Journal for Nature Conservation 26 (2015) 65–77

Contents lists available at ScienceDirect

Journal for Nature Conservation

journal homepage: www.elsevier.de/jnc

Co-defining program success: Identifying objectives and indicators for a livestock damage compensation scheme at Kruger National Park, South Africa

Brandon P. Anthony[a,*], Louise Swemmer[b]

[a] Environmental Sciences & Policy Department, Central European University, Nádor utca 9, Budapest 1051, Hungary
[b] Scientific Services: South African National Parks, Kruger National Park, Phalaborwa, South Africa

ARTICLE INFO

Article history:
Received 13 March 2015
Received in revised form 15 May 2015
Accepted 26 May 2015

Keywords:
Adaptive management
Compensation
Evaluation
Human–wildlife conflict
Kruger National Park
Monitoring

ABSTRACT

Wildlife damage compensation schemes have been used worldwide as a mechanism to mitigate human–wildlife conflicts. These have had mixed success due to a number of factors, including a lack of shared understanding of the problem and how to monitor and evaluate effectiveness. The long history of damage-causing animals (DCAs) which exit the Kruger National Park (KNP), South Africa, inflicting damage on persons and property, increasing risk of disease transfer between wildlife and livestock, and seriously undermining the livelihoods of local communities, remains a contentious issue. As a partial response and within a strategic adaptive management framework, the park and its larger governing body, SANParks, have negotiated a wildlife damage compensation scheme with local communities, which entails financial retribution given to farmers who have previously lost livestock to DCAs originating from the park. A corollary scheme will see compensation paid to valid claims commencing from 2014. Here we present findings of a novel study undertaken with KNP staff, livestock farmers, and others to co-identify potential indicators of an objective-based participatory monitoring and evaluation program for the scheme. Based on a multi-method approach, a wide array of goals and objectives were articulated for the scheme. In addition, 88 program indicators were generated as potential measures to monitor change. This suite of indicators is both qualitative and quantitative in nature and, if adopted in whole or in part, would enlist the involvement of a broad range of stakeholders. The first step at consolidating these indicators are presented, and are based on information sources, methodological tools, and institutions responsible for monitoring.

1. Introduction

1.1. Strategic adaptive management (SAM)

La vutisaka ndlela, a nga lahleki/'The one who asks his way will not get lost'

As this local Tsonga proverb highlights, managing should be an iterative process by which regular feedback loops increase learning, allowing for more proactive (rather than reactionary) thinking and decision-making (Biggs & Rogers, 2003). Holling (1978) described adaptive management as an integrated, multidisciplinary and systematic approach to improving management and accommodating change by learning from the outcomes of management policies and practices. Rooted in domains of experimental science and systems theory, but applied as a resource-management paradigm, adaptive management addresses the complexity of socio-ecological systems through conceptually mapping the knowledge gaps and spots of uncertainty within the system through structured decision-making. Strategic adaptive management (SAM) has become a core part of the planning and decision-making within SANParks, the South African National Parks agency. It was conceived by recognizing the social-ecological system complexity and the existence of multiple and diverse stakeholders within which its parks are embedded (Freitag, Biggs, & Breen, 2014; Roux & Foxcroft, 2011; Venter, Naiman, Biggs, & Pienaar, 2008). One of the main purposes of SAM is to purposefully learn and strategically adapt over time. This learning, however, needs to take place throughout both the planning and implementation stages of a management cycle, involving multiple stakeholders and involve regular formal and informal feedback loops. Learning is backed by the continuous monitoring and evaluation of system responses to management actions (Linkov et al., 2006). Evaluation and reporting of the results at multiple scales contributes to the reassessment of the problem,

* Corresponding author. Tel.: +36 13273000x2007; fax: +36 13273031.
E-mail addresses: anthonyb@ceu.hu (B.P. Anthony), louise.swemmer@sanparks.org (L. Swemmer).

http://dx.doi.org/10.1016/j.jnc.2015.05.004
1617-1381/

compares the actual outcomes to forecasts and interpreting the reasons underlying any differences, and revisits the policy before adapting it to the new cycle (Clark, Curlee, & Reading, 1996; Maris & Béchet, 2010).

Within SANParks, application and experimentation with SAM have featured more heavily with the biophysical realm of social-ecological systems, i.e., on biodiversity monitoring and the development of *thresholds of potential concern* (TPCs), essentially minimum and maximum limits along a gradient of change in selected environmental variables (Biggs, Ferreira, Freitag-Ronaldson, & Grant-Biggs, 2011). Where SAM has been attempted on more recognizable *social*-ecological systems, e.g., sustainable resource use by local communities, ecological indicators and TPCs have predominated, with emphasis on developing appropriate indicators of socio-economic factors from which to assess management actions still nascent; a recognized deficiency within SANParks (Gaylard & Ferreira, 2011; Scheepers, Swemmer, & Vermeulen, 2011; Swemmer, Grant, Annecke, & Freitag-Ronaldson, 2015; Swemmer & Taljaard, 2011). Not surprisingly, social and economic monitoring and evaluation within these frameworks can be laborious, as it often entails qualitative data and social science research methodologies and frameworks, both of which are relatively new and unexplored domains within the conservation sector. Furthermore, evaluation of these schemes historically have not considered the tradeoffs between costs and benefits, and the added value in collectively assessing impact within and between stakeholders, and between stakeholders and the natural environment (Swemmer et al., 2015). Noteworthy, it has been recognized that effective monitoring and evaluation of such frameworks, and the projects which they constitute, can be both pragmatic and empowering in addressing multi-stakeholder needs (Rist, Campbell, & Frost, 2013; Stringer et al., 2006).

1.2. Human wildlife conflict (HWC) and damage causing animals (DCAs)

HWC are products of socio-economic and political landscapes and the institutional architecture in place to manage these conflicts, and are controversial because the resources concerned have economic value and the wildlife involved are often high profile and legally protected (McGregor, 2005; Treves & Karanth, 2003). Globally, the frequency of conflicts involving DCAs has grown in recent decades, chiefly because of (i) increases in human populations and consequential expansion of human activities (Woodroffe, 2000; Woodroffe, Thirgood, & Rabinowitz, 2005), (ii) growth of some wildlife distributions (Enserink & Vogel, 2006), as well as (iii) a recurrent inability of institutions to manage such conflicts effectively (Anthony, Scott, & Antypas, 2010).

Managing HWC effectively is important for both biodiversity conservation as well as human well-being. Attitudes towards protected areas (PAs) and their policies are often influenced by perceived or real damage caused by wildlife (Anthony & Moldovan, 2008; de Boer & Baquete, 1998; Hill, 2004). Wildlife damage represents tangible threats to livelihoods in terms of personal injury, crop and livestock losses, and property damage (Graham, Beckerman, & Thirgood, 2005; Happold, 1995). Retaliatory killing of wildlife due to livestock damage has been identified as an important factor in observed carnivore declines (Hazzah, Borgerhoff Mulder, & Frank, 2009; Kahler, Roloff, & Gore, 2012; St John et al., 2012). And finally, human–wildlife conflicts can be socially corrosive, creating and reflecting larger conflicts of value and class and other interests (Anthony et al., 2010; McGregor 2005). Especially in developing countries, such conflicts have the potential to weaken human security and undermine the effectiveness and legitimacy of state institutions. Understanding these conflicts contextually through the lens of various actors can help develop more nuanced strategies to alleviate conflicts, bringing about more positive outcomes for protected areas, wildlife, and people.

The Kruger National Park (KNP), situated in the northeastern section of the Republic of South Africa, was established in 1926, and covers nearly two million hectares (Carruthers, 1995). It is unrivalled among South Africa's 19 national parks, being home to an unparalleled diversity of wildlife and is maintained by one of the world's most sophisticated management systems (Braack, 2000). KNP has a long history of DCA management and impact, including negatively impacting on peoples' well-being through damage to people, livestock and property (Chaminuka, McCrindle, & Udo, 2012), increased risk of disease transfer between wildlife and livestock (Brahmbhatt et al., 2012), as well as negative impacts on conservation through losing support for biodiversity as well as retaliatory killing of wildlife. Damage by wildlife has contributed to many communities feeling dissatisfied with park authorities in the past (Anthony, 2007; Cock & Fig, 2000). Recent work in the KNP region has shown that (i) most DCAs originate from the park, significantly affecting its long-term legitimacy among local communities; (ii) between 2002 and 2004, over 12% of households within 15 km of the park in their study area experienced DCA damage, with incidents positively correlated with proximity to KNP and higher numbers of mammalian livestock; (iii) DCA incidents are affecting opinions concerning KNP, as those who experienced damage were less likely to believe that the park would ever help their household economically; and (iv) DCA procedures are highly flawed due to ambiguity concerning species and movement of DCAs, poor reporting, inadequate response times, overlapping responsibilities, and corruption (exacerbated by weak and, in some cases, competing institutions) (Anthony et al., 2010). human–wildlife conflicts that are not satisfactorily resolved contribute to the maintenance of a strained relationship between the park and its neighbors, which has undesirable social consequences and, because of its perception as environmental injustice, poses risks for the park and its resources in the longer-term (see Cheldelin, Druckman, & Fast, 2003). Developing an adequate response to the problem of DCAs is a high priority for park authorities and other governmental bodies (Madden, 2004).

2. Response to DCA problem

Mhaka a yi bori/a case does not rot

As exemplified by this local Tsonga proverb, the acute problem of DCAs, their control, and the need for compensation demands a solution in order to improve relationships between communities and management institutions, and to arrive at better outcomes for communities and conservation alike. Fostering communication and trust, demonstrating effort and a willingness to address the issue, and following through can lead to improved governance (Lockwood, 2010) and have a positive effect on the attitudes and actions of people in conflict with wildlife (Anthony & Wasambo, 2009; Madden, 2004), particularly if inherent trade-offs in decision-making are articulated well in advance (Anthony & Szabo, 2011). However, with such a complex issue, one cannot rely on any one solution alone but is more likely to succeed by employing a battery of flexible instruments and policies. To this end, the responses to the DCA problem at KNP have been multi-faceted including increased efforts in maintaining and upgrading the border fence (Ferguson & Hanks, 2010), and reducing damage caused by an increasing elephant population (Scholes & Mennell, 2008).

