conservation processes are locally-driven	Leadership, social influence, community participation,	Seixas and Davy 2008; Brooks *et al*. 2013; Weeks *et al*. 2014
Balancing livelihoods needs and ecological requirements	Land values, land tenure, livelihood benefits	Salafsky and Wollenberg 2000; Sayer *et al*. 2013; Wittman *et al*. 2017
Community action to reduce threats species and habitats	Self-organisation, shared environmental problems, landscape values	Kapos *et al*. 2009; Tulloch *et al*. 2015; Overton *et al*. 2015
Alignment with local and national institutional frameworks	Social organisation, local governance, policy frameworks	Brooks *et al*. 2013; Mills *et al*. 2014; Waylen *et al*. 2010

Guided by the considerations presented in Table 6.2 and reflecting on evidence of impactful conservation actions and success factors across sites, five recommendations for crane and wetland conservation were drawn. They are presented in the next section.

6.2. The five recommendations

In this section, the five recommendations are presented and discussed. They are framed in an active voice mode in line with the overall gist of this chapter, to guide what crane and wetland conservation planners should prioritise and reflect on when developing crane and wetland conservation projects. References to evidence presented in preceding chapters are added.

6.2.1. Build and sustain collective agendas with stakeholders

Presently, crane conservation is an agenda primarily driven by national and international conservation non-governmental organisations. Despite the notable community buy-in and uptake of the agenda at sites where conservation actions have been implemented, it is still largely an external agenda in the eyes of most rural communities in regions where cranes are found. Evidently, it has not been effectively institutionalised into national conservation agencies' plans, programmes and priorities as has been the case with other iconic mega-fauna in Africa. Findings of the human-crane interface analysis revealed that the survival of cranes and maintenance of suitable habitats are largely influenced by decisions and actions of individuals and community groups at the farm- and wetland landscape levels (see Chapters 2 and 3). The decisions and actions are influenced by household-level economic motivations, community-level wetland resource management institutions and national environmental policies enforced by local district/county authorities and national conservation agencies. In this vein, impactful conservation programmes to secure the future of cranes should start with local environmental actions to protect species and promoting land use practices that secure and restore habitats. These broad recommendations are based on positive experiences from Mitooma, Nyamuriro and Saiwa (See Chapter 4 and 5). As the evidence from the sites showed, this can only be achieved if the crane and wetland conservation agenda becomes a priority at interaction and information sharing platforms and environmental action events at community and local administrative authority levels.

As noted in the previous section, purposeful avoidance of breeding sites to reduce disturbance to cranes and enhance breeding success was a notable intentional conservation action across sites.

Acceptance and internalisation of the need to avoid breeding sites was a result of persuasive approaches used by project facilitators to create local interest in crane conservation, highlighting that cranes needed local community protection to survive (See Chapter 3, 4 and 5). This was achieved through protracted awareness programmes, leveraging community platforms where information could be shared and learning took place. At all sites, crane and wetland conservation awareness was achieved through the dissemination of facts on threats to cranes, referring to the local contexts and emphasising how local communities could contribute to the survival of cranes. The result was a notable internalisation of facts about cranes and commitment to take smile steps to protect the species and secure wetland patches used by the species to breed. Over time, local communities embraced roles in crane protection, including exercising restraint as went about their daily business (movements, wetland utilisation routines and environmental actions) (See Chapters 3, 4 and 5). This confirms the feasibility of inculcating positive attitudes and behaviour required for crane survival, especially at critical stages when breeding pairs and chicks are vulnerable. Notably, crane and wetland conservation awareness activities continued as projects evolved. Community attachment to and association with cranes was documented at Driefontein, Mitooma and Saiwa, reinforced as the social ties between the project facilitator and communities grew over the years. Winning the hearts of local communities in the quest to make crane and wetland conservation a local agenda should therefore start with finding the right platforms to disseminate species and habitat conservation persuasively, allowing relationships between project facilitators and communities to thrive.

At all sites targeted for crane conservation, evidence of community buy-in, ratification of project activities by community leaders and recognition of on-the-ground conservation actions by national government agencies were documented (see Chapters 3, 4 and 5). It was evident that framing crane conservation as an agenda that could be merged with local stakeholder interests, aspirations and expectations was an effective entry point to initially win the support of local communities. This became a solid foundation upon which collective agendas with local stakeholders were built and sustained over the years. Recognition of new collective agendas created the necessity for regular social interactions among community members, government officers and conservation organisation staff which, over time contributed to mutual respect, and gradually led to the social acceptability of crane conservation projects. As the evidence from the project sites show, a network of local conservation actors and supporters evolved over time, with district authorities and government agencies providing seals of approval (see Chapters 3, 4 and 5).

Experiences from the study sites showed that collective agendas were built, leveraged and sustained in different ways, depending on the local context. One approach used to merge the crane conservation with other local agendas was to identify environmental and community development programmes that were socially relevant and economically beneficial to local communities. This can be described as a socio-technical approach whereby technologies and practices that had a positive appeal to local communities, constituted long-term priorities of government environmental agencies and had the potential to effectively mitigate local environmental problems were promoted alongside crane and wetland conservation. The use of tree planting as an entry strategy to promote sustainable land management and new stewardship ethic among local communities in Kenya demonstrates how project facilitators can find common ground with local stakeholders and effectively gain a footing in the community through this socio-technical approach to building collective agendas. Giving agricultural and environmental extension officers the role of trainers and mentors as part of livelihood and sustainable wetland management interventions respectively was another innovative way of leveraging government-supported programmes for crane and wetland conservation gains. This was particularly impactful in Uganda and Zimbabwe where extension officers were actively involved in planning and technically supporting livelihood activities, introduced through the crane and wetland conservation projects (See Chapter 3 and 5). Provision of technical support to ensure the success of the livelihood activities gradually become part of their plans for routine extension support to communities around crane sites.

The second approach involved the use of social and institutional entry points and opportunities to build collective agendas with local, district and national stakeholders. Influential individuals, reputable community groups and government agencies that had a notable influence in conservation and community development decision-making were engaged strategically to enhance the acceptance of the crane and wetland conservation agenda. These reputable individuals and community groups did, as projects progressed, played a key role by supporting the inclusion of crane- and wetland-related issues into community discussions and environmental actions. In Uganda, non-conservation community-based groups (e.g., agricultural cooperatives at Nyamuriro) were engaged and a new role (to support crane and wetland conservation actions) was added to their pre-existing agendas (See Chapter 5). Identifying institutional frameworks (policies and regulations) that resonate with species and habitat conservation is another option that was used to mainstream crane conservation into a much broader conservation planning framework. The case

of community-based wetland planning in Uganda, where provisions of a national wetland policy were used as the basis for securing crane breeding sites as part of the wetland site management planning, is a notable example (See Chapter 5). In Kenya, a respected community leader and innovator were at the forefront of making crane and wetland conservation a topical issue through his engagement of the community using social events such as village meetings, weddings, national events (See Chapter 4).

In a nutshell, adopting persuasive conservation awareness approaches and identifying ways to build long-term relationships with local communities, administrative authorities and government agencies form the foundation of developing collective agendas for the acceptance of the crane and wetland conservation agenda. This is important since the reduction of threats to cranes and wetlands must start at the lowest levels where local communities are the decision-makers are embraced by stakeholders. Examples cited above show that opportunities for enhancing conservation may exist in the form of enabling national environmental policies, supportive local government administrative structures, popular development extension programmes and widely-known technical environmental standards set by national authorities. Despite the different socio-institutional contexts in the study countries, site-level experiences confirmed that leveraging these opportunities could lead to the crane and wetland conservation agenda being embraced, internalised and prioritised over time.

6.2.2. Identify and empower local conservation champions

From the communities around wetlands targeted for conservation action emerged individuals that stood out from the rest and significantly contributed to the attainment projects' social and environmental outcomes. They voluntarily made personal commitments to complement project facilitators' efforts in promoting the crane and wetland conservation agenda. They developed a keen interest in cranes and grasped overall project thrust faster than other community members. Some assumed leadership roles and took unprecedented personal initiative to lead in the implementation of collective actions to protect and restore wetlands (See Chapters 4 and 5) and leading exemplary household-based custodianship of cranes and wetlands (Chapter 5). Other actions they undertook included disseminating information about cranes and demonstrating the tangible roles communities could play in conserving the species (Chapter 3, 4 and 5), monitoring crane breeding events and reporting mortality incidents (See Chapter 4) and encouraging adherence to village-level wetland resource management by-laws (See Chapters 4 and 5). As the projects progressed, they assumed new social status in their communities as local conservation champions, with their roles and influence increasingly becoming prolific as they became the local flag-bearers of crane conservation (Chapter 3 and 5).

Through their active leadership and support to project facilitators, local conservation champions managed to build social capital needed to motivate fellow community members to perform environmental actions voluntarily and sustain the actions beyond donor-defined implementation timeframes (See Chapter 4 and 5). Whilst some played key leadership roles in encouraging community self-organisation (e.g., collective action for wetland restoration at Nyamuriro and village-enforced regulations for wetland utilisation at Saiwa), others demonstrated good practices for species and habitat conservation. The outcomes of the local conservation champions' actions varied across sites. They included a broad spectrum of conservation impacts (e.g., enhanced breeding success, the rescue of chicks, prevention of wetland encroachment, regulation of wetland resource use to secure breeding habitats; restoration of native wetland vegetation). Their work, therefore, represents local stewardship actions that cumulatively contribute to improved land management required to protect habitats increasingly under threat in human-dominated landscapes.

Local champions fell into two main categories: respected community leaders whose reputation and influence preceded the crane conservation projects and individuals that gained prominence through their active and consistent involvement in project activities. Whilst some champions played their positive roles in an individual capacity, others acted on behalf of collective community groups. Leaders of cooperatives that led wetland management planning and restoration activities at Nyamuriro Wetland in Uganda and the leader of the Kipsaina Crane and Wetland Conservation Group (Kenya) fall into the first category. These are examples of community leaders, already acknowledged and recognised in their communities, who were prepared to risk their reputation by ratifying pragmatic decisions that were initially not popular with some wetland users (e.g., regulation of wetland utilisation to improve vegetation cover at Nyamuriro). In the Driefontein Grasslands, Zimbabwe, Site Support Group members who developed a keen interest in cranes and became carriers of conservation messages typify the second category of individuals that gained prominence through their dedicated involvement in project activities. At Mitooma Wetlands in Uganda, families (described as crane custodians in Chapter 4), became champions by adjusting

their farm utilisation routines to create space for and allow cranes to crane breed pairs without disturbance while protecting chicks. They fall into the second category too.

