



Building Peace to Save Nature: Multi-disciplinary Approaches to Managing Conflicts in Conservation

Isla D. Hodgson, Jeremy Cusack, Isabel Jones,
Jeroen Minderman, Lovisa Nilsson, Rocío A. Pozo,
O. Sarobidy Rakotonarivo, and Nils Bunnefeld

Abstract

Conservation conflicts are highly complex and challenging issues to understand and address. Such problems involve ecological and economic arguments that are centred around conservation, such as disputes over land rights and access, or the management of wildlife. However, conflicts often have roots that go beyond conservation, concerning social, cultural, historical and political matters. These dimensions are typically latent, requiring significant expertise and resources to disentangle and overcome. The management of conservation conflicts should therefore be carefully considered and

enacted in a way that reflects the multi-dimensional nature of such phenomena.

In this chapter, we provide an overview of several disciplines and perspectives that view conflict through different lenses and offer a multitude of methodologies and tools that can be used to advance our knowledge and improve our approaches to researching and tackling them. Using illustrative examples, we include insights from the social and political sciences, the natural sciences, armed conflicts and peace studies. Current research and management efforts tend to focus on superficial aspects of conflicts, such as tangible or measurable wildlife impacts or clashes of interest, and overlook deeper-rooted issues. In this chapter, we hope to demonstrate that taking a multi-disciplinary perspective can contribute to a more holistic approach, beneficial to both conflict management and broader challenges in conservation.

I. D. Hodgson (✉) · I. Jones · J. Minderman ·
N. Bunnefeld
Biological and Environmental Sciences, University of
Stirling, Stirling, UK
e-mail: isla.hodgson@stir.ac.uk

J. Cusack
Biological and Environmental Sciences, University of
Stirling, Stirling, UK

Centre for Ecosystem Modelling and Monitoring,
Universidad Mayor, Santiago, Chile

L. Nilsson
Grimsö Research Station, Department of Ecology,
Swedish University of Agricultural Sciences, Uppsala,
Sweden

R. A. Pozo
Center for Climate and Resilience Research, CR2,
Santiago, Chile

O. S. Rakotonarivo
École Supérieure des Sciences Agronomiques,
Antananarivo, Madagascar

Keywords

Conservation conflicts · Conflict
management · Multi-disciplinary · Decision-
making · Human dimensions

An Introduction to Conflicts in Conservation

The conservation of nature is a subject that is inherently susceptible to conflict. The Concise

Oxford English Dictionary defines conflict as ‘a state of opposition or hostilities’, ‘a fight or a struggle’ or a ‘clashing of opposed principles’ (COED 2011). People hold strong and often disparate views of the natural world and how it should (or should not) be managed. Such views are a reflection of different cultures, beliefs and values (Hill et al. 2017; Redpath et al. 2013). Conflicts therefore frequently emerge between individuals—or groups—with different interests and opinions relating to conservation and can arise in a wide variety of situations (Baynham-Herd et al. 2018). For example, rural farmers may kill protected carnivores in retaliation after losing livestock to predation, which clashes with the priorities of conservation bodies. Or, the establishment of a new reserve that places restrictions on an existing land-use—such as fishing or logging—may cause hostilities between those implementing the restrictions and the resource managers affected by them.

Conflicts in conservation are widespread problems of global concern, with often severe and negative consequences for both people and nature (d’Harcourt et al. 2017; Redpath et al. 2015a). They can significantly limit progress towards worldwide goals of biodiversity preservation and sustainable development (Young et al. 2016a; UN 2015). Evidence suggests that additional environmental pressures such as climate change, increasing habitat degradation and human population expansion may serve to increase the frequency and severity of conflicts (Vargas et al. 2019; Mason et al. 2018). Therefore, in recent years, conflicts have received growing attention from the scientific community, as well as international governments and conservation bodies. For example, the International Union for the Conservation of Nature (IUCN) formally designated a task force of experts to research and implement more preventative and mitigative strategies for conflicts involving wildlife (IUCN 2020b). However, current research indicates that there are still substantial gaps in the knowledge and practice of conflict management, suggesting a necessary transformation in how we understand and approach such challenges (Hodgson et al. 2020).