As a further response, the park and its larger governing body, SANParks, have negotiated a wildlife damage compensation scheme with local communities, which entails financial retribution given to affected farmers who have previously lost livestock to DCAs originating from the park. A corollary scheme will see compensation paid to valid claims commencing from 2014. Although

this is the first official compensation scheme to be implemented for the park, there are individual historical records of ad hoc approaches to compensation that were made in the form of selling products from DCA control. The rationale for this current scheme is constituency building and redressing environmental injustice, and is meant to be inclusive and facilitative, i.e., it seeks to "...build a sense of common purpose amongst all relevant stakeholders and to develop a collective roadmap for getting from a current (usually undesirable) reality to a more desirable social-ecological system." (Roux & Foxcroft, 2011; p. 2). Although compensation schemes may create continuing financial burdens and increase expectations (Crawshaw Jr., 2004; Graham et al., 2005), and be counter-productive to conservation by stimulating agricultural expansion (Bulte and Rondeau, 2005, 2007), the legitimacy of institutions may be enhanced where following through on long-standing promises are made, particularly where farmers perceive these institutions to be ameliorating the negative impacts of living adjacent to protected areas, through the payment of compensation for livestock loss.

3. KNP/SANParks objectives

In line with SAM, SANParks has developed a strategic plan and conceptual framework, with associated objectives, for meeting its overall mission, i.e., To develop, manage and promote a system of national parks that represents biodiversity and heritage assets by applying best practice, environmental justice, benefit-sharing and sustainable use. (SANParks, 2012). Both 'biodiversity' and 'people' objectives are integral to SANParks fulfilling its mission, with both 'benefit sharing' and 'constituency building' being core 'people' sub-objectives. Further, these sub-objectives have been sub-divided into more discrete sub-objectives (Fig. 1). The scheme to compensate affected livestock farmers seeks to contribute to the 'Constituency building objective' (2), more specifically sub-objectives 2.3 (Community relationship objective) and 2.4 (Ameliorate negative effects objective).

To date, no attempt has been made to offer a suitable set of indicators for the outcomes of the compensation scheme objectives. Moreover, as this compensation scheme is being implemented and embedded within a SAM framework, it is vital that research be conducted that will evaluate how the planning, implementation, and monitoring of the scheme will contribute to SANParks' overall objectives and those of neighboring communities (see Inskip & Zimmermann, 2009; Maclennan, Groom, Macdonald, & Frank, 2009; Pechacek et al., 2012).

3.1. Monitoring and evaluation (M&E)

Within the SAM cycle, monitoring and evaluation (M&E) are instrumental stages in understanding the effects of management decisions and processes, and informing where and how adjustments are needed for improvement. The evaluative criteria for M&E can originate from theory, analyses of cases, direct stakeholder elucidation (Chase, Decker, & Lauber, 2004), or a combination of these. There are a number of challenges associated with implementing M&E to assess the impacts of protected areas and their programs on people. One of these is *attribution*, i.e., how to determine whether observed impacts are related to the protected area as an institution, the ecosystem being managed or other factors unrelated to the protected area. A second challenge concerns assessing relatively *intangible* impacts, and identifying appropriate indicators for these impacts including changes in attitudes and practices, which may be just as important as more tangible impacts in determining the impact of a program (Swemmer & Taljaard, 2011). A third challenge lies in ensuring that the impacts on *multiple stakeholder groups* are being captured (Schreckenberg et al., 2010) based on the realization that stakeholder perceptions of the value of impact differ based on their individual socio-political and economic context (Swemmer et al., 2015).

To meaningfully assess the merits of any wildlife damage compensation program, one must disentangle the multiple goals of compensation (Agarwala, Kumar, Treves, & Naughton-Treves, 2010; Boitani, Ciucci, & Raganella-Pelliccioni, 2010; Decker, Lauber, & Siemer, 2002). This necessitates the inclusion of relevant stakeholders, whereby broadening involvement in identifying and analyzing change is a priority to enrich the data available to underpin all stages of the management decision process (Baruch-Mordo, Breck, Wilson, & Broderick, 2009; Fabricius & Cundill, 2014; White & Ward, 2010). Yet despite the obvious importance and sensitivity of compensation for wildlife damage, few compensation schemes have been rigorously analyzed, particularly on their effectiveness in reducing local efforts to eradicate problematic wildlife, reducing perceived risk from human–wildlife conflict, or on building support for conservation agencies and/or their mandates (Dickman, 2010; Montag, 2003; Nyhus, Osofsky, Ferraro, Madden, & Fischer, 2005; Pechacek et al., 2012; Redpath et al., 2013). Moreover, we know of no published cases where compensation schemes have articulated, embraced and incorporated 'external' stakeholder goals, objectives and indicators into the scheme's design, implementation, and M&E, despite the identified need to do so (Boitani et al., 2010; Decker et al., 2002; Messmer, 2000).

Participatory monitoring and evaluation (PM&E) is an approach which emerged due to a recognition of the limitations of non-participatory approaches, and is increasingly drawing interest from many agencies, since it offers new ways of assessing and learning from change that are more inclusive, and more aligned with the views and aspirations of those most directly affected. It does this through involving outside stakeholders, conservation agencies, and policy makers and deciding *together* how progress should be defined, measured, and results acted upon (Guijt & Gaventa, 1998). This shift in thinking has been prompted by: the growing interest in participatory appraisal and planning, which stress the importance of incorporating local people's perspectives (Guijt & Gaventa, 1998); increased pressure for greater accountability, particularly with dwindling resources; the shift within organizations towards reflecting more on their own experiences, and learning from them (Biggs & Rogers, 2003; Roux & Foxcroft, 2011); and the increased appreciation that communities have their own priorities for improving their lives, and their own ways of identifying impact indicators and measuring change which may be equally, if not more, legitimate than those imposed by external actors (Catley, Burns, Abebe, & Suji, 2007; Jeffery, Abonyi, Labonte, & Duncan, 2006).

Where project participants are included in the impact assessment process, this can create an opportunity to develop a learning partnership involving both the implementing partner and the intended target groups. The assessment process can create space for dialogue, and the increased pool of knowledge can provide a broader basis for discussions on how to improve programming and where best to allocate future resources (Emerson, Orr, Keyes, & McKnight, 2009; Rist et al., 2013). Based primarily on public health and development programs, several positive outcomes have been associated with effective stakeholder engagement in developing M&E systems (Catley et al., 2007; Danielsen, Burgess, & Balmford, 2005; Guijt & Gaventa, 1998; Jeffery et al., 2006; Lund, 2014; Thompson, Elmendorf, McDonough, & Burban, 2005; Treves, Wallace, & White, 2009). These include the identification of otherwise unavailable information, and capturing local information which is more likely to accommodate local needs and be more culturally appropriate, particularly in cross-cultural contexts.

It is within this dynamic and emerging context, with (largely unknown) associated benefits and costs, whereby KNP/SANParks is

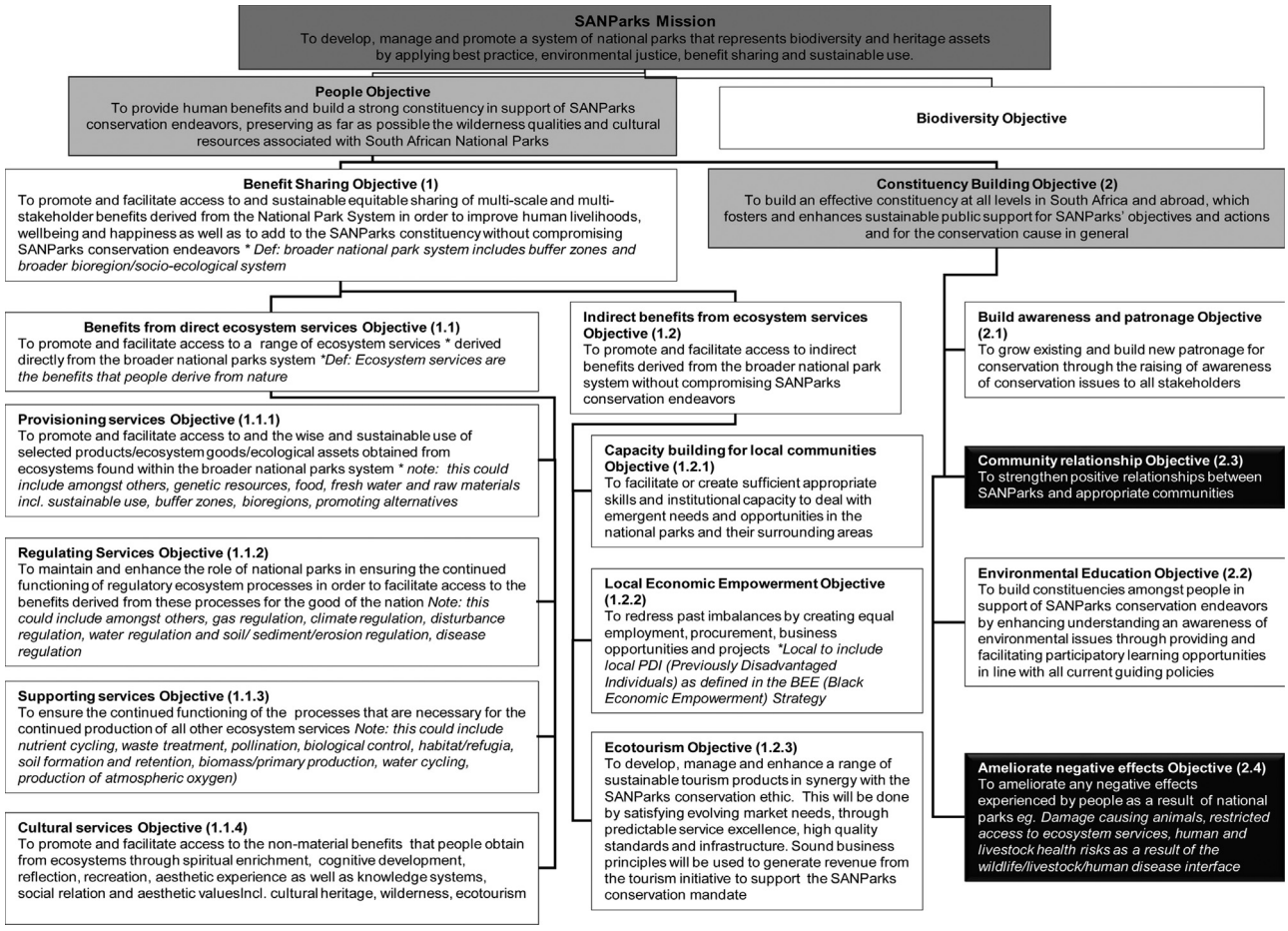

Fig. 1. Diagrammatic representation of high level management objectives for the people component of SANParks mandate. (Adapted from Swemmer & Taljaard, 2011).

embarking on a new, and more inclusive and participatory process to monitor and evaluate its 'people' objectives in general, and more specifically its wildlife damage compensation scheme. In doing so, it hopes to gain a deeper understanding of the socio-ecological system within which KNP is embedded, including how this compensation scheme can be critically evaluated to meet the park's own objectives *and* those of its intended target group(s).