Having described the personal attributes and exemplary actions of local conservation champions, it is important to highlight community engagement processes that enabled the emergence of champions during the various stages of the projects. It is also worthwhile to define some of the intrinsic motivations that drove the champions to perform tasks and platforms that represented enabling environments for champions to act and be accepted by the community. Crane and wetland conservation projects created new community interaction platforms (meetings, workshops, celebratory events) for discussing environmental problems in tandem with day-to-day community issues. Although project facilitators generally organised most of the interactions, there was a need for local leadership structures to be leveraged or evolve gradually, inspired by the quest to localise the crane and wetland conservation agenda. Evidence from the sites shows that the interaction platforms become entry points and opportunities for enterprising individuals to step forward and assume leadership roles in conservation activities. The project created an environment that encouraged champions to gain confidence and be ambassadors of crane and wetland conservation, knowing that they had the support of the project facilitators. This gave them legitimacy, paving way for acceptance of decisions and actions they made on matters related to the project by other community members. It is also important to note the most common motivation for conservation champions was predominantly rooted in the quest to fulfil social obligations. This is exemplified by the village committees in Driefontein, Kipsaina Crane and Wetland Conservation Group leader and cooperative leaders at Nyamuriro. A general lesson from the emergence of local conservation champions is the feasibility of adding new conservation-related roles to local leaders, transformation of pre-existing leadership roles to align them with conservation agendas and nurturing innovative leadership roles responding to the need for self-organisation for conservation action.

6.2.3. Build on local socio-economic values to secure wetlands for the benefit of cranes

Conversion of wetlands into agricultural fields was a common threat to wetlands containing crane breeding sites across all sites covered in this study. The common challenge that confronted project facilitators across the sites pertained ways to maintain the hydrological functions and vegetation characteristics of wetlands (important for maintaining wetlands as suitable crane habitats) without comprising the wetlands' socio-economic values (typified by the livelihoods benefits derived by local communities). Given that a protectionist approach, excluding people and their interests in the quest to secure habitats, would not be readily accepted by households and community groups, it was important to ensure that habitat management actions were compatible with prevailing management institutions governing ownership, access and utilisation of wetland resources. Insights on key social and institutional considerations for balancing socioeconomic and ecological values of wetlands can be discerned from project experiences. These insights represent general options for securing crane habitats in cases when there is shared access and utilisation of wetlands, in addition to cases when wetland patches targeted for conservation are enclosed within privately owned farmlands. Practical examples of "conservation with use", which could inspire the stewardship of cranes and wetlands are presented below.

A general finding from this study was that household-based wetland management and community collective wetland management systems could contribute to the maintenance of suitable crane breeding habitats (See Chapter 2). Cases of breeding success were reported in wetlands that fall under two main categories: expansive and contiguous wetland landscapes (collectively managed as commons) and small and scattered wetland patches located within a mosaic of agricultural fields (privately managed by individual households). Some patches within these wetlands remained unconverted or action was taken to regulate their utilisation because they were essentially valued by specific households or community groups owing to the key ecosystem services; including livestock grazing (Chapter 3) and sources of plant materials for crafts and construction (Chapter 5) they provided. These values were sustained through land tenure systems and, to a less extent, state-based environmental regulations. On private household-owned plots, the unconverted patches could be described as micro-environments that meet the ecological requirements for cranes to breed successfully. Some of the micro-environments were in areas that families had decided not to reclaim for crop production either because they were perennially waterlogged or were reserved as livestock grazing zones. Essentially, most of the crane populations targeted for conservation, with notable successes documented in this study, depended on these two categories of wetlands for breeding space. It, therefore, makes sense to build on local socio-economic values attached to micro-environments within wetlands to protect and secure crane breeding sites.

To maintain crane breeding habitat suitability and curb further habitat loss, persuasive community engagement approaches were used. These approaches were premised on maintaining the local socioeconomic values of wetlands by introducing and strengthening local institutions to prevent

human-induced threats. This is exemplified by regulations to curb agricultural encroachment at Saiwa (See Chapter 4), rules to curb unsustainable harvesting at Nyamuriro (See Chapter 5), and designation of zones for community gardening away from crane breeding sites at Driefontein (See Chapter 3). At the initial stages, this was predominantly opportunistic conservation whereby wetland users were persuaded to simply avoid degrading remnant patches within transformed wetlands. However, as projects evolved, this was used to effectively demonstrate that crane habitat protection was compatible with local communities' wetland-based livelihood practices. By so doing, the projects also demonstrated that crane habitat protection and wetland conservation principles could be integrated into community-based wetland management planning and protection processes under common access regimes. During awareness meetings, reference was made to these tangible compatibilities between conservation and livelihoods to motivate and inspire households and community groups behind the conservation successes.

Background knowledge of communities' and individual farmers' reasons for leaving some wetlands unconverted was used to inform designing farm-level, village-based and community-enforced mechanisms for protecting crane nesting sites. For instance, an innovative wetland zoning process to protect crane breeding sites implemented in the Driefontein Grasslands, Zimbabwe, endorsed by the village leaders, was based on the clear demarcation of crop production (in the uplands) and grazing zones (on grassed and seasonally flooded riverine wetlands). Households were allocated plots in a consolidated community garden located in the uplands and the community agreed that individual gardens in wetland patches used by both Grey Crowned and Wattled Cranes for breeding would not be tolerated. This option worked because expansive wetlands that were relatively undisturbed still existed. The introduction of the custodianship concept in the Mitooma Wetlands in Uganda provides hope for securing breeding habitats in cases where wetlands may have been subdivided and privatised by individual households already. Engaging households owning fenced plots containing wetlands where cranes bred and actively persuading them to protect the breeding sites and pairs yielded the desired results in the form of improved breeding success. These households were encouraged to alter their grazing routines to allow recovery of grasses on patches that provided suitable nesting space for cranes. At another site in Uganda, Nyamuriro Wetland, community members reintroduced native wetland grass to areas to restore natural vegetation and flooding regimes to restore crane habitat and create shared socioeconomic values (papyrus and fodder grass). This case demonstrated how ecosystem services that had been lost could be reintroduced through practical community action. In Kenya, habitat protection and sustainable utilisation were attained through the development of community-enforced by-laws to regulate temporal and spatial access to wetlands for grazing and plant harvesting, specifically targeting sections provided suitable breeding habitat for cranes.

In planning ways to build on local socio-economic values to secure wetlands for the benefit of cranes, it is important to start by understanding why certain large wetlands and patches that contain crane breeding sites remain unconverted despite the high demand for arable land, water and plant materials. This makes it possible to discern some of the inherent success factors (values, institutions) that must be maintained or promoted to secure crane habitats. The temporal and spatial utilisation patterns at smaller patches lying within already converted wetland systems and how these patterns contribute to the maintenance of breeding habitats is another critical consideration that should also be well understood. This forms the basis upon appropriate patch- or landscape-level management practices that could be identified and promoted to maintain suitable habitat conditions. Practical action to improve or maintain wetland flooding patterns and allow recovery of native vegetation played a major role in creating suitable breeding conditions as evidence from Saiwa (See Chapter 4) and Nyamuriro (See Chapter 5) showed. This confirms the practicality of active and passive wetland restoration, rooted in community actions, and how it can lead to tangible conservation outcomes.

6.2.4. Harness the power of grassroots communities to solve environmental problems

Experiences across the study sites provided insights into ways in which crane and wetland conservation projects can be used as platforms for harnessing the power of grassroots communities to address environmental problems and promote learning among community members. This was achieved interventions meant to demonstrate the threats to cranes and wetlands did not manifest themselves in isolation but were part of broader problems affecting the environment and community livelihoods. Notably, crane and wetland conservation projects created interest and platforms for experiential learning in the quest to answer questions on the feasibility of conserving cranes in habitats that were increasingly being threatened by human activities. Sentiments of doubts on how cranes could coexist with people in rural landscapes (not to relocate them to safe sanctuaries elsewhere) were expressed by community members in Driefontein (See Chapter 3). The Nyamuriro case highlights the enormity of the challenge of securing space for cranes in wetlands located in densely-populated areas where local people are desperately in need of arable land (See Chapter 5). However, answers to these insurmountable challenges, in the eyes of local

communities, were generated as community members participated in project activities in different ways and capacities. Although the nature and levels of participation varied across sites, community members were exposed to practical steps for environmental problem solving and had opportunities to celebrate the successes of solutions they tried to solve environmental problems. The logic behind the problem-solving interventions was to identify common problems around project sites (e.g., cutting of trees in riverine forests at Saiwa, unsustainable harvesting of wetland plants at Nyamuriro) and define actions, implementable by local communities collectively, to address the problems. By so doing, the communities addressed environmental problems affecting ecosystems to improve the ecological integrity of crane habitats contained thereof.

One method used to encourage local community participation was the promotion of field interventions that necessitated collective decision-making, investment of labour and time, commitment and ownership, and shared benefits and pride in outcomes of the environmental actions. Two interventions stand out in this regard. First, at Saiwa in Kenya, the propagation and reintroduction of indigenous tree species that used to occur on riverine wetland fringes did not only recreate desired ecological characteristics of wetland ecosystems (tree cover) but also generated tangible benefits for the community (timber). Collective action to reintroduce papyrus to degraded wetland patches and designation of no-cultivation wetland buffer zones created at project sites in Uganda are other examples. These are exemplary interventions that communities could undertake to restore and improve the integrity of wetland ecosystems. Since collective action was involved, these action-oriented interventions did not only build social capital for wetland restoration but answered the question of how local actions could indirectly contribute to the enhancement of desired hydrological and ecological conditions for maintaining crane habitat suitability. They also signify feasible environmental action pathways that communities could follow as they move away from management systems that degrade wetlands and decimated crane habitats.