Understanding Conservation Conflicts

Because of the myriad places and scenarios in which conflicts can occur, we often see multiple terms used to describe them. These include human-wildlife conflicts (Dickman and Hazzah 2016), biodiversity conflicts (Young et al. 2010), land-use conflicts (Bax et al. 2019) and people-park conflicts (De Pourcq et al. 2019), to name but a few. For the purpose of this chapter, we refer to the broader term ‘conservation conflicts’—defined by Redpath et al. (2013)—as it encompasses a variety of situations where conservation and other competing interests clash, often with one party asserting its interests at the expense of another.

Conflict occurs fundamentally between humans, rather than between humans and wildlife or humans and nature. The term ‘human-wildlife conflict’ (HWC) is used widely by researchers, organisations, policy-makers and the media and has been criticised for the implication that wildlife are aware of their role as antagonists of humans (Peterson et al. 2013). Further, it is argued that terms like HWC suggest that once the adverse effects of wildlife on people—or vice versa—are eliminated, then conflicts will be resolved (Young et al. 2010; Peterson et al. 2013; Redpath et al. 2015b). But the reality is often much more complex.

Human-nature interactions can indeed have negative consequences, such as the predation of livestock, damage to human property, injury or loss of life, the hunting or exploitation of wild species and habitat destruction (Dickman and Hazzah 2016). It is thus necessary to implement measures to lessen these impacts. However, it is now widely recognised among the scientific and conservation community that more is required to address the full complexity of what is now referred to as a conservation conflict (Madden and McQuinn 2014; Redpath et al. 2015b). At the heart of such conflicts lies an amalgamation of social, political, cultural and economic dimensions which continually evolve over time.

Figure 1 provides a visual model for different levels of conflict and how they may be managed.

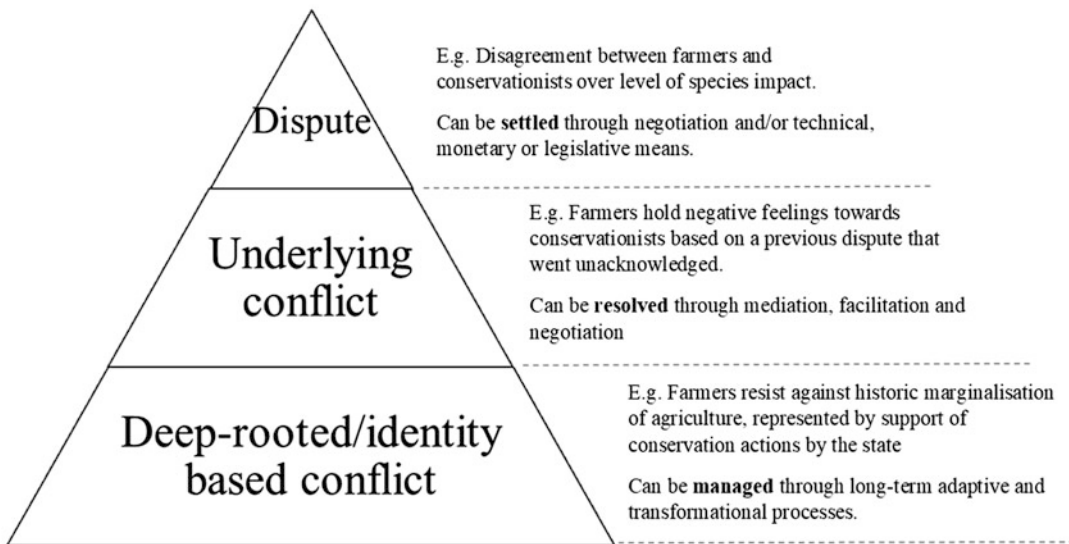


Fig. 1 The ‘levels of conflict’ as identified by the CICR (2000), with corresponding examples and suggested forms of management. Adapted from Madden and McQuinn (2014)