The purpose of this study was to use a participatory approach to develop objectives and associated indicators for use in one component of a broader SAM framework that is being applied in the management of the KNP livestock damage compensation scheme. The following research questions served as the primary avenues of investigation for the study:

a How can the relevant constituency building objectives related to HWC be elaborated upon as the basis for applying SAM in the context of compensation for livestock damage adjacent to the KNP? What indicators might be used to measure them?
b What are the goals and objectives of local communities living outside the KNP regarding the compensation scheme? According to these stakeholders, what indicators would be appropriate to measure these identified objectives?

4. Methods

Qualitative and quantitative data were collected using a multi-method approach including analysis of archival records, participant observation, informal and semi-structured interviews, and focus groups between May 2013 and May 2014.

4.1. Archival research

A wide review of human–wildlife conflict and compensation programs was conducted from published and grey literature, in part to identify relevant indicators for monitoring compensation schemes. In addition, analysis of relevant records pertaining to the DCA problem at KNP was carried out. These documents include: legal and policy documents of relevant provincial and federal bodies, as well as KNP and SANParks, concerning DCAs; provincial department and SANParks annual reports; community fora (consisting of KNP, provincial government and villages representatives) monthly meeting minutes, particularly as they pertain to DCA issues and/or compensation; and meeting minutes and reports of compensation scheme negotiations between SANParks and livestock farmers representatives.

4.2. Participant observation

Participation in meetings of various entities took place, including the DCA Task Team (representing mostly livestock farmers), community fora that liaise with the KNP (Hlanganani, Phalaborwa, Lubambiswano), and a Special Meeting called by KNP/SANParks to publicly announce the new DCA Compensation Scheme (Skukuza; 27 November 2013).

4.3. Interviews

Over 100 informal and semi-structured interviews were conducted with key informants including KNP/SANParks staff, Limpopo Department of Economic Development, Environment and Tourism (LEDET), Mpumalanga Tourism and Parks Agency (MTPA), community leaders, Traditional Authorities, community fora representatives, and livestock farmers adjacent to the park. These took place in both individual and group settings.

4.4. Focus groups

As recommended by Jeffery et al. (2006), focus groups in a workshop format were conducted to identify both KNP and community-based goals, objectives and indicators for the compensation scheme. These were conducted in March–April 2014, including one with KNP staff, and four with community members from surrounding villages (Fig. 2). These utilized a 'logic model' framework (W.K. Kellogg Foundation, 2004) to identify goals, objectives, and potential indicators[1] for the compensation scheme within the various groups represented. Indicators were notated as either *quantitative* measures (Qn), *qualitative* measures (Ql) or both quantitative and qualitative measures (Qn,Ql). Finally, proposed partners, methods, and frequency of monitoring and evaluation were elicited from focus group participants (Appendices I–V, Supplementary material).

In order to gain multiple perspectives from the large potential pool of livestock farmers living in the two provinces adjacent to the KNP (Limpopo and Mpumalanga), the 45 participants [9–13/workshop; 36 male (80%); 9 female (20%) mean age = 48.6; min = 25; max = 89] comprised mostly livestock farmers (96%) who resided in 34 villages represented in four of the seven KNP community forum areas and covered four language groups [Makuya (Venda), Hlanganani (XiTsonga), Phalaborwa (XiTsonga, Pedi), Lubambiswano (SiSwati)]. The KNP focus group was attended by staff (4) from both the 'Scientific Services' and 'Management' branches of the organization, and followed the same logic model framework as the community workshops. However, revision of the workshop results for the KNP group (plus an additional staff member) was granted to allow for refining various components of the model, particularly the articulation of potential indicators. All participants were briefed on the ethics of the research, and an introduction to the purposes of the workshop. Community workshop participants were provided with lunch, and compensated for travel costs. In addition, translators were remunerated for their assistance during the workshops.

4.5. Ethics protocol

A number of important principles in research ethics were adhered to in this research's protocol, as approved by both the Central European University, and SANParks. These included respect for free and informed consent, respect for privacy and confidentiality (Ritchie & Lewis, 2003).

[1] Attributes of a good indicator are that it is a *direct* and unambiguous measure of change; is *relevant* (measures objectives of the program); *varies* across time, space, groups, and is *sensitive* to change in programs, policy, or projects; is *transparent* and cannot be manipulated to show achievement where none exists; and is *cost-effective* to track (Schreckenberg et al., 2010).

Table 1
Identified objectives and indicators by KNP Workshop participants.

Objective	Indicator(s)
Understanding by livestock farmers of process required to lodge successful claim	• Assessing knowledge of claim verification and process (Qn,Ql) • Ratio of correctly completed claim forms: total forms submitted (Qn)
Efficient and effective damage verification process	• % of HWC Incident Reports satisfactorily completed (Qn) • % of successfully compensated cases compared to number submitted (Qn)
Roles and responsibilities of relevant stakeholders are clearly defined, understood, and implemented.	• Stakeholder roles and responsibilities clearly defined in documentation (Ql) • Number of communication efforts to communicate roles and responsibilities/protocol (Qn) • Accuracy of knowledge regarding roles and responsibilities by stakeholders (Ql) • Number of incidents when roles and/or responsibilities contravened (Qn)
Determination of compensation rates will be fairly reviewed by the appropriate party (Compensation Committee)	• Review of Compensation Committee meeting minutes (Qn,Ql) • Claimants' satisfaction with rates of compensation (Ql)
Ensure viability of sufficient resources (e.g., financial, time, human resource) to implement scheme	• % of attended DCA incidents to reported incidents (Qn) • Adequate budget allocation for Compensation Fund (Qn) • Allocation of appropriate resources for scheme to run smoothly (Ql)
Ensure no net decrease of societal support for conservation as a result of compensation scheme	• Attitudes towards KNP and conservation, due to knowledge of and/or participation in compensation scheme (Qn,Ql)

Note: Qn = *quantitative* measure; Ql = *qualitative* measure.

5. Results

5.1. KNP/SANParks goals, objectives and indicators

5.1.1. Goal

During the course of the KNP focus group (see Appendix I, Supplementary material), one overarching goal was identified by the participants for the compensation scheme, namely to:

> *Ameliorate negative tangible and intangible effects incurred as a result of human–wildlife conflict.*

It was agreed during the workshop discussion that the articulated goal and objectives (below) are KNP-centric, and there was unanimous acknowledgement that some sectors of society bear more negative effects/costs from KNP than others. It was also noted that embedded within this goal was a recognition that part and parcel of 'ameliorating negative effects' is 'building societal support' (and hence, it was not listed as a separate goal). Furthermore, it was noted that the wildlife damage compensation scheme was only one of a number of measures identified to effectively manage human–wildlife conflict in KNP.