Community participation in informal crane monitoring provided opportunities to create a dialogue between project facilitators and local communities. Before projects were initiated, the idea of systematically tracking flock movements, breeding events and mortality incidents was alien to communities as cranes were generally viewed as ordinary birds that did not warrant such attention and scrutiny. Messages disseminated during awareness meetings were meant to encourage local communities to observe crane behaviour thereby motivating them to learn about how their practices impacted crane survival and habitat suitability. Local ecological knowledge gained through these informal and experiential observations was merged with formal scientific knowledge during awareness workshops and face-to-face interactions. This approach yielded the desired results in Uganda and Zimbabwe where communities took pride in their knowledge, were motivated to continue observations over time and developed notable attachment to cranes (See Chapters 3 and 5). This demonstrates that encouraging participation could generate community interest in species monitoring. In all three countries, facilitators motivated community members to observe cranes by acknowledging data on cranes collected through daily informal observations by community members. A much more structured and systematic model for community participation in crane monitoring emerged in Kenya where teams comprising community members, teachers and learners collected data on breeding events as volunteers. Data collected through their monitoring activities were effectively used to generate a distribution map of breeding pairs across three major wetland systems (See Chapter 4).

Apart from the community efforts in securing patches used for breeding and restoring wetlands, actions by the Mitooma crane custodians in protecting breeding pairs and chicks on their plots is a promising practice that could be promoted in areas where wetlands have been privatised. Apart from making sure that the breeding sites were not disturbed, the custodians monitored the pairs from the egg-laying stage till the chicks fledged, providing informal updates to the project facilitator (See Chapter 5). What made it possible to protect the sites and the pairs is the clear demarcation and fencing of plots owned by specific households, giving custodians a sense of ownership and control over what they could do on their properties. One general lesson can be drawn from one publicised incident when chicks that had been captured for domestication were reported (by a custodian on whose property the chicks had been bred), leading to action to recover and rehabilitate the chicks in 2010. The action taken by the custodian when the chicks were captured shows that promoting custodianship ethics can lead to personal concern about and attachment to species targeted for conservation, prompting decisive action to protect the species. It also created a defensible space where households could ensure the security of breeding pairs, eggs and chicks. Given that cases of cranes breeding on household-owned properties are common in Uganda and Kenya, there is potential for promoting and adapting the custodianship approach to suit local contexts to ensure that cranes are protected, especially when they are breeding.

6.2.5. Build effective local institutions for sustained conservation actions

The central role of local institutions in averting the agricultural encroachment and other forms of wetland resource utilisation that would have compromised the conditions of crane breeding habitats was documented. Developing and supporting local institutions prevented agricultural encroachment into wetlands which could have led to the reduction in the size of patches containing crane sites, with negative implications on habitat quality (See Chapters 3, 4 and 5). Without the effective locally acceptable institutional mechanisms to curb agricultural encroachment, unsustainable plant harvesting, drainage, the ecological integrity of the wetlands would have been compromised, with negative impacts on crane breeding success. With customary regulations governing wetland utilisation having been eroded at most of the wetlands targeted for conservation and enforcement of state-based regulations weak, the solution, as experiences from the project sites showed, lay in facilitating the development of alternative local institutions governing wetland access and plant resource harvesting routines. Ultimately, the development of local institutions to regulate the management of wetlands empowered local communities to define defensive spaces in wetlands for the benefit of cranes.

Diverse site-based wetland management institutions that were promoted across the target sites reinforced collective stakes in wetlands thereby motivating community members to address wetland degradation. These institutions addressed the need to gaps where there were limited opportunities for the design, evolution and enforcement of wetland resource management institutions. Although there were variations in the way local institutions were developed and supported, the site-based experiences provide lessons on innovative ways to shape local institutions to avert the tragedy of the commons in wetlands critical in securing crane habitats. A general recommendation, building on the field observations, is that institutional analysis at the initial phases of the project is critical to identify acceptable and active community groups that can lead in the development and enforcement of institutions to prevent wetland degradation.

Actionable lessons on institutional development can be discerned from the project interventions at the various sites. First, as experiences from all Kenya and Uganda show, grounding the formation of community-based groups in already-existing and reputable institutions is an effective way of gaining trust and achieving voluntary participation in addressing threats to wetlands. This is typified by the engagement of politically aligned community leadership units such as village committees in Zimbabwe, group-based production entities such as agricultural cooperatives in Uganda and government-backed community development cooperatives in Kenya. These local community groups endorsed project activities and actively participated in activities meant to protect wetlands to secure crane habitats. The second lesson is that routine community practices, customary obligations for collective action and locally enforceable regulatory measures could also be carefully nurtured so that they become institutional arrangements in support of crane and wetland conservation. Examples of obligatory collective action arrangements include the village-based fire management system that evolved in Zimbabwe, which was turned into a routine action that benefitted Wattled Cranes as the communities committed themselves to protect crane breeding sites located in the riverine wetlands. The case of regulated papyrus harvesting in Uganda is another example of how community-enforced measures for managing a resource in high demand were incorporated as an institutional intervention to allow crane habitat recovery. The third lesson relates to the creation of collective stakes as an incentive to focus the community's attention on the ecosystem service they had already lost or risked losing. Reintroduction of papyrus to enhance values attached to wetlands in Uganda and supporting a land use zoning system that helped keep gardening and grazing areas in wetlands intact are typical examples. A key point to note is that the approach of creating and maintaining collective values is that it prevented the degradation of the wetland landscapes and resources thereby sustaining the tangible motivation for the community to invest in the protection of the resource.

Enabling opportunities that existed in the external environment also played a role in the process of shaping local institutions to secure crane habitats. For instance, the existence of a national wetland policy in Uganda provided entry points and a supportive policy framework for the formation of wetland management committees and formulation of community-enforced by-laws for wetland utilisation. In the Driefontein Grasslands, though defined loosely, wetland zoning process provided government-backed delineation criteria and acceptable land use. The wetland and stream buffers, in which cranes nested, were also acknowledged as predominantly livestock grazing and no-cultivation areas. This example demonstrates the intersectionality between local land management regulations and shared benefits and how they can be integrated to secure crane habitats.

6.3. Elaborating the model

In this section, the structural elements of the model (depicted by the temple figure) are discussed. In addition to highlighting the logic behind having the five recommendations connected to form the structure, the discussion also covers conditions for effective application of the model and opportunities for its improvement. Reference is made to general guiding principles and key considerations in the development of conservation models, drawn from literature.

An analogous visual which depicts the conservation model as a structure comprising the foundation, supporting pillars and the roof is presented in Fig 6.1.

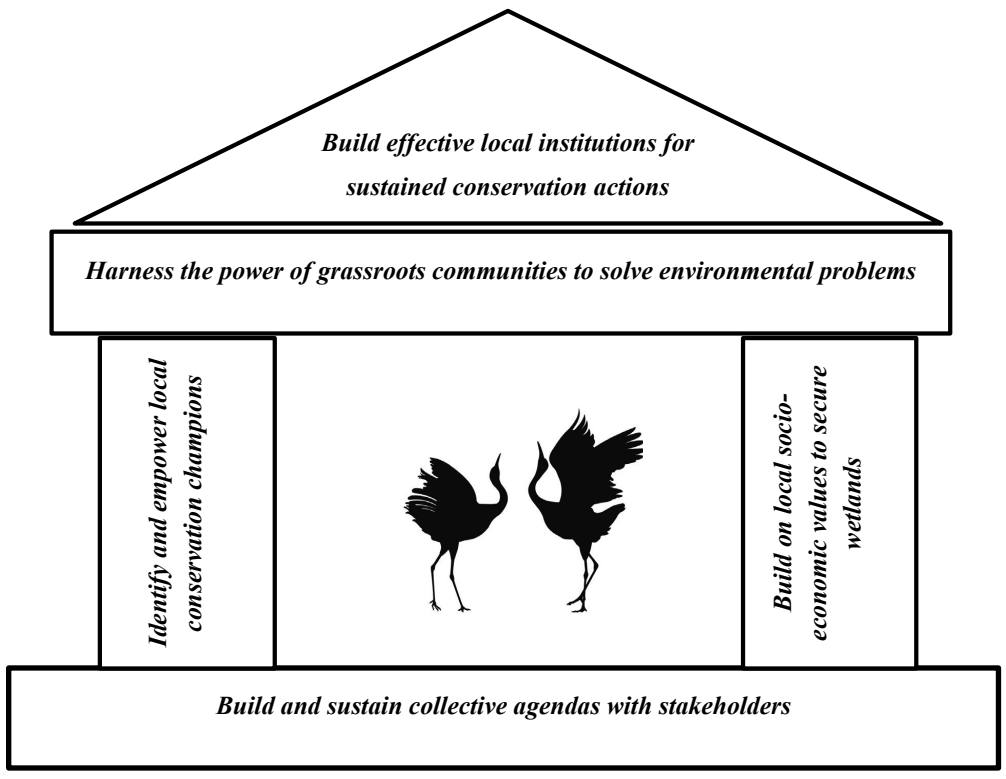

Fig 6.1. Conceptual conservation model for securing the future of cranes in human-dominated landscapes

6.3.1. Structuration of the conservation model

The conceptual model for crane and wetland conservation in a rural landscape presented in this chapter supports the notion of people-centred conservation. As shown in the visual, it integrates findings on the human dimensions of crane and wetland conservation, placing local communities are at the centre of the conservation planning process. Combined, elements of the temple figure, conceptually depict key interventions to secure the future of cranes in human-dominated landscapes based on insights from Kenya, Uganda and Zimbabwe.

As is the case in physical structures, the figure in its totality can only serve the intended purpose if the constituent elements are joined and viewed as parts contributing to the whole. Viewed holistically, it analogically represents three aspects: the foundation that should be established first, pillars of equal height that strengthen the structure, and the roof elements that are stabilised and supported by the pillars. As shown in Fig. 6.1, the five recommendations are joined together in a way that typifies how crane protection can be achieved – cranes are in a safe and secure place inside the temple. "Building and sustaining collective agendas with stakeholders" is the foundation upon which crane conservation projects should be grounded. The starts at project inception and should continue to ensure the agendas remain relevant and provide mutually acceptable justification for collaboration. Without the foundation, the other parts of the structure would irrevocably sink away or crumble. "Identifying and supporting local conservation champions" and "Building on socio-economic values to secure wetlands" are the pillars that support heavy roof elements. Without local conservation champions leading the crane protection agenda and in the absence of habitat management approaches compatible with local livelihoods, it would be a challenge to solve problems (address threats effectively). The basic purpose of a roof is to protect items (human or non-human) inside a structure. When applied to this conservation model, it is necessary to "Harness the power of community action to solve environmental problems" to deal with direct and indirect threats to cranes. Ultimately, long-term protection to cranes can be achieved if supportive and resilient institutions are developed and supported over time. Referring to the temple figure, "Build appropriate and responsive local institutions" is analogous to a roof that provides shelter against various weather elements for years.