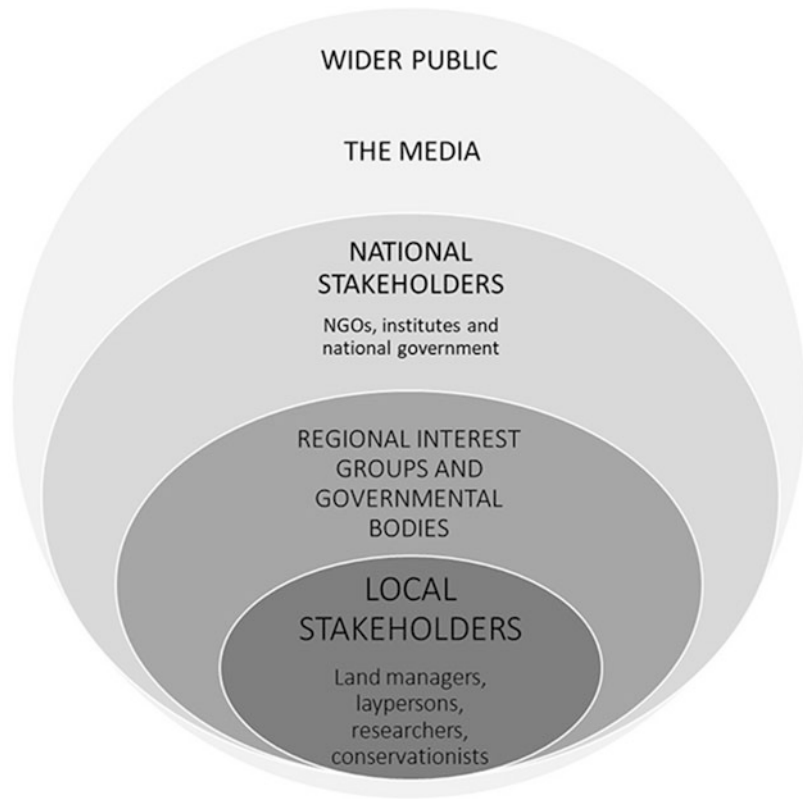
First described by the Canadian Institute for Conflict Resolution (CICR 2000), it was later adapted for conservation by Madden and McQuinn (2014) and is considered to be a pivotal piece of work that has been instrumental in developing our understanding of conservation conflicts. This model splits conflict into three ‘levels’: dispute, underlying conflict and identity or deep-rooted conflict. The most superficial level, known as the ‘dispute’, is the surface disagreement, which in the case of conservation may centre around environmental management, or the impact that wildlife has on human lives and livelihoods caused by species. Disputes can be settled, often through technical or monetary means—such as fencing, control of ‘so-called problem’ animals or compensation for livestock loss or crop damage. If disputes are unresolved or ignored, then an underlying conflict may develop. This lends a history to the conflict. Over time, tension grows, and emotions play a role in deepening the context of the issue. With each additional dispute, anxieties increase, and there is often an imbalance of power between parties, whether real or perceived, as one interest attempts to assert dominance over the other. At this stage, we begin to

see coalitions form between individuals with similar interests and values.

Beneath the surface dispute and underlying conflict, however, there often exists another dimension, known as deep-rooted or identity-based conflict. This level stems from issues that at first seem distantly related to conservation, such as social inequalities, injustices, cultural barriers, political histories, fractured relationships, value systems and more systemic asymmetries in power (Bhatia et al. 2019; Hodgson et al. 2020). These aspects collectively pertain to individual or group identity and thus can be significantly entrenched within society. They contribute to decision-making, prejudices, assumptions and therefore how an individual reacts towards conservation or conflict management efforts. This is further complicated when conflicts involve multiple stakeholders¹ at different levels of society (Fig. 2). For instance, in Malta, conflicts relating to the spring hunting of

¹The term ‘stakeholder’ refers to individuals or groups who influence, and are affected by, decisions relating to the management of wildlife and natural resources (Sterling et al. 2017).

Fig. 2 Diagram illustrating the variety of actors and societal levels that may potentially be involved in a conservation conflict at any one time



migratory birds include hunters and activists, as well as government, non-governmental organisations (NGOs) and scientific bodies (Veríssimo and Campbell 2015). In addition, conflicts can span countries and geographical regions, especially when migratory species require management at an international scale (see Box 1) or large-scale natural features—such as river systems—provide key resources but cross national boundaries (Dresse et al. 2019).