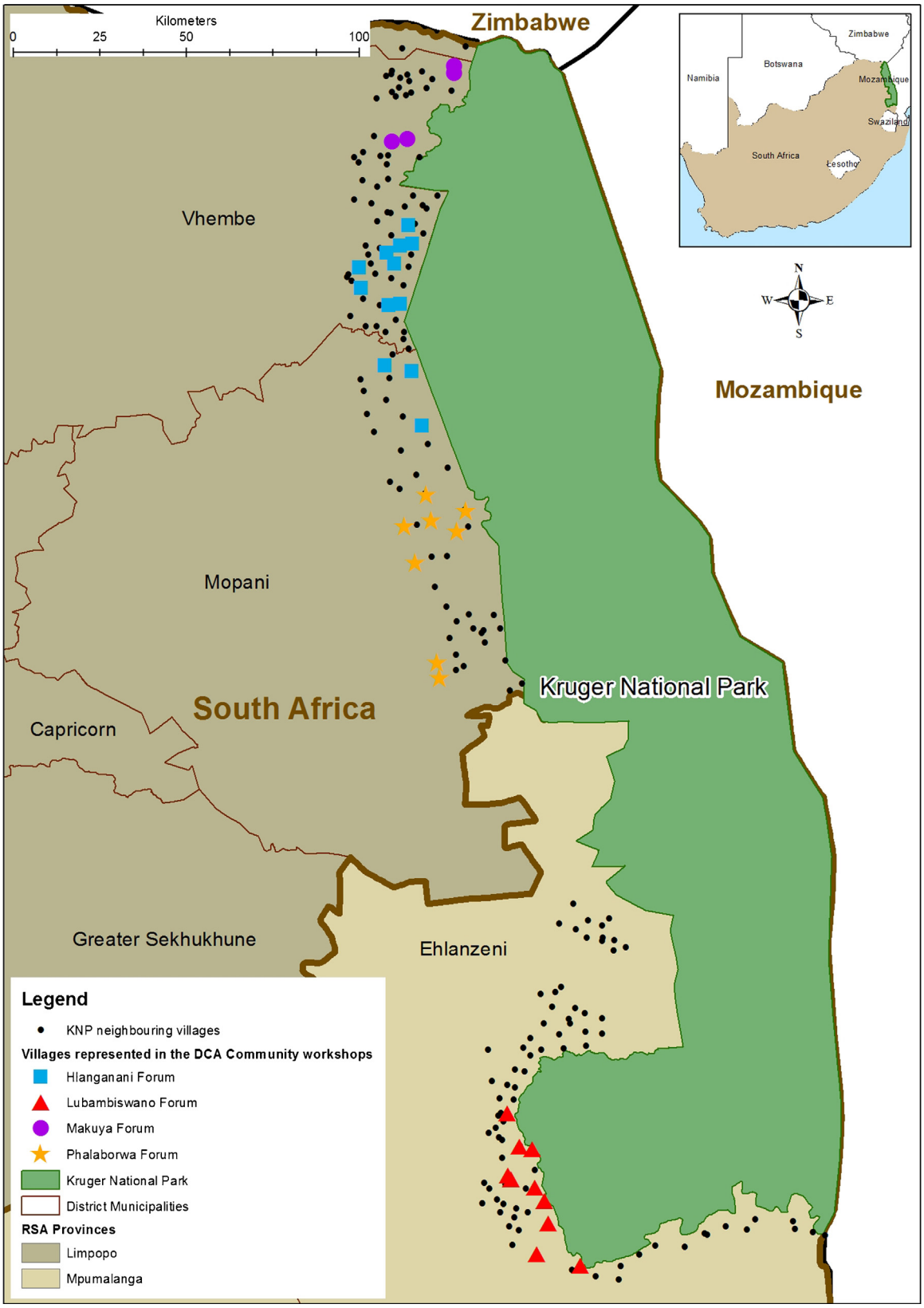

Fig. 2. Villages adjacent to KNP including those represented in study focus groups. Inset: KNP in southern Africa.

5.1.2. Objectives and indicators:

The KNP participants identified 6 objectives and 14 indicators associated to the goal identified (Table 1).

5.2. Local community goals, objectives and indicators

The various goals, objectives and indicators elucidated from the four workshops held with local community representatives

(Appendices II–V, Supplementary material) were ranked according to their frequency and prioritization in each workshop, and then consolidated for reporting purposes.

5.2.1. Goals

The community workshops participants identified five goals (prioritized below), which they perceived to be the most important potential future outcomes of the compensation process, namely:

[5.]

1. All DCA damage fairly compensated in culturally-relevant fashion.
2. Continual and effective minimization of DCA problem.
3. Apply community-based measures to mitigate human–wildlife conflict.
4. Improve relationships between stakeholders.
5. Eliminate human injury as a result of human–wildlife conflict.

A number of observations surfaced within the community workshops that are noteworthy. First, it was made emphatically clear at all four workshops that compensation for damage caused by DCAs should not be restricted to livestock losses only, nor only apply to DCAs that originate from KNP alone, but rather that compensation be extended to include DCAs from other areas (e.g., private reserves, provincial reserves) and to cover crop loss, property damage, and even human injury/death. Second, as in the KNP workshop, it was believed by most participants that compensation is worthwhile and necessary in this context, based on the history of the relationship between KNP and its neighboring communities, and that '*apology without compensation is just lip service*'. At the same time it was evident that, whilst important, simply paying compensation for livestock losses is insufficient in and of itself to reduce conflict and meet community goals in this regard. What emerged as of equal importance were culturally-relevant norms of conflict resolution, including that payment amounts should be determined by mutual understanding, and the payment be accompanied by an apology and an admission of responsibility/guilt. Third, in order to '*maintain harmony between KNP and communities*', a genuine effort needs to be made to minimize DCA incidents in the future. As one participant stated, '*acting responsibly is more important than the compensation*' and that '*if nothing is done to keep animals in KNP, even compensation with an apology will begin to lose its sincerity*'. It was observed on a number of occasions that even if compensation continued to be paid, failing to make a genuine effort to reduce the DCAs from exiting the KNP would be met with retaliatory action, i.e., killing the DCA. Finally, the majority of workshop participants acknowledged their own responsibility in mitigating human–wildlife conflict, both in terms of improved crop/animal husbandry practices, reducing illegal practices, and in maintaining the fence. Each of these aspects is further reflected in the objectives and indicators articulated by the groups.

5.2.2. Objectives and indicators

Due to the number of community workshops conducted and the overlapping nature of many goals and objectives, the results shown here have been consolidated from each of the workshops. In total, 11 objectives with 55 associated indicators were identified by the workshop participants (Table 2). Similar to the KNP workshop results, the objectives are shown with associated indicators and a notation as to whether the indicator is quantitative, qualitative, or both.

5.3. Other factors

In addition to the host of internally-derived indicators from the five workshops, relevant literature and interviews revealed a number of others that may be potentially useful (Table 3).

Table 2
Identified objectives and indicators by Community Workshop participants.

Objective	Indicator(s)
Improve understanding and communication between and within stakeholder groups concerning HWC	• Number of responses from KNP to visit village when invited (Qn,Ql) • Roles/responsibilities clearly defined & executed (Ql) • Number of meetings where all stakeholders attend (Qn) • Number of households who received info (Qn) • Number of persons injured/killed by DCAs (Qn)
Negotiate, establish and revise compensation rates in fair, culturally- and institutionally-relevant manner	• Elected person(s) confirm negotiated rates (Qn,Ql) • All parties sign Memorandum of Understanding that has been thoroughly unpacked/scrutinized (Ql) • Awareness level of fair market value (Qn) • Availability of 3rd party to decide price (Qn) • Regular publishing of rates by e.g., abattoirs (Qn)
Compensation to be accompanied with sincere apology and/or admission of responsibility	• % of compensation claims delivered in person (Qn) • Ratio of claims compensated to those submitted (Qn) • Letter of apology accompanies response for both valid and invalid claims (Qn,Ql) • Number of potentially affected parties informed at program onset of what to expect if DCA damage occurs (Qn)
Claims process should be adequately communicated and understood	• % of farmers who know whom to contact if DCA damage occurs (Qn) • Availability of contact person (Qn,Ql) • Number of DCA incidents reported to correct party (Qn) • % of correctly completed forms (Qn) • % of community members who know of claim process (Qn)
Verification and claims process should be timely, effective, and efficient	• Evidence protected & collected within 24 h (Qn,Ql) • Qualified investigators cooperate with herders (Ql) • Comparing village/KNP/provincial government records to determine number of cases claimed to those that occurred (Qn) • Time taken between report and investigation (Qn) • Tracking, shooting, capturing ability of investigator (Qn,Ql) • Quality of HWC reports by provincial rangers (Qn,Ql) • Qualified provincial or KNP ranger(s) respond (Ql) • Time taken between claim submission and payment (Qn)
Control of DCAs outside KNP timely and effective	• Time of report to time of control (Qn) • % of DCA outbreaks that result in damage (Qn)

Table 2 (*Continued*)

Objective	Indicator(s)
Improve community-based practices to minimize HWC	• Number of DCA outbreaks/time (Qn) • % of cattle in kraals at night (Qn) • Education/awareness of farmers on benefits of good practices (by responsible party) (Qn,Ql) • Number of grazing camps fenced (Qn) • Proximity of cattle & buffalo (Qn) • Number of municipalities with by-laws for kraaling (Qn) • Number of offences/time for not kraaling (Qn) • Proximity of KNP fence to community (Qn)
KNP border fence adequately upgraded and maintained by responsible personnel	• Number of DCA damage incidents (Qn) • Budget for fence upgrade/maintenance (Qn) • Number of DCA outbreaks (Qn) • Adequate KNP fencing (%, km) (Qn) • % of locally employed fence workers (Qn) • Number of skilled fence workers/village (Qn) • Causes of fence damage (Qn,Ql) • Number of patrollers (Qn) • Time spent patrolling (Qn) • Number of field rangers employed (Qn)
Illegal activities eliminated	• Number of fence vandalism events (Qn) • Number of poachers/poaching incidents (Qn)
Land use planning improved to mitigate HWC	• Number of cases of corridor disease (form of theileriosis) (Qn) • Number of DCA outbreaks (Qn) • Kilometers of buffer created (Qn) • Amount of good land for grazing outside KNP (Qn,Ql)
Improve medical care for humans injured as a result of HWC	• Time taken to respond (Qn) • Injuries leading to death, where death could have been prevented (Qn,Ql)

Note: Qn = *quantitative* measure; Ql = *qualitative* measure.

5.4. Indicator consolidation

In total, 88 indicators were identified in this research (Table 4). In cases where duplicates were discovered (even if intended to measure different objectives), these were consolidated, resulting in a final total of 76. These consist of 42 quantitative measures, 15 qualitative measures, and 19 mixed measures. These indicators may be further consolidated, at the discretion of the relevant partners, into groupings for multiple purposes, including:

1. to target particular sources of information: e.g., indicators 2, 4, 9, 26, 27, 34, 37, 39, 40, and 41 could all be measured when reviewing correspondence between claimants and the DCA Compensation Committee (e.g., Claim Forms, response letters to claimants);
2. when considering methodological tools: e.g., indicators 1, 10, 14, 18, 28–30, 33, 36, 45–47, 67, 70–76, 78, 79, 81, and 82 would be worthwhile variables to consider based on the administration of a face-to-face community survey in participating villages; and
3. by focusing on institutions responsible for monitoring: e.g., indicators 44, 53–55, 58–60, 62 and 65 were all identified as primarily involving the Department of Veterinary Services.

A wide variety of actors, methods and monitoring schedules were identified by workshop participants to be best suited for any proposed M&E activities concerning human–wildlife conflict,

Table 3
Potential indicators identified in literature and/or through interviews.