The essence of this chapter was to consolidate site-based narratives of stakeholder engagement and institutional development successes that translated into notable conservation impacts at sites where

pioneering crane conservation projects in Africa were implemented. Inherent factors (prevailing social systems and stakeholder agendas, wetland ecosystem values, social and environmental programs) and community engagement approaches (effective ways to engage, motivate and empower stakeholders for them to take actions to address threats to cranes and wetlands) were integrated into a conceptual conservation model, which is actionable and adaptable to suit local conditions.

Founded on the concept of informed opportunism for effective conservation (Bryan *et al*. 2010; Game *et al*. 2011; Whitehead *et al*. 2014), the model guides the conservation planner and implementer to prioritise inherent social structures, institutional arrangements, collective action platforms, land tenure, leadership and resource value systems. It highlights foundational aspects of conservation, including inherent community attributes and their motivations, which provide insight into appropriate project entry points (influential individuals, popular social platforms, collective values and rallying points). It points to the community engagement and field conservation methodologies for effective crane and wetland conservation. Fundamentally, it guides conservation planners to prioritise institutional development at local and supra-local levels, creating an enabling framework for securing community commitment work together and secure project impacts in the long term. The model should be viewed as an adaptable decision-making tool that aids project conservation planning, with emphasis being placed on careful identification of site- and context-specific attributes that define each of the five structural elements of the model.

This study revealed the central role of local communities in ensuring the long-term survival of cranes in wetlands that are increasingly threatened by human activities. As the experiences from the project target sites show, community-focused approaches used to promote crane and wetland conservation in the three countries contributed to the attainment of various social conditions for project success, which form the basis of the model. These conditions, also acknowledged by Pomeroy *et al*. (2001), Knight *et al*. (2006), Gruber 2011 and Brooks *et al*. (2013), include local community participation, social acceptance of project goals, social learning, leveraging institutional networks, sustaining socio-economic benefits from ecosystems and building human and social capital for conservation action. The multiple roles of local communities as conservation supporters, monitors, evaluators, participants, collaborators and catalysts should therefore be acknowledged in crane conservation planning. This also highlights the importance of mainstreaming social processes (interactions, decisions, actions, social influence and ratification of each other's objectives by stakeholders) into conservation planning. The crane conservation model, therefore, addresses the need, acknowledged in conservation circles, for incorporating and valuing human welfare and decision making in conservation planning (Salafsky and Wollenberg 2000; Manfredo and Dayer 2004; Le Cornu *et al*. 2014).

6.3.2. The conceptual conservation model is not a blueprint

While the conceptual conservation model provides hope in that it is an empirically-derived and strategic framework to plan for action to address threats contributing to the decline of cranes, it is not a blueprint that should be applied as is. As noted by Knight *et al*. (2006), Margules and Pressey (2010) and Sayer *et al*. (2013), conceptual conservation models provide guidance on strategic ways to achieve the desired conservation impacts but users should be aware of some of the inherent limitations of the models.

The main limitation of the model primarily emanates from the fact that it was derived using field experiences from a small number of project sites. This was unavoidable given the projects considered in this study represented the only fully-fledged projects where community-based approaches have been used to mitigate threats to cranes and wetlands in East and Southern Africa at the time of the research. This implies that the model itself may need to be adapted and revised by incorporating relevant and complementary insights through gathering fresh evidence of success from other project sites in future. This adaptation process will make the model more representative and therefore applicable under diverse social, economic, biophysical and policy settings. Possibly, new pillars and supporting evidence for the already-included pillars could be added to the conceptual model through a consideration of evidence from other sites. For instance, experiences at other sites may point to the need to focus on strengthening private (household-based) interventions rather than collective community action. In the same vein, insights on ways to effectively focus conservation action on direct species protection may also emerge. This may include approaches for incentivizing direct species protections and methods of building flagship status for cranes among communities, a central issue that is glaringly not well-integrated in the current model.

Like any other conceptual model, its utility and effectiveness largely depend on the technical capacity and experience of the conservation project designer and implementer. The ability of the practitioner to connect, track and document field developments and understand how they fit into the model is crucial. Despite the human capacity barriers that may limit the effective operationalization of the model, it should be acknowledged that applying the model could be a

learning process within the adaptive project management realm. In practice, the model will require frequent revision as project impacts evolve and follow defined pathways, with stakeholder consultation and field observations playing a significant role in the adaptation process as proposed by Game *et al*. (2011), Halliday and Glaser (2011) and Sayer *et al*. (2011). The process of adapting the model may involve a deeper analysis of operational linkages between the different pillars. For instance, this could involve research aimed at understanding how local conservation champions can play a role in efforts to balance socio-economic and ecological values of wetlands. In the same vein, determining how the social networks among stakeholders would add operational value and strength to the model. Efforts to improve the model could therefore involve, research aimed at understanding the factors that could make the model fail in practice (e.g., social costs of conservation) and how to navigate the challenges under different situations. With growing calls for incorporating resilience thinking in the conservation and development sector (Walker *et al*. 2004; Dixon 2008; van Oudenhoven *et al*. 2011; Bush and Marschke 2014), it is worthwhile to also factor in how shared wetland values, opportunities for participation, social learning and collective action and resource governance institutions can be sustained over time as part of the adaptive management process.

Lastly, the crane conservation model described here is an element in the contemporary evidence-based and community-based paradigm in conservation. It aims to make the design and application of these approaches in the field more focused, adaptable and efficient. It also provides a social-scientific basis and an avenue for untangling complexity associated with defining linkages between social interventions and conservation impacts in community-based projects. In this regard, it eliminates operational challenges associated with putting conceptual models into practice. Because the model makes abstract visions such as community-based more concrete and therewith more accessible to a broad number of practitioners, it may also help to inspire conservation professionals to include community-based actions in their work. Given that in contemporary conservation, the need to come up with measurable indicators of project impacts is increasingly being recognized, the model provides insights on starting points in defining social domains and parameters of monitoring and evaluation frameworks for projects. These include community-level assessments of socio-economic attributes, resource management institutions, values and perceptions and participation and technical capacity issues. Measurement of these social parameters is not beneficial for understanding project impacts and pathways but also allows conservation organizations to incorporate and understand ethical and other human welfare issues as required by donors of conservation projects, especially in Africa.

6.4. Final remarks

This study represents the first attempt to collate evidence of the social dimensions of crane and wetland conservation from landscapes and sites that support globally significant populations of cranes. As noted in this and the previous chapters, some promising interventions, described as bright spots, that inspire optimism in the quest to ensure the long-term survival of cranes in human-dominated landscapes, were documented. While the bright spots have been acknowledged and used to develop the conceptual conservation model to secure the future of cranes, the inherent context-specific challenges and site-focused interventions that did not yield the desired conservation outcomes should not be ignored since lessons can also be drawn conservation failures.

This study demonstrated that adaptable methodological frameworks can be applied across sites to generate knowledge on human-crane interactions, highlighting the commonalities and peculiarities in social causes and drivers. Key successes of conservation projects and success factors, from social and institutional perspectives, can be also drawn through evaluative studies at the sites. Findings of these strands of research can be used as the basis for linking conservation science, practice and policy. Defining these linkages is not only important in the design of quality conservation programmes but provides a sound basis upon which national governments, global organisations and treaties managing data on species and habitats and sponsors of conservation programmes can be engaged. As much as the conceptual model presented in this chapter provides guidelines for practitioners, successful operationalisation of the model requires that issues around credible evidence of social and ecological impacts of crane and wetland conservation projects and packaging of as fundable initiatives should be prioritised. The projects' fundability depends on the successful articulation of the linkages between conservation actions and the welfare of local communities. This necessitates the systematic collation of evidence from project sites at national levels and integrating them across nations to inspire policies that are required to secure the future of cranes responding to national and regional needs and challenges.

In today's world, the notion of saving threatened species against extinction invokes mental constructs portraying human welfare as being perpetually at odds with the survival of wildlife and maintenance of ecosystem functions. This gloom and doom mindset, rooted in contemporary global environmental crises affecting biodiversity and humans, should not stifle innovations for effective conservation. This thesis is a narrative of the social dimensions of a crisis affecting vulnerable and elegant species (cranes) that depends on fragile ecosystems (wetlands) in East and Southern Africa. On a positive note, however, and most importantly, it is also documentation of a glimmer of hope for the species. This hope emanates from encouraging wide-ranging field experiences that should inspire positive thinking among conservationists, local communities, national governments and project donors. Securing the future of cranes in human-dominated landscapes in Africa hinges upon nurturing the environmental motivations, commitments and actions of local communities, within a supportive framework of local administrative and national policies, priorities and plans.

References

Adams, W. M., and Sandbrook, C. (2013). Conservation, evidence and policy. Oryx 47(3): 329–335.

Ban, N. C., Mills, M., Tam, J., Hicks, C. C., Klain, S., Stoeckl, N., Bottrill, M. C., Levine, J., Pressey, R. L., Satterfield, T., and Chan, K. M. A. (2013). A social-ecological approach to conservation planning: Embedding social considerations. Frontiers in Ecology and the Environment 11(4): 194–202.

Bennett, N. J., Roth, R., Klain, S. C., Chan, K., Christie, P., Clark, D. A., Cullman, G., Curran, D., Durbin, T. J., Epstein, G., and Greenberg, A. (2017). Conservation social science: Understanding and integrating human dimensions to improve conservation. Biological Conservation 205: 93–108.

Brooks, J. S., Waylen, K. A., and Mulder, M. B. (2012). How national context, project design, and local community characteristics influence success in community-based conservation projects. PNAS 109(52): 21265–21270.

Brooks, J., Waylen, K. A., and Borgerhoff Mulder, M. (2013). Assessing community-based conservation projects: A systematic review and multilevel analysis of attitudinal, behavioral, ecological, and economic outcomes. Conservation Evidence 2(2). https://doi.org/10.1186/2047-2382-2-2.