Deep-rooted conflicts can be difficult to detect and distinguish from other levels. They can manifest as surface disputes (Madden and McQuinn 2014) and require more time and effort to fully understand and address (Baynham-Herd et al. 2018). Consequently, managers tend to focus on achieving relatively quick, ‘win-win’ outcomes to disputes and overlook more challenging, obstinate dimensions such as social and political tensions. However, if allowed to persist, deep-rooted identity conflicts may cause issues for conflict management further down the line. For

example, even if negative human-nature impacts are lessened, or competing interests and values resolved, deep-rooted conflicts may simply lie dormant before emerging in response to new developments or events (Mathevet et al. 2015; Gerique et al. 2017). In recent years, these deeper-rooted elements of conservation conflicts have received more attention (Hodgson 2018; Hodgson et al. 2019; Harrison et al. 2019; Jani et al. 2019). Yet expansion and further integration of such knowledge into applied techniques remains a challenging endeavour.

Box 1 Waterbirds and Transboundary Conflicts

The United Nations Agreement on the Conservation of African-Eurasian Migratory Waterbirds (UN-AEWA) is an intergovernmental treaty working to bring countries and the wider conservation community together, to establish coordinated

(continued)

conservation and management of migratory waterbirds throughout their ranges (UNEP/AEWA 2018). One such species is the lesser white-fronted goose (LWfG; *Anser erythropus*), a long-distance migrant with variable and only partially known migration routes from Scandinavia and eastern Siberia to the Mediterranean and S.E. Asia, via key staging grounds in Central Asia and Europe (Marchant and Musgrove 2011). LWfG are globally threatened, with an estimated population of 16,000–27,000 adult individuals, and hunting is a key threat to this species (IUCN 2020a). In Kazakhstan—a key LWfG staging ground—hunting LWfG is illegal. To reduce accidental hunting of LWfG, which can happen when LWfG are flying in mixed flocks, specific conservation interventions to raise awareness of LWfG identification and of its protected status have been suggested (Jones et al. 2017). However, hunting and habitat loss occurs in other countries within the LWfG range, exacerbating LWfG population decline and reducing the efficacy of conservation interventions implemented. Not all countries along species' migration routes will be signatories to international agreements on species protection or may not have the resources to implement and enforce appropriate conservation measures (Runge et al. 2015). A difference in socio-economic status both within and between countries may also lead to different levels of legal and illegal hunting. Thus, conservation conflicts may develop across international boundaries, whereby there is an unequal distribution of costs associated with conservation interventions among nations. In such cases, species will not be fully protected across their migration route, undermining the efficacy of conservation interventions and creating transboundary conservation conflicts (Studds et al. 2017).

In the following sections, we describe approaches and tools that can be used to understand and manage conservation conflicts in their entirety. Due to the complex and multi-dimensional nature of conflicts, these approaches come from a range of fields and disciplines that include, but are not constrained to, the natural sciences. There are a number of disciplines exploring conservation conflict through a different lens and offering a multitude of tools, approaches and perspectives that may be utilised. This chapter serves to provide an overview and does not delve into the deeper theories and ideologies therein. Useful texts to expand this knowledge include Redpath et al. (2015b), Bunnefeld et al. (2017), Bennett et al. (2017a, b) and Hodgson et al. (2020).

Multi-disciplinary Approaches and Perspectives on Conservation Conflicts

A Natural Sciences Perspective

As conservation conflicts often centre around environmental issues, research and management is often subject to disciplinary and sectorial silos—predominantly with a bias towards the natural sciences and with expertise from ecology and conservation (Sandbrook et al. 2013; Bennett et al. 2017a). This is not to say that a natural science perspective is not integral to the process. Studies of animal behaviour, movements and habitat use are essential to the understanding of human-nature interactions, around which many disagreements centre. Box 2 illustrates how ecological modelling is helping to better predict and manage conflicts across Europe in relation to common cranes, *Grus grus*, a migratory waterbird that places pressure on agricultural interests (Nilsson et al. 2019). Using such models, negative impacts can be anticipated and potentially avoided or lessened. Further, technical projects—such as collecting data on animal physiology and behaviour, monitoring habitat use and movements or the testing of new technologies—

can also be useful tools with which to encourage collaboration and dialogue among conflicting stakeholders (Dresse et al. 2019; Duthie et al. 2018).