Indicator	Source(s)
Socio-demographic	
Religious affiliation (Qn)	Dickman (2010), Hazzah et al. (2009) and Manfredo & Dayer (2004)
Ethnicity & cultural beliefs (Qn,Ql)	Anthony et al. (2010), Chardonnet et al. (2010), Dickman (2010), Hazzah et al. (2014), Lindsey et al. (2013), Manfredo & Dayer (2004), McGregor (2005), Skogen (2003) interviews
Social group (Qn,Ql)	Boissière et al. (2014), Manfredo & Dayer (2004), Ogra & Badola (2008), Romanach, Lindsey, and Woodroffe (2007); Thorn, Green, Dalerum, Bateman, and Scott (2012), Treves & Bruskotter (2014); interviews
Household income (Qn)	Dickman, Macdonald, and Macdonald (2011) and Ogra & Badola (2008)
Gender (Qn,Ql)	DeMotts & Hoon (2012), Kaltenborn, Bjerke, and Nyahongo (2006) and Ogra & Badola (2008)
Age (Qn)	Lindsey et al. (2013)
Level of education (Qn)	Agarwala et al. (2010) and Dickman (2010)
Livelihood	
Agricultural expansion (Qn)	Bulte & Rondeau (2005, 2007)
Choice to own livestock (Ql)	Anthony et al. (2010); interviews
Purpose for keeping livestock (Ql)	Hazzah et al. (2009)
Coping mechanisms (Ql)	Catley et al. (2007), Hill (2004) and Treves et al. (2006)
Experiential	
Personal experience with DCAs (Ql)	Anthony (2007), Anthony et al. (2010), Barua, Bhagwat, and Sushrut (2013), Hazzah et al. (2009), Lindsey et al. (2013), McGregor (2005), interviews
Perceived risk of DCAs (Ql)	Chardonnet et al. (2010), Decker et al. (2002), Dickman (2010), Hill (2004), Hazzah et al. (2009) and Kaltenborn et al. (2006)
Behavioural	
Level of retaliatory killing/habitat destruction (Qn,Ql)	Anthony (2006), Boitani et al. (2010), Chardonnet et al. (2010), Kahler et al. (2012), Mishra et al. (2003), Ogada, Woodroffe, Oguge, and Frank (2003), interviews
Reporting of illegal activity (Qn,Ql)	Anthony (2006) and interviews
Resistance to conservation (e.g., rhino campaign) (Ql)	Holmes (2013) and interviews
Institutional	
Level of internal strife/conflict as a result of decisions regarding compensation scheme (Ql)	Interviews
Improved interaction between stakeholders and institutions (Ql)	Interviews
Improved social learning (Ql)	Stringer et al. (2006) and interviews

Note: Qn = *quantitative* measure; Ql = *qualitative* measure.

Table 4
Indicators identified in study.

No.	Indicator	Measure	Duplicate(s)
KNP Workshop			
1	Assessing knowledge of claim verification and process	Qn,Ql	18,28,33
2	Ratio of correctly completed claim forms: total forms submitted	Qn	26
3	% of HWC Incident Reports satisfactorily completed	Qn	32
4	% of successfully compensated cases compared to number submitted	Qn	
5	Stakeholder roles and responsibilities clearly defined in documentation	Ql	16
6	Number of communication efforts to communicate roles and responsibilities/protocol	Qn	
7	Accuracy of knowledge regarding roles and responsibilities by stakeholders	Ql	
8	Number of incidents when roles and/or responsibilities contravened	Qn	
9	Review of Compensation Committee meeting minutes	Qn,Ql	
10	Claimants' satisfaction with rates of compensation	Ql	
11	% of attended DCA incidents to reported incidents	Qn	
12	Adequate budget allocation for Compensation Fund	Qn	
13	Allocation of appropriate resources for scheme to run smoothly	Ql	
14	Attitudes towards KNP and conservation, due to knowledge of and/or participation in compensation scheme	Qn,Ql	
Community Workshops			
15	Number of responses from KNP to visit village when invited	Qn,Ql	
16	Roles/responsibilities clearly defined & executed	Ql	5
17	Number of meetings where all stakeholders attend	Qn	
18	Number of households who received info	Qn	1,28,33
19	Number of persons injured/killed by DCAs	Qn	
20	Elected person(s) confirm negotiated rates	Qn,Ql	
21	All parties sign Memorandum of Understanding that has been thoroughly unpacked/scrutinized	Ql	
22	Awareness level of fair market value	Qn	
23	Availability of 3rd party to decide price	Qn	
24	Regular publishing of rates by e.g., abattoirs	Qn	
25	% of compensation claims delivered in person	Qn	
26	Ratio of claims compensated to those submitted	Qn	2
27	Letter of apology accompanies response for both valid and invalid claims	Qn,Ql	
28	Number of potentially affected parties informed at program onset of what to expect if DCA damage occurs	Qn	1,18,33
29	% of farmers who know whom to contact if DCAs damage occurs	Qn	
30	Availability of contact person	Qn,Ql	
31	Number of DCA incidents reported to correct party	Qn	52
32	% of correctly completed forms	Qn	3
33	% of community members who know of claim process	Qn	1,18,28
34	Evidence protected & collected within 24 h	Qn,Ql	
35	Qualified investigators cooperate with herders	Ql	40
36	Comparing village/KNP/provincial government records to determine number of cases claimed to those that occurred	Qn	
37	Time taken between report and investigation	Qn	42,68
38	Tracking, shooting, capturing ability of investigator	Qn,Ql	
39	Quality of HWC reports by provincial rangers	Qn,Ql	
40	Qualified provincial or KNP ranger(s) respond	Ql	35
41	Time taken between claim submission and payment	Qn	
42	Time of report to time of control	Qn	37,68
43	% of DCA outbreaks that result in damage	Qn	
44	Number of DCA outbreaks/time	Qn	54,65
45	% of cattle in kraals at night	Qn	
46	Education/awareness of farmers on benefits of good practices (by responsible party)	Qn,Ql	
47	Number of grazing camps fenced	Qn	
48	Proximity of cattle & buffalo	Qn	
49	Number of municipalities with by-laws for kraaling	Qn	
50	Number of offences/time for not kraaling	Qn	
51	Proximity of KNP fence to community	Qn	
52	Number of DCA damage incidents	Qn	31
53	Budget for fence upgrade/maintenance	Qn	
54	Number of DCA outbreaks	Qn	44,65
55	Adequate KNP fencing (%, km)	Qn	
56	% of locally employed fence workers	Qn	
57	Number of skilled fence workers/village	Qn	
58	Causes of fence damage	Qn,Ql	
59	Number of patrollers	Qn	
60	Time spent patrolling	Qn	
61	Number of field rangers employed	Qn	
62	Number of fence vandalism events	Qn	
63	Number of poachers/poaching incidents	Qn	
64	Number of cases of corridor disease	Qn	
65	Number of DCA outbreaks	Qn	44,54
66	Kilometers of buffer created	Qn	
67	Amount of good land for grazing outside KNP	Qn,Ql	
68	Time taken to respond	Qn	37,42
69	Injuries leading to death, where death could have been prevented	Qn,Ql	

Table 4 (*Continued*)

No.	Indicator	Measure	Duplicate(s)
Interviews and/or literature			
70	Religious affiliation	Qn	
71	Ethnicity & cultural beliefs	Qn,Ql	
72	Social group	Qn,Ql	
73	Household income	Qn	
74	Gender	Qn,Ql	
75	Age	Qn	
76	Level of education	Qn	
77	Agricultural expansion	Qn	
78	Choice to own livestock	Ql	
79	Purpose for keeping livestock	Ql	
80	Coping mechanisms	Ql	
81	Personal experience with DCAs	Ql	
82	Perceived risk of DCAs	Ql	
83	Level of retaliatory killing/habitat destruction	Qn,Ql	
84	Reporting of illegal activity	Qn,Ql	
85	Resistance to conservation (e.g., rhino campaign)	Ql	
86	Level of internal strife/conflict as a result of decisions regarding compensation scheme	Ql	
87	Improved interaction between stakeholders and institutions	Ql	
88	Improved social learning	Ql	

and particularly the damage compensation scheme (Appendices I–V, Supplementary material). Potential partners include traditional/tribal authorities, provincial conservation agencies, KNP, community fora, livestock farmer associations, and independent researchers. Suggested methods to be utilized include community surveys, participant observation, document analysis, and statistical measures, ranging from daily to annual timelines.

6. Discussion

Within inclusionary approaches to monitoring and evaluation, such as PM&E, local stakeholders not only define the methodology, but also contribute to the actual monitoring using their own internally-derived indicators, adapted for their particular area and purpose. Theoretically, this approach should work well, especially in the long-term, but requires more research, a relatively high level of input from experts in the preliminary stages, and a clear definition of how the M&E system is to evolve (Niemela et al., 2005). For example, local people do not always understand the concept of monitoring and evaluation, and by extension, the benefits they could receive. The same can be said of various people and departments within the same organization (Wahlén, 2014). Thus, developing a comprehensive framework of long-term participatory monitoring, ensuring local interest, and offering incentives are key issues to be addressed. This research is one of the first steps towards that end, but parties would be wise to note that *substantial and sustained resources and capacity building will be required to design, launch and implement a PM&E system within KNP's strategic adaptive management framework*. During the course of the research, a number of challenges to implementing such an inclusionary approach were identified including cost, institutional barriers, different institutional logics towards M&E, capacity and differing priorities of stakeholders (Rist et al., 2013; Scheepers et al., 2011; Wahlén, 2014). Exacerbating these challenges, in some cases, was a moderate level of distrust between individuals within and across various institutions, including doubt by some community representatives that KNP would involve them in such a PM&E program. As one community workshop participant highlighted, '*If it* [the monitoring scheme] *is taken seriously by KNP, this will be a huge benefit for the communities*'. Working diligently to confront these challenges, and mending these relationships, should be a priority.

Overcoming these challenges towards a successful PM&E process necessitates *effective self-mobilization and engagement between the KNP/SANParks and its neighboring communities*. Emerson et al. (2009) demonstrated that such engagement is vital to not only reaching agreement, but is also a major contributor to the quality of agreement, and improved working relationships among parties. By effectively engaging with these, and other relevant actors, the first step towards a successful PM&E process will have been realized (Fig. 3).