Bush, S. R., and Marschke, M. J. (2014). Making social sense of aquaculture transitions. Ecology and Society 19(3): 50. http://dx.doi.org/10.5751/ES-06677-190350.

Byran, B. A., Raymond, C. M., Crossman, N. D., and King, D. (2010). Comparing spatially explicit ecological and social values for natural areas to identify effective conservation strategies. Conservation Biology 25(1): 172–181.

Dixon, A. D. (2008). The resilience and sustainability of local wetland management institutions in Illubabor and Western Wellega, Ethiopia. Singapore Journal of Tropical Geography 29(3): 341–356.

Foli, S., Ros-Tonen, M. A. F., Reed, J., and Sunderland, T. (2018).Natural resource management schemes as entry points for integrated landscape approaches: Evidence from Ghana and Burkina Faso. Environmental Management 62: 82–97.

Game, E. T., Lipsett-Moore, G., Hamilton, R., Peterson, N., Kareseka, J. Atu, W., Watts, M., and Possingham, H. (2011). Informed conservation planning in the Solomon Islands. Conservation Letters 4(1): 38–46.

Gilman, E. L. (1997). Community-based and multiple purpose protected areas. Coastal Management 25(1): 59–91.

Grantham, H. S., Bode, M., McDonald-Madden, E., Game, E. T., Knight, A. T., and Possingham, H. P. (2010). Effective conservation planning requires learning and adaptation. Frontiers in Ecology and the Environment 8(8): 431–437.

Gruber. J. S. (2011). Perspectives of effective and sustainable community-based natural resource management: An application of Q methodology to forest projects. Conservation and Society 9(2): 159–171.

Halliday, A., and Glaser, M. (2011). A management perspective on social-ecological systems: A generic system model and its application to a case study in Peru. Research in Human Ecology 18(1): 1–18.

Ives, C., and Kendal, D. (2014). The role of social values in the management of ecological systems. Journal of Environmental Management 144(1): 67–72.

Kapos, V., Balmford, A., Aveling, R., Bubb, P., Carey, P., Entwistle, A., Hopkins, J., Mulliken, T., Safford, R., Stattersfield, A., and Walpole, M. (2009). Outcomes, not implementation, predict conservation success. Oryx 43(3): 336–342.

Knight, A. T., Cowling, R. M., and Campbell, B. M. (2006). An operational model for implementing conservation action. Conservation Biology 20(2): 408–419.

Knight, A. T., Cowling, R. M, Difford, M., and Campbell, B. M. (2010). Mapping human and social dimensions of conservation opportunity for the scheduling of conservation action on private land. Conservation Biology 24(5): 1348–1358.

Le Cornu, E., Kittinger, J. N., Koehn, J. Z., Finkbeiner, E. M., and Crowder, L. B. (2013). Current practice and future prospects for social data in coastal and ocean planning. Conservation Biology 28(4): 902–911.

Manfredo, M. J., and Dayer, A. A. (2004). Concepts for exploring the social aspects of human-wildlife conflict in a global context. Human Dimensions of Wildlife 9: 317–328.

Margules C. R., and Pressey, R. L. (2000). Systematic conservation planning. Nature 405: 243–253.

McShane, T. O., and Wells, M. P. (Eds) (2004). Getting biodiversity projects to work: Towards More Effective Conservation and Development. Columbia University Press, Columbia.

Mills, M., Álvarez-Romero, J. G., Vance-Borland, K., Cohen, P., Pressey, R. L., Guerrero, A. M., and Ernstson, H. (2014). Linking regional planning and local action: Towards using social network analysis in systematic conservation planning. Biological Conservation 169: 6–13.

Moon, K., Adams, V.M., Januchowski-Hartley, S. R., Polyakov, M., Mills, M., Biggs, D., Knight, A.T., Game, E. T., and Raymond, C. M. (2014). A multidisciplinary conceptualization of conservation opportunity. Conservation Biology, 28(6): 1484–1496.

Muhumuza, M. and Balkwill, K., 2013. Factors affecting the success of conserving biodiversity in national parks: a review of case studies from Africa. International Journal of Biodiversity, 2013.http://dx.doi.org/10.1155/2013/798101.

Overton, J. M., Walker, S., Price, R., Stephens, R.T., Henson, S., Earl, R., and Wright, E. (2015). Vital sites and actions: an integrated framework for prioritizing conservation actions and reporting achievement. Diversity and Distributions 21(6): 654–664.

Palomo, I., Montes, C., Martin-Lopez, B., Gonzalez, J. A., Garcia-Lorrente, M., Alcorlo, P., and Mora, M. R. G. (2014). Incorporating the social-ecological approach in protected areas in the Anthropocene. 3(1): 181–191.

Pomeroy, R. S., Katon, B. M., and Harkes, I. (2001). Conditions affecting the success of fisheries co-management: Lessons from Asia. Marine Policy 25: 197–208.

Raymond, C. R., and Knight, A. T. (2013). Applying social research techniques to improve the effectiveness of conservation planning. BioScience 63(5): 320–321.

Reyers, B., Roux, D. J., Cowling, R. M., Ginsburg, A. E., Nel, J. L, and O' Farrell, P. (2010). Conservation planning as a transdisciplinary process. Conservation Biology 24(4): 957–965.

Salafsky, N., Cauley, H., Balanchander, G., Parks, C.J., Margoluis, C., Bhatt, S., Encarnacion, C., Russell, D., and Margoluis, R. (2001). A systematic test of an enterprise for community-based biodiversity conservation. Conservation Biology 15(6): 1585–1595.

Salafsky, N., Margoluis, R., Redford, K. H., and Robinson, J. G. (2002). Improving the practice of conservation: A conceptual framework and research agenda for conservation science. Conservation Biology 16(6): 1469–1479.

Salafsky, N., and Wollenberg, E. (2000). Linking livelihoods and conservation: A conceptual framework and scale for assessing the integration of human needs and biodiversity. World Development 28(8): 1421–1438.

Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J-L, Sheil, D., Meijaard, E., Venter, M., Boedhihartono, A. K., Day, M., Garcia, C., and van Oosten, C. (2013). Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing uses. PNAS 110(21): 8349–8356.

Seixas, C. S., and Davy, B. (2008). Self-organization in integrated conservation and development Initiatives. International Journal of the Commons 2(1): 99–125.

St. John, F. A.V., Keane, A. M., Jones, J. P. G., and Milner-Gulland, E. J. (2014). Robust study design is as important on the social as it is on the ecological side of applied ecological research. Journal of Applied Ecology 51(6): 147–1485.

Sunderland T. C. H., Sayer, J., and Hoang M-H (eds.). (2013). Evidence-based conservation: Lessons from the lower Mekong. Centre for International Forest Research, Bogor.

Sutherland, W. J., Dicks, L. V., Ockendon, N., and Smith, R. K. (2015). What works in conservation. Open Book Publishers, Cambridge.

Sutherland, W. J., Pullin, A. S., Dolman, P. M., and Knight, T. M. (2004). The need for evidence-based conservation. Trends in Ecology and Evolution 19(6): 305–308.

Tulloch, V.J., Tulloch, A. I., Visconti, P., Halpern, B. S., Watson, J. E., Evans, M. C., Auerbach, N. A., Barnes, M., Beger, M., Chadès, I. and Giakoumi, S. (2015). Why do we map threats? Linking threat mapping with actions to make better conservation decisions. Frontiers in Ecology and the Environment 13(2): 91–99.

Waylen , K. A., Fischer, A., McGowan, P. J. K., Thirgood, S. J., and Milner-Gulland, E. J. (2010). Effect of local cultural context on the success of community-based conservation interventions. Conservation Biology 24(4): 1119–1129.

Van Oudenhoven, F. J. W., Mijatovic, D., and Eyzaguirre, P. B. (2011). Social-ecological indicators of resilience in agrarian and natural landscapes. Management of Environmental Quality: An International Journal 22(2): 154–173.

Waylen , K. A., Fischer, A., McGowan, P. J. K., Thirgood, S. J., and Milner-Gulland, E. J. (2010). Effect of local cultural context on the success of community-based conservation interventions. Conservation Biology 24(4): 1119–1129.

Weeks, R., Pressey, R. L., Wilson, J. R., Knight, M., Horigue, V., Abesamis, R. A., Acosta, R. and Jompa, J. (2014). Ten things to get right for marine conservation planning in the Coral Triangle. F1000Research 3. doi: 10.12688/f1000research.3886.3.

Whitehead, A. M., Kujala, H., Ives, C. D., Gordon, A., Lentini, P. E., Wintle, B. A., Nicholson, E., and Raymond, C. M. (2014). Integrating biological and social values when prioritizing places for biodiversity conservation. Conservation Biology 28(4): 992–1003.

Wittman, H., Chappell, M. J., Abson, D. J., Kerr, R. B., Blesh, J., Hanspach, J., Perfecto, I., and Fischer, J. (2017). A social–ecological perspective on harmonizing food security and biodiversity conservation. Regional Environmental Change 17(5): 1291–1301.

Summary

The social dimensions of crane and wetland conservation in rural landscapes: Insights from Kenya, Uganda and Zimbabwe

Research aimed at gaining a better understanding of the social dimensions of species and habitat conservation outside formally protected areas is increasingly taking centre stage in the ongoing drive to advance conservation science, practice and policy. Among others, social dimensions research fulfils three broad and interlinked goals: (1) understanding patterns, drivers and results of interactions between human communities and species targeted for conservation, (2) discerning ways in which human values and needs can be mainstreamed into conservation action plans without compromising the landscape functions and species requirements, and (3) determining impacts of conservation actions on human welfare, species survival and habitat integrity. Outputs of social dimensions research contribute to socially acceptable conservation plans supported by resource user communities, administrative authorities and conservation agencies. This is critical from a sustainability perspective since it lays the foundation for local stewardship of landscapes and natural resources therein, including threatened species.