However, a bias towards this perspective risks narrowing the perception of what issues require the most attention and may limit what we can achieve when attempting to address conflicts (Redpath et al. 2015a; Moon et al. 2019a). For example, the natural sciences have a largely technical focus, traditionally relying on quantitative assessments, more rigid hypotheses and mechanistic perspectives. Moreover, for obvious reasons, its focus is usually on the animals or natural resource in question, with the human dimension (e.g. behaviour of stakeholders, resource users or interactions among them) often considered only in basic terms. Although this lends important insight into the natural resource aspect of conflict, human dimensions require a wider array of methodologies, the inclusion of more qualitative data and more open-ended research questions (White and Ward 2011). There are a wide variety of inter- and trans-disciplinary perspectives which offer multiple lenses through which to view and understand conflict and provide a more holistic approach to managing them (Redpath et al. 2015b; Hodgson et al. 2020).

A Social Sciences Perspective

The social sciences encompass a vast diversity of theoretical and applied disciplines, including—but not limited to—anthropology, sociology, history, economics, ethnography, psychology, communication studies and law. These disciplines are vast, and within each exist innumerable paradigms, theories and concepts. In essence, the social sciences involve the analysis of a variety of social phenomena at all levels of society, from individual values to group dynamics, and further to wider societal patterns and trends (Tindall and Piggot 2015; Bennett et al. 2017a). They may assist in the understanding of not just human decision-making and behaviours but also how economic, political and historical factors—

such as agency, governance and inequality—shape social events, structures and hierarchies (Hicks et al. 2016). Given that conflict is fundamentally a social phenomenon among humans (Brox 2000), the social sciences have much to offer in the way of understanding conservation conflicts.

Box 2 Understanding Staging Site Selection of Common Cranes Along the Western-European Flyway to Guide Crop Damage Prevention

Common cranes (*Grus grus*) have increased drastically along the Western-European flyway over the last decades, due to protection from the EU Birds Directive and wetland restorations, such as the European Natura 2000 network (Harris and Mirande 2013; EC 2020). The aim of the network is to support migratory and protected species, such as the common crane, by increasing supranational connectivity between protected areas (EC 2020). However, cranes now congregate in large numbers (occasionally up to 268,000 ind.) at wetland-agricultural sites along the flyway (LPO 2020). When foraging, cranes can have negative impacts on agricultural production, which fuels the reluctance of farmers to support wetland restorations and consequently encourages conflicts between conservation (i.e. species and wetland protection) and farming interests (i.e. maximising yields) (Salvi 2010; Montràs-Janer et al. 2019). Ecological studies of habitat and foraging patterns can be used to predict where species are likely to cause damage and thus guide management interventions (Fox et al. 2017; Nilsson et al. 2016). For example, location data derived from GPS transmitters demonstrate that cranes select Natura 2000 sites as wetland night roosts along their flyway, with a 97% probability that cranes will be present at these sites. However, the Natura 2000 sites do not fulfil their daily feeding

(continued)

requirements, which drives cranes to forage on the surrounding agricultural land. The probability of cranes utilising farmland is 63% for areas with close proximity to Natura 2000 sites; however, probability decreases to 27% with increasing distance from Natura 2000 sites (max 89.3 km; Nilsson et al. 2019).

The potential for crop damage on land that is close to protected areas indicates a high risk of conflicts between conservation and agricultural objectives. This in turn identifies a need for improved cross-boundary collaboration and policy development to reduce agricultural impacts and to manage conflicts when implementing protected areas (Nilsson et al. 2019). One key aspect is to decentralise management decisions to local stakeholders in order to implement effective compensation and damage prevention strategies within the vicinity of protected areas (Mason et al. 2018; Nilsson et al. 2019). Strategies could, for example, include providing undisturbed fields with attractive food (e.g. barley or wheat) for cranes within protected areas as a diversionary tactic and employing 'scaring' methods adjacent to growing crops (Nilsson et al. 2016, 2019).