Despite the substantially growing recognition of the benefits of more inclusive M&E systems, it is also being demonstrated that such systems can be challenging to design, implement, and integrate into an adaptive management framework. These challenges include increased expenditures in terms of time, financial and other resources (Fabricius & Cundill, 2014; Rist et al., 2013). It also encourages people to examine their assumptions about what constitutes success, and to confront the contradictions and conflicts that can emerge, as PM&E is focused on both the positive and negative impacts that matter most to *all* stakeholders (Guijt & Gaventa, 1998; Richie, Oppenheimer, & Clark, 2012). In some instances, it may also lead to a reshaping of the intervention itself, and an effort to gain more control over resources by local communities (Funder, Danielsen, Ngaga, Nielsen, & Poulsen, 2013). In bringing together people's various ways of looking at the world, PM&E challenges established notions of what constitutes rigorous data collection and analysis. Conventional concepts of validity and reliability of data are being questioned as methods are combined in new ways and 'experts' interact more with relevant stakeholders. This may be particularly challenging for determining attribution and assessment of intangible impacts. Consequently, adopting PM&E requires the acceptance of new, less rigid, standards of credibility of information, and an appreciation of when information is 'good enough' for the task at hand - rather than being perfect (Danielsen et al., 2005, 2009; Guijt & Gaventa, 1998). Finally, an additional challenge lies in that PM&E acknowledges that the *process* by which decisions are reached in M&E plays a critical role in shaping impressions of, and compliance with, those decisions. A decision reached by an unsatisfactory process may leave many stakeholders disappointed. A satisfactory process, on the other hand, can increase the acceptability of a basically good decision (Decker et al., 2002).

We advocate using a framework, such as the one presented in Fig. 3, to guide the PM&E process, which is based on four broad principles (Guijt & Gaventa, 1998):

1. **Participation** – this means continuing to solicit the perspectives of those most directly affected (e.g., livestock farmers) to the design of the process and the co-analysis of the data. It also requires an agreed definition of the problem which, as this study has uncovered, is multi-faceted. Problem definitions that fail to

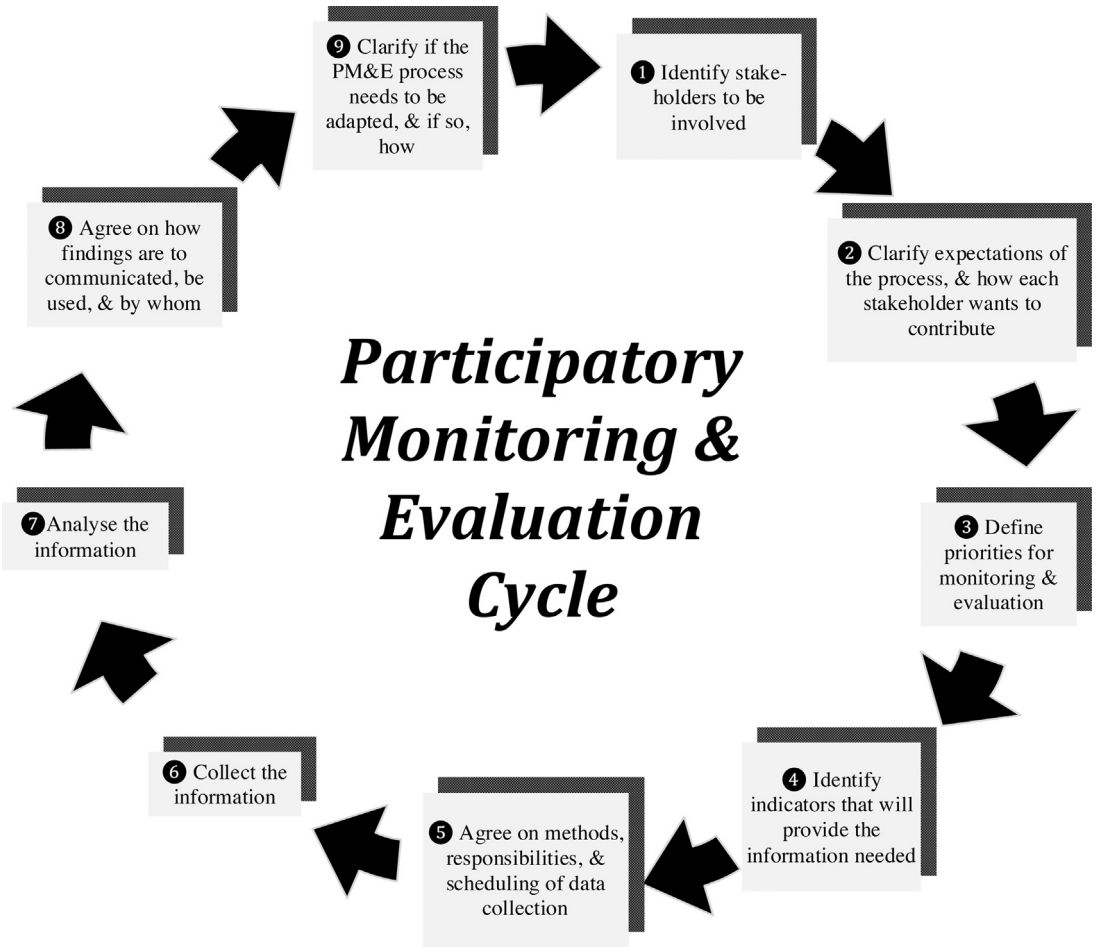

Fig. 3. The Participatory Monitoring & Evaluation Cycle.

(Adapted from Guijt & Gaventa, 1998).

appreciate the historical, socio-economic, organizational, and political contexts can lead to faltering M&E programs because they are inadequate to clarify goals, generate practical alternatives, and to justify the goals and the selected alternative to the broader public and to decision and policy makers. The problem definition must go beyond unilaterally describing an undesirable state or more desirable alternative, but be a shared exercise, including co-defining the steps necessary to achieve the desired state(s), and indicate if the problem is even worth solving (Clark et al., 1996).

2. The inclusiveness of PM&E also requires a good deal of **negotiation** to reach agreement about (i) what is the goal of the monitoring to be undertaken, (ii) what will be monitored or evaluated, (iii) how and when data will be collected and analyzed (e.g., by initiating the development of 'participatory statistics'; see Holland, 2013), (iv) what the data actually means (addressing aforementioned challenges of attribution and measuring intangible impacts), (v) how findings will be communicated to managers, decision makers and the public, and (vi) what action will be taken (Boissière, Bastide, Basuki, Pfund, & Boucard, 2014). Furthermore, stakeholders' view on success may depend on whether they consider the participatory activity as an end in itself or as a means to an end, or both.
3. The two previous steps should facilitate **co-learning** throughout, which becomes the basis for subsequent improvement and corrective action.
4. Lastly, since the number, role, and skills of stakeholders, the external environment, and other factors change over time, **adaptability** is essential for dealing with the complexity of such PM&E systems.

7. Conclusions

We are cognizant that research itself can be politicized because the things one measures, how one frames questions, and how one interprets the results, may favor one stakeholder over another. Doolittle (2003) extends this idea to highlight that some stakeholders will often use 'outsiders' to legitimize their claims over contested resources. This can become a serious problem if the resulting information is misused or misleading (Lund, 2014). This became evident during this current research, as some community research participants were at first hesitant in sharing information, claiming that they had no assurance that KNP would not use the findings 'just for their own purposes'. Thus, we must continue to remain impartial as an honest broker of information and willingly 'relinquish control over the outcome of negotiations between stakeholders' (Treves, Wallace, Naughton-Treves, & Morales, 2006). It is our recommendation that in similar contexts where institutions are considering PM&E frameworks, *genuine good will and foresight will guide the process, and both research and findings will be utilized by relevant parties for positive and complementary, rather than competitive, purposes.*

The results and discussion presented in this paper provide suggestions on the first stage of setting up a PM&E system for livestock compensation in the Kruger National Park. Internalization and subsequent implementation of components from this process will

take more time, and will be the responsibility of all stakeholders involved. Noteworthy is that almost two decades of applying SAM in SANParks has demonstrated that social and political drivers can derail management processes no matter how well designed, and researched the processes may be (Cundill, Cumming, Biggs, & Fabricius, 2011). In the context of benefit sharing and DCA management, treating stakeholders with dignity and respect and acknowledging and managing for various power relationships play a critical role in the successful implementation of SAM (Swemmer et al., 2015). Stakeholders working together on both challenges and solutions facilitates a culture of co-learning, which is far more conducive to developing real partnerships where all stakeholders feel and have legitimacy.

Acknowledgements

This study was funded through a Central European University RSS Type-1 grant (Ref: OTHERENS0411). We wish to thank KNP/SANParks and SAEON (Phalaborwa) for in-kind support. In particular, we are grateful for KNP/SANParks personnel, Scientific Services GIS Lab members of the Livestock Farmer's DCA Task Team, LEDET, MTPA, Office of the Public Protector, and SANDF for their willingness to share valuable insights. Additionally, we extend appreciation to members of the Hlanganani, Phalaborwa, and Lubambiswano Community Forums for allowing us to attend their meetings, and Traditional Authorities and community members who shared their time and experiences. Finally, we thank Chantelle Mashele, David Mapophe, Edward Siphuga, and Elmon Mthombothi for translation at the community workshops, and two anonymous reviewers for insightful comments on an earlier draft.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.jnc.2015.05.004

References

Agarwala, M., Kumar, S., Treves, A., & Naughton-Treves, L. (2010). Paying for wolves in Solapur, India and Wisconsin, USA: Comparing compensation rules and practice to understand the goals and politics of wolf conservation. *Biological Conservation*, *143*(12), 2945–2955.

Anthony, B. P. (2006). *A view from the other side of the fence: Tsonga communities and the Kruger National Park, South Africa*. Dissertation, Budapest: Central European University.

Anthony, B. P. (2007). The dual nature of parks: Attitudes of neighboring communities towards Kruger National Park, South Africa. *Environmental Conservation*, *34*(3), 236–245.