This thesis focuses on the social dimensions of crane and wetland conservation in rural landscapes in Kenya, Uganda and Zimbabwe. It draws on findings from research conducted between 2011 and 2014. The study sites comprised six landscapes containing wetlands that support nationally significant crane populations in the three countries. Although the research focus was predominantly on landscapes that globally significant populations of the Grey Crowned Crane, one chapter is dedicated to social dimensions of Wattled Crane conservation in Zimbabwe. Key findings from this study contribute to an improved understanding of interactions between cranes and rural communities and provide insights into strategic approaches for addressing the decline of cranes within their range in East and Southern Africa. Despite their documented decline in recent years, cranes still fall into a category of species that have a low conservation profile and do not receive much attention from conservation agencies across their range. Not much research has been

conducted to generate knowledge on the social dimensions of African cranes, and this hinders evidence-based conservation. This thesis is therefore pioneering in that it tackles social dimensions research questions on crane and wetland conservation outside protected areas, i.e., in rural landscapes valued for community livelihoods.

Research that culminated in this thesis was conducted in three laps. First, an analysis of human-crane interactions and the social causal chains behind threats to cranes and wetlands was conducted. Second, social and institutional processes and associated conservation outcomes under site-focused conservation projects were evaluated. Third, building on evidence generated from the first two laps, a conceptual conservation model for effective crane and wetland conservation was developed. This was achieved by integrating knowledge generated through the human-crane interface analysis and the promising field conservation approaches discerned from a long-running project implemented in Kenya since 1990, projects that were initiated in the early 2000s in Uganda and Zimbabwe.

Chapter 1 is an introduction to the thesis. It describes the central problem tackled in this thesis, the decline of cranes in socio-ecological landscapes. It highlights how the decline can be conceptualised as an environmental problem driven by human factors, including livelihoods, land use patterns, community environmental values, local natural resource management institutions and national policy frameworks. The theoretical foundations of human-environmental interactions, the utility of problem analytical frameworks and the relevance of conceptual models for conservation planning are then presented. Interventions to mitigate the decline of cranes proposed in this thesis are inclined towards people-centred conservation, which places grassroots communities, environmental extension agencies and administrative authorities are at the centre stage of environmental problem-solving. In this regard, the underlying principles of people-centred conservation are elaborated, highlighting how the inclusion of social science and social dimensions into the conservation biology realm is contributing to improved conservation approaches. Acknowledging this, the chapter gives an overview of how these social dimensions have been framed and evaluated in practice. The chapter concludes with a presentation of the study objectives and structure of this thesis.

Habitat loss, emanating from human-induced alteration of vegetation structure and hydrological regimes of wetlands, is a major and the most prevalent threat to Grey Crowned Cranes in the study countries. In Chapter 2, habitat loss processes at six wetland sites, selected in Kenya, Uganda and Zimbabwe, are analysed. The Action-in-Context (AiC) framework was used to trace the social causal chains behind habitat loss, focusing on the linkages between human actions, motivations and underlying drivers of actions. Key actions contributing to crane habitat loss fall into five broad categories: ditching to drain water from agricultural fields, wetland edge cultivation, the introduction of alien invasive trees, overgrazing and trampling by livestock, overharvesting of wetland plants and persistent human presence in wetlands. The analysis revealed how increasing demand for arable land due to population growth triggered agricultural encroachment onto wetlands and led to the evolution of local institutions governing wetland subdivision, privatization, access and utilization in Kenya and Uganda. Past policies (land, agricultural and economic) and politically-driven government declarations influenced wetland ownership and utilisation patterns, with implications on wetland ecological integrity across the sites. Land tenure facets (ownership, access and utilisation regimes) influence the capacities and motivations of wetland users for the management of wetlands, with implications on crane habitat suitability. At all sites, cranes now depend on either expanse of unconverted wetlands managed as commons or remnant wetland patches in agricultural plots managed by individual households. Such non-unconverted wetlands, noted to be larger in Zimbabwe than in Kenya and Uganda, offer windows of opportunity for securing the crane breeding habitats in rural landscapes. Overall, findings reinforce the need to critically analyse local contextual factors to identify site-specific threats and their drivers to secure habitats, leveraging values and institutions that prevent unsustainable utilisation of wetlands.

Located in central Zimbabwe, the Driefontein Grasslands form a unique landscape in which the largest population of Wattled Cranes still thrive in a rural setting in the country. For decades, cranes thrived in relatively undisturbed seasonal wetlands scattered in landscapes devoid of human settlement. The land resettlement programme implemented in 2000 saw drastic land use change from commercial cattle ranching to subsistence mixed farming. Chapter 3 unravels key social, political, economic, cognitive and biophysical factors that influence interactions between cranes and the subsistence farming communities. Guided by the Action-in-Context Framework, an analysis of the human-crane interface exposes a myriad of social issues that drive the emergence of threats to cranes. Apart from wetland cultivation, overgrazing and human disturbance, community inaction on dam maintenance and ineffective local fire management systems are also revealed as drivers of breeding habitat loss. Positive attitudes towards the cranes attributable to a decade-long externally-driven conservation outreach were documented. Village-level social control

mechanisms seem to be strong enough to suppress agricultural encroachment into wetlands important for cranes. Four thematic areas to facilitate strengthening community-based conservation action are proposed: (1) strengthening attitudes towards cranes and values attached to wetlands, (2) supporting inherent local resource management institutions that are positively contributing to the maintenance of wetlands as suitable crane habitats, (3) facilitating collective actions to maintain ecosystem services provided by wetlands for sustaining livelihoods and habitats, (4) promoting appropriate technologies and practices to reduce community reliance on wetland-based crop production and (5) creating platforms for shared learning among local communities and supportive agencies for ownership and sustainability of conservation interventions.

In Kenya, the Kipsaina Crane and Wetland Conservation Project, is renowned as a model community-led conservation initiative, started in 1990. Chapter 4 draws lessons on the effectiveness of community-led conservation approaches through an evaluation of this community-led initiative. It explores the protracted social processes and conservation associated outcomes under four project interventions (tree planting, livelihood schemes, environmental education and awareness, regulation of wetland utilisation). The findings confirm the pertinent role of transformational leadership in swaying community environmental values, motivations and actions to develop solutions to environmental problems. The project is a classic case of how pre-existing community-based social groups can be successfully integrated and nurtured so that they support conservation goals. It proves that through strategic facilitation, conservation agendas can be gradually embedded into community social dialogues and problem-solving arenas. Project experiences showed that the promotion of alternative livelihoods to reduce pressure on habitats may not lead to tangible conservation impacts if the livelihood-conservation linkage is not present. Although popular project entry interventions (technologies) and entry points (social interaction platforms) can effectively give projects local relevance and contribute to widespread acceptance of the projects, there may be a need for decisive actions to ensure that the interventions do not perpetually proceed on a pathway that is only weakly linked to the ultimate conservation targets. An exemplary intervention involving the development and implementation of community-level institutions for site-, resource- and species-stewardship was documented. The case study shows that community-led conservation involves complex social processes that allow communities to learn and adapt their values and actions over time, leading to local stewardship of sites and species in human-dominated landscapes.

In Uganda, crane and wetland conservation efforts involved the development of grassroots institutions (community groups and locally-enforced wetland management systems). Chapter 5 presents results of an evaluation of the institutional development process and the ensuing environmental conservation impacts at three sites where conservation projects were initiated in 2002. The evaluation reveals the efficacy of developing and nurturing local institutions to improve the management of landscapes containing habitats critical for cranes. It shows that institutional development can be aided by process-based factors (facilitating community agreements on tenure and resource use, adding value to resources and landscapes, innovative facilitation approaches) and complementary community attributes (transformational leadership, history of collaboration and collective interests, motivations for various actors, power relations) as well as external environmental factors (enabling policy, supportive government programmes). Institutional development around cranes can, however, be hindered by external factors such as land tenure complexities and decentralisation of environmental rights by local administrative authorities. Desirable land tenure systems, property right regimes and resource use patterns necessary for habitat protection and species survival can be attained through strategic and protracted local institutional development. Engagement of leadership structures, shaped by and recognised through decades-long fulfilment of social roles, may positively influence the development of institutions in support of conservation. A key lesson from the study is that inherent and covert motivations for leaders and local communities to participate in institutional development need to be well understood and managed when building and strengthening local institutions for effective conservation.

Chapter 6 is a synthesis of key findings from the preceding chapters, addressing the question of what works for cranes and wetland conservation in rural landscapes in East and Southern Africa. It fills a critical conservation knowledge gap by presenting a conceptual model developed by piecing together key project design considerations, field methodological approaches and enabling environmental conditions that were observed to have contributed to social and ecological impacts at each of the six study sites. The model is founded on the premise that cranes can survive in socio-ecological landscapes if the conservation agenda of the species and its habitats are effectively mainstreamed into the interaction platforms, communication forums and problem-solving contexts of the actors, from community to national levels. Promotion of land management practices that allow communities to balance wetland utilisation and maintenance of suitable

habitats for cranes can provide opportunities for the long-term survival of the species. Experiences from the three countries provided tangible lessons of how to promote "conservation with use" which increases community stewardship of threatened species and fragile habitats. Also documented is the critical role of local conservation champions in leading community self-organisation, promoting the adoption of good livelihood and environmental practices for species and habitat conservation and articulating the conservation agenda so that it resonates with local agendas. Participation of local communities in environmental actions can contribute to experiential learning, enhance capacity for problem-solving, improve knowledge about species and habitats and improve emotional attachment to species and habitats. There is a need for innovative ways to shape local institutions to avert the tragedy of the commons in wetlands, which contributed to the protection of nesting sites and enhanced breeding success.

In a nutshell, this thesis dispels the gloom and doom mindset and offers hope for cranes. This hope emanates from encouraging wide-ranging field experiences that should inspire positive thinking among conservationists, local communities, national governments and project donors. Securing the future of cranes in human-dominated landscapes in Africa hinges upon nurturing the environmental motivations, commitments and actions of local communities, within a supportive framework of local administrative and national policies, priorities and plans.