Anthony, B., & Moldovan, D. (2008). Poised for engagement? Local communities and Macin Mountains National Park, Romania. *The International Journal of Biodiversity Science and Management*, *4*, 230–241.

Anthony, B. P., Scott, P., & Antypas, A. (2010). Sitting on the fence? Policies and practices in managing human–wildlife conflict in Limpopo Province, South Africa. *Conservation & Society*, *8*(3), 225–240.

Anthony, B. P., & Szabo, A. (2011). Protected areas: Conservation cornerstones or paradoxes? Insights from human–wildlife conflicts in Africa and Southeastern Europe. In J. López-Pujol (Ed.), *The Importance of biological interactions in the study of biodiversity* (pp. 255–282). Rijeka, Croatia: InTech.

Anthony, B. P., & Wasambo, J. (2009). *Human–wildlife conflict study report: Vwaza Marsh Wildlife Reserve, Malawi*. Central European University: Prepared for Malawi Department of National Parks and Wildlife. Budapest.

Barua, M., Bhagwat, S. A., & Sushrut, J. (2013). The hidden dimensions of human–wildlife conflict: Health impacts, opportunity and transaction costs. *Biological Conservation*, *157*, 309–316.

Baruch-Mordo, S., Breck, S. W., Wilson, K. R., & Broderick, J. (2009). A tool box half full: How social science can help solve human–wildlife conflict. *Human Dimensions of Wildlife*, *14*(3), 219–223.

Biggs, H., Ferreira, S., Freitag-Ronaldson, S., & Grant-Biggs, R. (2011). Taking stock after a decade: Does the 'thresholds of potential concern' concept need a socio-ecological revamp? *Koedoe*, *53*(2) http://dx.doi.org/10.4102/koedoe.v53i2.1002. Art. #1002, 9 pages

Biggs, H. C., & Rogers, K. H. (2003). An adaptive system to link science, monitoring and management in practice. In J. T. du Toit, K. H. Rogers, & H. C. Biggs (Eds.), *The Kruger experience: Ecology and management of savanna heterogeneity* (pp. 59–80). Washington DC: Island Press.

Boissière, M., Bastide, F., Basuki, I., Pfund, J. L., & Boucard, A. (2014). Can we make participatory NTFP monitoring work? Lessons learnt from the development of a multi-stakeholder system in Northern Laos. *Biodiversity and Conservation*, *23*(1), 149–170.

Boitani, L., Ciucci, P., & Raganella-Pelliccioni, E. (2010). Ex-post compensation payments for wolf predation on livestock in Italy: A tool for conservation. *Wildlife Research*, *37*(8), 722–730.

Braack, L. E. O. (2000). *Kruger National Park* (2nd ed). London: New Holland.

Brahmbhatt, D. P., Fosgate, G. T., Dyason, E., Budke, C. M., Gummow, B., Jori, F., et al. (2012). Contacts between domestic livestock and wildlife at the Kruger National Park interface of the Republic of South Africa. *Preventive Veterinary Medicine*, *103*(1), 16–21.

Bulte, E. H., & Rondeau, D. (2005). Why compensating wildlife damages may be bad for conservation. *Journal of Wildlife Management*, *69*(1), 14–19.

Bulte, E. H., & Rondeau, D. (2007). Compensation for wildlife damages: Habitat conversion, species preservation and local welfare. *Journal of Environmental Economics and Management*, *54*, 311–322.

Carruthers, J. (1995). *The Kruger National Park: A social and political history*. Pietermaritzburg. RSA: University of Natal Press.

Catley, A., Burns, J., Abebe, D., & Suji, O. (2007). *Participatory impact assessment: A guide for practitioners*. Medford, MA: Feinstein International Center, Tufts University.

Chaminuka, P., McCrindle, C. M. E., & Udo, H. M. J. (2012). Cattle farming at the wildlife/livestock interface: Assessment of costs and benefits adjacent to Kruger National Park, South Africa. *Society & Natural Resources*, *25*(3), 235–250.

Chardonnet, P., Soto, B., Fritz, H., Crosmary, W., Drouet-Hoguet, N., Mesochina, P., et al. (2010). *Managing the conflicts between people and lion: Review and insights from the literature and field experience*. FAO: Wildlife Management Working Paper 13. Rome.

Chase, L. C., Decker, D. J., & Lauber, T. B. (2004). Public participation in wildlife management: What do stakeholders want. *Society & Natural Resources*, *17*(7), 629–639.

Cheldelin, S., Druckman, D., & Fast, L. (2003). *Conflict: From analysis to intervention*. London: Continuum.

Clark, T. W., Curlee, A. P., & Reading, R. P. (1996). Crafting effective solutions to the large carnivore conservation problem. *Conservation Biology*, *10*(4), 940–948.

Cock, J., & Fig, D. (2000). From colonial to community based conservation: Environmental justice and the national parks in South Africa. *Society in Transition*, *31*(1), 22–35.

Crawshaw, P. G., Jr. (2004). Depredation of domestic animals by large cats in Brazil. *Human Dimensions of Wildlife*, *9*(4), 329–330.

Cundill, G., Cumming, G. S., Biggs, D., & Fabricius, C. (2011). Soft systems thinking and social learning for adaptive management. *Conservation Biology*, *26*(1), 13–20.

Danielsen, F., Burgess, N., & Balmford, A. (2005). Monitoring matters: Examining the potential of locally-based approaches. *Biodiversity and Conservation*, *14*, 2507–2542.

Danielsen, F., Burgess, N., Balmford, A., Donald, P. F., Funder, M., Jones, J. P., et al. (2009). Local participation in natural resource monitoring: A characterization of approaches. *Conservation Biology*, *23*(1), 31–42.

de Boer, W. F., & Baquete, D. S. (1998). Natural resource use, crop damage and attitudes of rural people in the vicinity of the Maputo Elephant Reserve, Mozambique. *Environmental Conservation*, *25*(3), 208–218.

Decker, D. J., Lauber, T. B., & Siemer, W. F. (2002). *Human–wildlife conflict management*. Ithaca. NY: Northeast Wildlife Damage Management Research and Outreach Cooperative.

DeMotts, R., & Hoon, P. (2012). Whose elephants? Conserving, compensating, and competing in northern Botswana. *Society & Natural Resources*, *25*(9), 837–851.

Dickman, A. J. (2010). Complexities of conflict: The importance of considering social factors for effectively resolving human–wildlife conflict. *Animal Conservation*, *13*(5), 458–466.

Dickman, A. J., Macdonald, E. A., & Macdonald, D. W. (2011). A review of financial instruments to pay for predator conservation and encourage human–carnivore coexistence. *Proceedings of the National Academy of Sciences*, *108*(34), 13937–13944.

Doolittle, A. (2003). Finding a new direction during a participatory community mapping project. *Tropical Resources*, *22*, 74–78.

Emerson, K., Orr, P. J., Keyes, D. L., & McKnight, K. M. (2009). Environmental conflict resolution: Evaluating performance outcomes and contributing factors. *Conflict Resolution Quarterly*, *27*(1), 27–64.

Enserink, M., & Vogel, G. (2006). The carnivore comeback. *Science*, *314*(5800), 746–749.

Fabricius, C., & Cundill, G. (2014). Learning in adaptive management: Insights from published practice. *Ecology and Society*, *19*(1), 29. http://dx.doi.org/10.5751/ES-06263-190129

Ferguson, K., & Hanks, J. (2010). *Fencing impacts: A review of the environmental, social and economic impacts of game and veterinary fencing in Africa with particular reference to the Great Limpopo and Kavango-Zambezi Transfrontier Conservation Areas*. Pretoria: Mammal Research Institute, University of Pretoria.

Freitag, S., Biggs, H., & Breen, C. (2014). The spread and maturation of strategic adaptive management within and beyond South African national parks. *Ecology & Society*, *19*(3), 25. http://dx.doi.org/10.5751/ES-06338-190325

Funder, M., Danielsen, F., Ngaga, Y., Nielsen, M. R., & Poulsen, M. K. (2013). Reshaping conservation: The social dynamics of participatory monitoring in

Tanzania's community-managed forests. *Conservation & Society*, *11*(3), 218–232.
Gaylard, A., & Ferreira, S. (2011). Advances and challenges in the implementation of strategic adaptive management beyond the Kruger National Park – Making linkages between science and biodiversity management. *Koedoe*, *53*(2) http://dx.doi.org/10.4102/koedoe.v53i2.1005. Art. #1005
Graham, K., Beckerman, A. P., & Thirgood, S. (2005). Human–predator–prey conflicts: Ecological correlates, prey losses and patterns of management. *Biological Conservation*, *122*, 159–171.
Guijt, I., & Gaventa, J. (1998). *Participatory monitoring & evaluation: Learning from change, no. 12*. Brighton, UK: Institute for Development Studies.
Happold, D. C. D. (1995). The interaction between humans and mammals in Africa in relation to conservation: A review. *Biodiversity and Conservation*, *4*(4), 395–414.
Hazzah, L., Borgerhoff Mulder, M., & Frank, L. (2009). Lions and warriors: Social factors underlying declining African lion populations and the effect of incentive-based management in Kenya. *Biological Conservation*, *142*, 2428–2437.
Hazzah, L., Dolrenry, S., Naughton, L., Edwards, C. T. T., Mwebi, O., Kearney, F., et al. (2014). Efficacy of two lion conservation programs in Maasailand, Kenya. *Conservation Biology*, *28*(3), 851–860.
Hill, C. M. (2004). Farmers' perspectives of conflict at the wildlife–agriculture boundary: Some lessons learned from African subsistence farmers. *Human Dimensions of Wildlife*, *9*(4), 279–286.
Holland, J. (2013). *Who counts? The power of participatory statistics*. Rugby. UK: Practical Action Publishing.
Holling, C. S. (1978). *Adaptive environmental assessment and management*. IIASA: Vienna.
Holmes, G. (2013). Exploring the relationship between local support and the success of protected areas. *Conservation & Society*, *11*(1), 72–82.
Inskip, C., & Zimmermann, A. (2009). Human–felid conflict: A review of patterns and priorities worldwide. *Oryx*, *43*(1), 18–34.
Jeffery, B., Abonyi, S., Labonte, R., & Duncan, K. (2006). Engaging numbers: Developing health indicators that matter for First Nations and Inuit people. *Journal of Aboriginal Health*, *3*(1), 44–52.
Kahler, J. S., Roloff, G. J., & Gore, M. L. (2012). Poaching risks in community-based natural resource management. *Conservation Biology*, *27*(1), 177–186.
Kaltenborn, B. P., Bjerke, T., & Nyahongo, J. (2006). Living with problem animals: Self-reported fear of potentially dangerous species in the Serengeti Region, Tanzania. *Human Dimensions of Wildlife*, *11*(6), 397–409.
Lindsey, P. A., Havemann, C. P., Lines, R., Palazy, L., Price, A. E., Retief, T. A., Rhebergen, T., & Van der Waal, C. (2013). Determinants of persistence and tolerance of carnivores on Namibian ranches: Implications for conservation on southern African private lands. *PLoS One*, *8*(1), e52458.
Linkov, I., Satterstrom, F. K., Kiker, G., Batchelor, C., Bridges, T., & Ferguson, E. (2006). From comparative risk assessment to multi-criteria decision analysis and adaptive management: Recent developments and applications. *Environment International*, *32*(8), 1072–1093.
Lockwood, M. (2010). Good governance for terrestrial protected areas: A framework, principles and performance outcomes. *Journal of Environmental Management*, *91*, 754–766.
Lund, J. F. (2014). Towards a more balanced view on the potentials of locally-based monitoring. *Biodiversity and Conservation*, *23*(1), 237–239.
Maclennan, S. D., Groom, R. J., Macdonald, D. W., & Frank, L. G. (2009). Evaluation of a compensation scheme to bring about pastoralist tolerance of lions. *Biological Conservation*, *142*, 2419–2427.
Madden, F. (2004). Creating coexistence between humans and wildlife: Global perspectives on local efforts to address human–wildlife conflict. *Human Dimensions of Wildlife*, *9*(4), 247–258.
Manfredo, M. J., & Dayer, A. A. (2004). Concepts for exploring the social aspects of human–wildlife conflict in a global context. *Human Dimensions of Wildlife*, *9*(4), 17–328.
Maris, V., & Béchet, A. (2010). From adaptive management to adjustive management: A pragmatic account of biodiversity values. *Conservation Biology*, *24*(4), 966–973.
McGregor, J. (2005). Crocodile crimes: People versus wildlife and the politics of postcolonial conservation on Lake Kariba, Zimbabwe. *Geoforum*, *36*(3), 353–369.
Messmer, T. A. (2000). The emergence of human–wildlife conflict management: Turning challenges into opportunities. *International Biodeterioration and Biodegradation*, *45*, 97–102.
Mishra, C., Allen, P., McCarthy, T., Madhusudan, M. D., Bayarjargal, A., & Prins, H. H. T. (2003). The role of incentive programs in conserving the snow leopard. *Conservation Biology*, *17*(6), 1512–1520.
Montag, J. (2003). Compensation and predator conservation: Limitations of compensation. *Carnivore Damage Prevention News*, *6*, 2–6.
Niemela, J., Young, J., Alard, D., Askasibar, M., Henle, K., Johnson, R., et al. (2005). Identifying, managing and monitoring conflicts between forest biodiversity conservation and other human interests in Europe. *Forest Policy and Economics*, *7*(6), 877–890.
Nyhus, P. J., Osofsky, S. A., Ferraro, P., Madden, F., & Fischer, H. (2005). Bearing the costs of human–wildlife conflict: The challenges of compensation schemes. In R. Woodroffe, S. Thirgood, & A. Rabinowitz (Eds.), *People and wildlife: Conflict or coexistence?* (pp. 107–121). Cambridge: Cambridge University Press.
Ogada, M. O., Woodroffe, R., Oguge, N. O., & Frank, L. G. (2003). Limiting depredation by African carnivores: The role of livestock husbandry. *Conservation Biology*, *17*(6), 1521–1530.
Ogra, M., & Badola, R. (2008). Compensating human–wildlife conflict in protected area communities: Ground-level perspectives from Uttarakhand, India. *Human Ecology*, *36*(5), 717–729.
Pechacek, P., Li, G., Li, J., Wang, W., Wu, X., & Xu, J. (2012). Compensation payments for downsides generated by protected areas. *Ambio*, *42*(1), 90–99.
Redpath, S. M., Young, J., Evely, A., Adams, W. M., Sutherland, W. J., Whitehouse, A., et al. (2013). Understanding and managing conservation conflicts. *Trends in Ecology & Evolution*, *28*(2), 100–109.
Richie, L., Oppenheimer, J. D., & Clark, S. G. (2012). Social process in grizzly bear management: Lessons for collaborative governance and natural resource policy. *Policy Sciences*, *45*(3), 265–291.
Rist, L., Campbell, B. M., & Frost, P. (2013). Adaptive management: Where are we now? *Environmental Conservation*, *40*(1), 5–18.
Ritchie, J., & Lewis, J. (2003). *Qualitative research practice: A guide for social science students and researchers*. London: SAGE.
Romanach, S. S., Lindsey, P. A., & Woodroffe, R. (2007). Determinants of attitudes towards predators in central Kenya and suggestions for increasing tolerance in livestock dominated landscapes. *Oryx*, *41*(2), 185–195.
Roux, D. J., & Foxcroft, L. C. (2011). The development and application of strategic adaptive management within South African National Parks. *Koedoe*, *53*(2), 5. http://dx.doi.org/10.4102/koedoe.v53i2.1049
SANParks. (2012). *South African National Parks Strategic Plan for 2012/13–2016/17*. Available from: <http//www.sanparks.org/assets/docs/about/5_year_strategic_plan_2012-2013_to_2016-2017.pdf/> accessed 19.08.14
Scheepers, K., Swemmer, L., & Vermeulen, W. J. (2011). Applying adaptive management in resource use in South African National Parks: A case study approach. *Koedoe*, *53*(2), 14. http://dx.doi.org/10.4102/koedoe.v53i2.999
Scholes, R. J., & Mennell, K. G. (2008). *Elephant management: A scientific assessment for South Africa*. Johannesburg: Wits University Press.
Schreckenberg, K., Camarago, I., Withnall, K., Corrigan, C., Franks, P., Roe, D., et al. (2010). *Social assessment of conservation initiatives: A review of rapid methodologies*. London: International Institute for Environment and Development.
Skogen, K. (2003). Adapting adaptive management to a cultural understanding of land use conflicts. *Society & Natural Resources*, *16*, 435–450.
St. John, F. A. V., Keane, A. M., Edwards-Jones, G., Jones, L., Yarnell, R. W., & Jones, J. P. G. (2012). Identifying indicators of illegal behavior: Carnivore killing in human-managed landscapes. *Proceedings of the Royal Society B: Biological Sciences*, *279*, 804–812.
Stringer, L. C., Dougill, A. J., Fraser, E., Hubacek, K., Prell, C., & Reed, M. S. (2006). Unpacking 'participation' in the adaptive management of social-ecological systems: A critical review. *Ecology and Society*, *11*(2), 39. Available from: <http//www.ecologyandsociety.org/vol11/iss2/art39/>
Swemmer, L. K., Grant, R., Annecke, W., & Freitag-Ronaldson, S. (2015). Toward more effective benefit sharing in South African National Parks. *Society & Natural Resources*, *28*(1), 4–20.
Swemmer, L. K., & Taljaard, S. (2011). SANParks, people and adaptive management: Understanding a diverse field of practice during changing times. *Koedoe*, *53*(2), 7. http://dx.doi.org/10.4102/koedoe.v53i2.1017
Thompson, J. R., Elmendorf, W. F., McDonough, M. H., & Burban, L. L. (2005). Participation and conflict: Lessons learned from community forestry. *Journal of Forestry*, *103*(4), 174–178.
Thorn, M., Green, M., Dalerum, F., Bateman, P. W., & Scott, D. M. (2012). What drives human–carnivore conflict in the North West Province of South Africa? *Biological Conservation*, *150*(1), 23–32.
Treves, A., & Bruskotter, J. (2014). Tolerance for predatory wildlife. *Science*, *344*(6183), 476–477.
Treves, A., & Karanth, K. U. (2003). Introduction: Special section: Human–carnivore conflict: Local solutions with global applications. *Conservation Biology*, *17*(6), 1489–1490.
Treves, A., Wallace, R. B., Naughton-Treves, L., & Morales, A. (2006). Co-managing human–wildlife conflicts: A review. *Human Dimensions of Wildlife*, *11*(6), 383–396.
Treves, A., Wallace, R. B., & White, S. (2009). Participatory planning of interventions to mitigate human–wildlife conflicts. *Conserv. Biol.*, *23*(6), 1577–1587.
Venter, F. J., Naiman, R. J., Biggs, H. C., & Pienaar, D. J. (2008). The evolution of conservation management philosophy: Science, environmental change and social adjustments in Kruger National Park. *Ecosystems*, *11*(2), 173–192.
Wahlén, C. B. (2014). Constructing conservation impact: Understanding monitoring and evaluation in conservation NGOs. *Conservation & Society*, *12*(1), 77–88.
White, P. C. L., & Ward, A. I. (2010). Interdisciplinary approaches for the management of existing and emerging human–wildlife conflicts. *Wildlife Research*, *37*(8), 623–629.
W.K. Kellogg Foundation. (2004). *Logic model development guide: Using logic models to bring together planning, evaluation, and action*. Battle Creek, Michigan: W.K. Kellogg Foundation.
Woodroffe, R. (2000). Predators and people: Using human densities to interpret declines of large carnivores. *Animal Conservation*, *3*, 165–173.
Woodroffe, R., Thirgood, S., & Rabinowitz, A. (2005). *People and wildlife: Conflict or co-existence? Conservation Biology, No 9*. Cambridge: Cambridge University Press.