Samenvatting

De sociale dimensies van kraanvogel- en wetlandbehoud in landbouwgebieden:

Inzichten uit Kenia, Oeganda en Zimbabwe

Onderzoek naar de sociale aspecten van natuurbehoud buiten natuurgebieden wordt steeds belangrijker voor het versterken van wetenschap en praktijk van het natuurbeheer. Dit onderzoek dient hoofdzakelijk drie doelen: (1) het beter begrijpen van patronen, oorzaken en effecten van de interacties tussen bedreigde soorten enerzijds en lokale gemeenschappen anderzijds, (2) het ontdekken van manieren waarop menselijke waarden en behoeften een plaats kunnen krijgen in de bescherming van soorten zonder bovenliggende functies van het landschap als geheel aan te tasten, en (3) het bepalen van het effect van natuurbescherming op menselijk welzijn, soortbehoud en de integriteit van habitats. De resultaten van dergelijk onderzoek dragen bij tot het formuleren van natuurbeschermingsplannen die ondersteund kunnen worden door alle betrokkenen: de lokale gemeenschappen, de lokale overheden en de natuurbeschermingsorganisaties. Dit is essentieel vanuit een oogpunt van duurzaamheid, omdat het de basis legt voor het lokaal gedragen rentmeesterschap van landschappen en de bedreigde soorten daarbinnen.

Deze dissertatie richt zich op de sociale dimensies van kraanvogel- en wetlandbescherming in landbouwgebieden in Kenia, Oeganda en Zimbabwe, gebaseerd op veldwerk gedaan tussen 2011 en 2014. De veldwerkgebieden bestonden uit zes landschappen met wetlands die belangrijk zijn voor nationaal belangrijke kraanvogelpopulaties in de drie landen. De nadruk ligt hierbij op de Grijze kroonkraanvogel (*Balearica regulorum*) maar hoofdstuk 3 van de dissertatie is gewijd aan de Lelkraanvogel (*Bugeranus carunculatus*) in Zimbabwe. De resultaten van het onderzoek dragen bij aan een beter begrip over de interacties tussen kraanvogels en lokale mensen en geven

aanwijzingen voor meer effectieve manieren om de huidige afname van kraanvogels in Oost- en Zuidelijk Afrika tegen te gaan. Ondanks dat deze afname de laatste jaren goed is gedocumenteerd krijgen kraanvogels nog steeds weinig aandacht van natuurbeschermingsorganisaties en is er nog weinig onderzoek gedaan naar de sociale dimensies van hun behoud in Afrika. Dit staat effectieve, 'evidence-based' bescherming van de soorten en hun wetland habitats in de weg. En omdat veel kraanvogels in Afrika leven in gebieden buiten natuurgebieden is het urgent om, zoals het onderzoek in deze dissertatie doet, meer te leren over de factoren die van invloed zijn op kraanvogels en hun wetland habitats in landbouwgebieden.

Het onderzoek dat in deze dissertatie wordt beschreven is uitgevoerd in drie stappen. Als eerste werden veldwerk en een analyses uitgevoerd van de interacties tussen kraanvogels en de lokale bevolking en de sociale factoren achter deze interacties. Daarna richtten het veldwerk en de analyses zich op de sociale en institutionele processen die bijdragen aan de effectiviteit van lokale projecten die kraanvogels en hun habitats beschermen. De derde stap was gebaseerd op de voorgaande twee en ontwikkelde een algemeen conceptueel model voor meer effectieve bescherming van kraanvogels en wetlands. De betrokken projecten liepen vanaf de jaren 1990 in Kenia en vanaf de jaren 2000 in Oeganda en Zimbabwe.

Hoofdstuk 1 is de inleiding tot de dissertatie. Het beschrijft het basisprobleem van de dissertatie, de achteruitgang van kraanvogels in Afrika, en benadrukt hoe dit probleem beschreven kan worden als een milieuprobleem veroorzaakt door menselijke factoren zoals economische behoeften, landgebruikspatronen, milieuwaarden van de lokale gemeenschappen, lokale instituties rond landgebruik en nationaal beleid. Daarna volgt een discussie over de theoretische grondslag van mens-milieu interacties, het nut van probleem-analytische raamwerken en de relevantie van conceptuele modellen voor de vormgeving van natuurbescherming. De interventies die in deze dissertatie worden geanalyseerd en voorgesteld zijn grotendeels sociaal gericht, en dat plaatst lokale gemeenschappen, milieuorganisaties en lokale overheden in het centrum van de belangstelling. Daarom worden in hoofdstuk 1 ook de onderliggende principes van lokaal gebaseerde natuurbescherming uitgewerkt, om te laten zien hoe het opnemen van sociale wetenschappen en sociale dimensies in de natuurbeschermingswetenschap kan helpen om natuurbescherming effectiever te maken. Het hoofdstuk besluit met een overzicht van de doelen van het onderzoek en de structuur van de dissertatie.

Het verlies van broedhabitat, gedreven door menselijk ingrijpen in vegetaties en hydrologie van wetlands, is de belangrijkste bedreiging voor de Grijze Kroonkraanvogel in de drie landen van deze dissertatie. **Hoofdstuk 2** geeft een analyse van het verlies van kraanvogelhabitat in zes wetlandgebieden in Kenia, Oeganda en Zimbabwe. Hierbij werd gebruik gemaakt van Action-in-Context, een raamwerk voor het traceren van de oorzaken van menselijk handelen, waarin onder andere verbindingen tussen handelingen, handelingscapaciteit, motivaties en achterliggende structuren een rol spelen. De belangrijkste handelingen die het verlies van kraanvogelhabitat veroorzaakten bleken het aanleggen van ontwateringssloten, het planten van gewassen aan de randen van wetlands, aanplant van exotische boomsoorten, overbegrazing en vertrapping door vee, over-onttrekking van wetlandplanten zoals papyrus, en te frequente menselijke aanwezigheid in de wetlands. De verdere analyse liet zien dat de toename van de behoefte aan landbouwgrond, gedreven door bevolkingsgroei, de stapsgewijze omzetting van de wetlands tot landbouwgrond veroorzaakte, en in Kenia en Oeganda tegelijkertijd aanleiding was voor de groei van lokale instituties (regels) met betrekking tot de verdeling, privatisering, toegang en gebruik van wetlands. Deze processen werden beïnvloed door achterliggend overheidsbeleid (rond land, landbouw en economie) en politiek gemotiveerde overheidsuitspraken. Algemene regels over landeigendom, bijvoorbeeld, beïnvloedden de capaciteiten en motivaties van wetlandgebruikers met betrekking tot hun wetlandmanagement, met grote gevolgen voor de kraanvogels. Op alle zes veldwerksites waren de kraanvogels afhankelijk geworden van stukken nog resterend natuurlijk wetland, beheerd als gemeenschappelijk land van de lokale gemeenschap of als overgebleven stukjes wetland in akkers in het bezit van individuele huishoudens. Deze nog niet aangetaste stukken wetland – die in Zimbabwe groter waren dan in Kenia en Oeganda – bieden kansen voor het behoud van broedhabitat voor kraanvogels in landelijk gebeid. Een algemene conclusie van dit deel van het onderzoek is dat het van groot belang is om de bedreigingen, factoren en kansen op lokaal niveau goed in kaart te brengen, zodat die kunnen worden ingezet voor duurzaam en kraanvogelvriendelijk wetlandgebruik.

Gelegen in centraal Zimbabwe vormen de Driefontein Graslanden een uniek landschap met de grootste populatie Lelkraanvogels van het land. Van oudsher maakten de kraanvogels gebruik van relatief ongestoorde seizoensgebonden wetlands achter dammetjes in het grasland dat werd gebruikt voor extensieve veeteelt. Na het verdwijnen van het oude regime en het instellen van een rechtvaardiger landverdeling in het jaar 2000 werd het land gedeeltelijk omgezet naar akkers en weides voor gemengde landbouw door zich vestigende gemeenschappen. **Hoofdstuk 3** ontrafelt de sociale, economische, politieke, cognitieve en fysieke factoren die de relaties tussen de kraanvogels en de lokale landbouwgemeenschappen bepalen. Geholpen door het Action-in-Context raamwerk toont de analyse een grote verscheidenheid aan bedreigingen en factoren aan,

zoals het omzetten van wetlandranden in akkers, overbegrazing, verstoring van broedparen, het afzien van onderhoud van de dammetjes en ineffectieve brandbestrijding. Aan de andere kant werden ook positieve attitudes ten opzichte van de kraanvogels aangetoond, die mede konden worden toegeschreven aan de langlopende communicatie-benadering door een natuurbeschermingsorganisatie. Ook bleken er in de dorpen sociale regels te bestaan die het omzetten van wetlands in akkers onderdrukken. Kansen om het voortbestaan van de kraanvogels te bevorderen leken vooral te bestaan uit de volgende: (1) het verder versterken van de positieve attitudes ten aanzien van kraanvogels en wetlands, (2) het verder versterken van lokale regels die bijdragen aan het behoud van de wetlands, (3) het bevorderen van gemeenschappelijke acties ten behoeve van de ecosysteemdiensten die de wetlands leveren, (4) het bevorderen van technologieën en praktijken die mensen minder afhankelijk maken van gewassen uit de wetlands, en (5) het scheppen van een platform voor gezamenlijk leren en gezamenlijke actie door de lokale gemeenschappen en natuurbeschermingsorganisaties.

In Kenia is het Kipsaina Crane and Wetland Conservation Project sinds 1990 een welbekend lokaal ontworpen en gedragen natuurbeschermingsproject. Door middel van een evaluatie van dit project trekt **Hoofdstuk 4** lessen voor de effectiviteit van lokaal gebaseerde natuurbescherming. Het verkent de langdurige sociale processen en uitkomsten van vier actievormen van het project: aanplant van bomen, alternatieve inkomens, milieu-educatie en bewustzijnsvordering, en de vorming van lokale regels voor het gebruik van wetlands. De resultaten bevestigen de prominente rol van transformatief leiderschap in het veranderen van lokale waarden en de motivaties en acties om oplossingen voor milieuproblemen te ontwikkelen. Het project is een voorbeeld van hoe reeds bestaande lokale groepen succesvol kunnen worden geholpen en geïntegreerd in het ondersteunen van milieudoelen. Het bewijst dat door strategisch handelen en communicatie natuurbescherming kan worden ingebed in de dialogen en probleemoplossingen van de gemeenschap. De ervaringen lieten ook zien dat het bevorderen van alternatieve inkomens om de druk op kwetsbare habitats te verlichten niet tot duidelijke verbetering voor natuurbescherming leidt indien er geen sterke, liefst fysieke, link is met een natuurbeschermingsdoel. Sommige typen interventies zoals het introduceren van alternatieve inkomensbronnen via bestaande lokale groepen kunnen projecten snel populair maken maar er moet veel aandacht worden geschonken aan het voorkomen dat het project de gevangene wordt van dit succes, zonder dat de gewenste milieudoelen worden gehaald. De evaluatie van dit project laat zien dat lokaal gedragen natuurbescherming complexe sociale leerprocessen in werking zet die het mogelijk maken dat gemeenschappen hun waarden en handelen aanpassen richting rentmeesterschap van de natuur.

In Oeganda richtten projecten ter bescherming van kraanvogels en hun wetland habitats zich op de ontwikkeling van lokale instituties. **Hoofdstuk 5** presenteert de resultaten van een evaluatie van het sociale proces en de natuurbeschermingsuitkomsten van deze projecten die in 2002 werden gestart op drie plaatsen. De evaluatie laat het resultaat zien het werken met lokale groepen en het lokaal geregeld beheer van wetlands die essentieel waren voor kraanvogels. Het bleek dat deze institutionele ontwikkeling bevorderd werd door procesfactoren zoals het ondersteunen van het bereiken van lokale overeenkomsten over landeigendom en het verhogen van de economische waarde van natuurlijke hulpbronnen en factoren in de gemeenschap zelf, zoals de aanwezigheid van transformatief leiderschap en voorafgaande ervaringen met collectieve actie. Ook externe factoren speelden een rol, zoals ondersteunende overheidsprogramma's. Andere externe factoren kunnen echter een negatieve werking hebben op de ontwikkeling van lokaal wetlandbeheer, zoals tegenspraken in landeigendomregels en de decentralisatie van milieurechten door lokale overheden. Per saldo bleek echter dat lokaal ontwerp en implementatie van regels die die nodig zijn voor het overleven van de kraanvogels bereikt konden worden door een strategische en langdurige inzet. Daarbij speelde het engagement van lokale leiders, gevormd door het decennialang vervullen van functies in de lokale gemeenschap, een sleutelrol. Een belangrijke les uit dit onderzoek is dan ook dat onderliggende motivaties van leiders en gemeenschappen goed begrepen en betrokken moeten worden voor het bereiken van effectieve lokale instituties voor natuurbescherming.

Hoofdstuk 6 is een synthese, gericht op de algemene vraag naar wat werkt voor kraanvogels in landbouwgebieden in Oost- en Zuidelijk Afrika. Het hoofdstuk vult een belangrijk hiaat in de kennis door middel van een conceptueel model, ontwikkeld door het samenvoegen van de bevindingen over kenmerken van projecten, werkmethoden en contextuele factoren die een positieve werking bleken te hebben voor de sociale en ecologische effecten in de zes onderzoeksgebieden. Het model drukt de conclusie van het onderzoek uit, die is dat de kraanvogels kunnen overleven buiten de natuurgebieden als de behoeften van de kraanvogels deel worden van de communicatie en besluitvorming van de betrokken gemeenschappen en organisaties van lokaal tot nationaal niveau. Op het fysieke niveau liggen er vele mogelijkheden voor de bevordering van methoden van landgebruik die broedhabitat voor kraanvogels sparen en hun overleven op de lange termijn verzekeren. Het model drukt vervolgens uit hoe de ervaringen

in de drie landen lessen hebben opgeleverd om deze combinaties van wetlandgebruik en natuurbescherming te bevorderen, samen met het onderliggende gevoel van rentmeesterschap in de lokale gemeenschappen. Een deel daarvan is aandacht voor de centrale rol van lokale leiders in natuurbescherming, die de overstap naar natuurvriendelijke landbouwpraktijken kan bevorderen op een wijze die aansluit bij lokale doelen en behoeften. Participatie van de bevolking in natuurgerichte acties kan bijdragen aan ervaringsgebaseerd leren, de capaciteit van de gemeenschappen om problemen op te lossen, de kennis over de soorten en hun habitats en een gevoel van verbondenheid met de kraanvogels. Er is behoefte aan innovatieve manieren om lokale instituties vorm te geven die de collectieve verantwoordelijkheid voor de bescherming van broedhabitat in de wetlands effectief tot uitdrukking brengen.

Concluderend laat deze dissertatie zien dat pessimisme over de toekomst van de kraanvogels niet leidend hoeft te zijn. De brede ervaringen in het veld laten zien dat er hoop is voor de kraanvogels, en dat behoort een positieve manier van denken op te roepen bij natuurbeschermers, lokale gemeenschappen, overheden en donoren. Het zekerstellen van de toekomst van kraanvogels in de landbouwlandschappen van Afrika draait om het koesteren en bevorderen van natuurvriendelijke motivaties, beloften en acties van lokale gemeenschappen, in een context van ondersteunend overheidsbeleid en planning.

Acknowledgements

During my PhD journey, I received support from individuals, conservation organisations, government agencies, academic institutions and local community groups. Suggestions, comments and criticisms I received from individuals helped me refine and enrich my research ideas. I acknowledge the financial, human and material resources that were generously availed to me by my sponsors, employers, work colleagues and research subjects (local communities). These diverse forms of support cushioned me against the physical strain and emotional drain associated with travel, data collection and manuscript preparation.

Primarily, I would like to express my sincere gratitude to my promotor, Professor Wouter de Groot, for being a dedicated and patient mentor, right from the conceptualisation phase of my study until I completed writing the last chapter of this thesis. Despite his busy work schedule as Director of the Institute of Environmental and later as the Dean of Science, my second supervisor, Professor Geert de Snoo, dedicated time to critique my data collection methods and presentation style through the lens of conservation ecology. In 2012, Dr Erica Cochrane, then a Director of Education at the International Crane Foundation, joined my supervisory team as a manuscript reviewer. She tirelessly read my manuscripts and provided sound advice, which helped me improve the outline of my chapters and my technical writing skills. Professor Robert Fincham of the University of KwaZulu Natal was my field supervisor. His comments made me realise that I was not only doing my research to generate theoretical knowledge but to generate empirical evidence to guide practitioners and policymakers.

During my research, I was working as a Community Projects Coordinator for the African Crane Conservation Programme, a joint initiative of the International Crane Foundation and the Endangered Wildlife Trust. I, therefore, acknowledge the two organisations for granting three-month study leave every year between 2011 and 2014. This enabled me to travel and spend time in the Netherlands to consult my promotors and read extensively to broaden my knowledge of conservation biology. My manager, Ms Kerryn Morrison, encouraged and supported me during the entire course of my studies. She regularly reminded me of the significant contribution my research findings would make in the quest to improve community engagement strategies to save cranes in human-dominated landscapes.

I acknowledge the Uganda National Council for Science and Technology and the National Council for Science and Technology of Kenya for granting permission to conduct my research. My colleagues coordinating national crane conservation projects in Kenya, Uganda and Zimbabwe assisted me. Special gratitude goes to Maurice Wanjala (Founder of the Kipsaina Crane and Wetland Conservation Group), Jimmy Muheebwa (Uganda Crane and Wetland Conservation Project Coordinator) and Togarasei Fakarayi (BirdLife Zimbabwe's Project Officer). They did not only drive me to my field sites but organised meetings and workshops and helped me avoid breaching protocol when dealing with local community leaders and administrative authorities. I am indebted to all representatives of local communities that I consulted for voluntarily providing invaluable social data based on their knowledge and experiences. They set aside time to answer my questions despite having their own pressing needs and priorities. They never turned me away when I needed to speak to them. They include the Site Support Group members from the Driefontein Grasslands (Zimbabwe), Self-help Groups from Kipsaina and Kingwal (Kenya) and Agricultural Enterprise Groups from Kaku, Mitooma and Nyamuriro (Uganda).

My fellow PhD students at the Institute of Environmental Sciences (CML) made me appreciate that I was not alone in the pursuit of academic research. During each stint in the Netherlands, I met new students with whom I interacted informally, shared experiences and discussed challenges associated with being PhD researchers. We constantly reminded each other about the academic standards we had to meet as PhD students. Though I met many students, I acknowledge the inspiration I got through my interactions with Ishmael Kosamu, Arbainsyah, Chimere Ohajinwa and Willie Saliling. I am also grateful to the CML administrative and IT staff members for their logistical support.

I would not have been able to conduct my research without the financial support from the Netherlands Fellowship Programme (Nuffic). I extend my gratitude to Mr. Edward Chuma for introducing me to the world of community-based natural resource management and being my mentor and advisor as I made decisions that shaped my career.

Lastly, I thank my family and friends. They did not complain, at least not too loudly, even though conducting my research and writing my thesis meant being away from them for weeks or months.

Curriculum Vitae

Osiman Mabhachi was born in Bikita, Zimbabwe, on 11 July 1974. He completed his primary and secondary education in his home district. He studied Maths, Physics and Chemistry at Assisi High School, where he obtained his Advanced Level Certificate in 1992. He graduated with a BSc. Agricultural Engineering degree from the University of Zimbabwe in 1999. Between 1999 and 2007, he worked in various field-based positions, coordinating agricultural, natural resource management and biodiversity conservation projects in Zimbabwe. During this period, he participated in participatory environmental research and extension projects, working with rural communities. In 2007, he registered as an MSc Environmental Management student at the University of Wolverhampton, United Kingdom. His dissertation was on modelling the projected impacts of climate change on rain-fed maize production in two regions of contrasting agricultural potential in Zimbabwe.

Upon completion of his MSc studies in 2008, he joined the International Crane Foundation / Endangered Wildlife Trust Partnership as a Community Projects Coordinator. His brief was to coordinate a regional conservation programme aimed at mainstreaming community-based approaches in the conservation of cranes in Kenya, Rwanda, South Africa, Uganda and Zimbabwe. He played a key role in project conceptualisation, fund-raising and technical capacity development during a time when the programme was setting up in-country offices in East Africa. He continued to fulfil his work responsibilities as he was pursuing his PhD research at the University of Leiden between 2011 and 2015. Upon completion of his PhD research, he contributed to the development of national project strategies and plans for community-based crane and wetland conservation projects in Kenya, Uganda and Zimbabwe. He has professional interest in the development of strategies for biodiversity conservation outside formally protected areas. Osiman is currently employed by Voluntary Service Overseas (VSO) as a Programme Design and Quality Lead. He provides technical support in the design of regional programmes in Africa and Asia, focusing on Education, Health and Livelihoods.