As diverse and extensive as these disciplines are, so are the methodologies available to study social phenomena in the field. Quantitative approaches can involve questionnaires, surveys, lab and field experiments, choice experiments, demographic evaluations and cost-benefit analysis (Hanley et al. 2019; Bennett et al. 2017a). Such methods can offer large sample sizes capable of statistical analysis and thus are often used in deductive, hypothesis-driven studies, as well as to provide broad overviews of wide subject areas. For example, many large-scale attitudinal studies have compared levels of tolerance towards predators and management interventions in relation to demographic or geographical data (e.g. Mkonyi et al. 2017). However, where more

in-depth, detailed and nuanced answers are needed, qualitative (non-numerical) data may be preferable (Rust et al. 2017). Methodologies include interviewing, focus groups, discourse analysis, ethnography, conservation analysis and analysis of oral and archival histories (Young et al. 2018; Hodgson et al. 2018; Bennett et al. 2017b). Typically, qualitative research takes a more inductive or grounded line of enquiry, where conclusions are more probable and open-ended, rather than certain answers to hypotheses-driven questions. It is not unusual for a mixed-methods approach to be used, where quantitative data is used to complement qualitative, and vice versa (Aramo-Immonen 2011; Schoonenboom and Johnson 2017). For example, in-depth debriefing interviews can be used to better understand the results from choice experiments and provide insight into decision-making processes. Extending beyond a theoretical understanding of conflict, the social sciences can also aid in the management of conflict in the field, facilitating the development and execution of participatory processes (Bennett et al. 2017a, b) and conservation planning (e.g. Ban et al. 2013).

The social sciences are increasingly applicable to conservation conflicts and to conservation in general. Within academia, more recent application of social science perspectives has extended to explore different values and meanings in conflict (St John et al. 2019), the motivations and reasoning behind wildlife crime (Von Essen et al. 2014; Von Essen and Allen 2017), ethics and social justice (Wright 2019; Brittain et al. 2020) and the role of discourse and social interaction in shaping conflict (Hodgson et al. 2018). However, there is still much potential to broaden the scope (Bennett et al. 2017a, b). For instance, Moon et al. (2019c) make a compelling argument that current research focuses on defining and quantifying social elements in conservation, when there are opportunities to further engage with different methodologies and philosophies. The authors refer to ethnographic approaches (methods that involve unstructured, open-ended interviews and participant observation) and advocate for plurality, openness and reflexivity in research. The next two sections describe in more

detail two extensions of the social sciences that are highly relevant to conflict: socio-economics and political science.

Box 3 Using Ethnography to Gain a Deeper Understanding of Raptor-Grouse Conflicts in Scotland, UK

A contentious example of conservation conflict is illustrated in the competing interests of driven grouse shooting and the conservation of birds of prey (Thirgood and Redpath 2008). Driven grouse shooting is a recreational sport which traditionally takes place in upland areas. Rather than more conventional hunting methods—where hunters are on foot—in driven shooting, hunters remain stationary, targeting birds as they are ‘driven’ towards them by an advancing line of estate workers. Shooting estates, which are privately owned, rear artificially high populations of grouse in order to make a profit (Thompson et al. 2009). Predatory birds are viewed as a threat and have historically been persecuted on land managed for grouse shooting, driving some species to the brink of extinction. Protective legislation has slowed lethal control and allowed populations to recover; however, killing continues illegally. The ensuing conflict between grouse moor advocates and conservation interests has escalated, becoming entrenched due to the strong cultural aspects of grouse shooting and deep-rooted social and political elements (Hodgson et al. 2018). Many attempts to manage this conflict have failed, and parties have been unable to engage in meaningful dialogue. Until recently, research has focused on the surface dispute over the impacts of raptors and illegal wildlife crime (e.g. Thompson et al. 2009).

Hodgson et al. (2018) aimed to study the social and political elements of this conflict with the use of qualitative methodology. Given the highly sensitive nature of this situation and its associations with wildlife

crime, an ethnographic approach was required whereby the researcher observed subjects in their day-to-day lives and held unrecorded interviews in a variety of settings. Once trust was established, semi-structured interviews—interviews with no formal questions, but guidelines to ensure key topics are covered (Young et al. 2018)—were conducted and recorded. Stakeholder perceptions were strongly influenced by trust, social relations, power dynamics and how they were perceived to be represented at a national level (Hodgson et al. 2018). These factors were major barriers to stakeholders engaging constructively with collaborative processes, causing them either to act antagonistically and reinforce their own interests or to feel powerless and disengage completely. This study demonstrated the importance of including social and political factors into conflict management processes, rather than the current focus on technical solutions and legislation.

A Socio-Economic Perspective

A socio-economic perspective can answer many questions relating to trade-offs and decision-making between different stakeholder groups. Although already used to some extent in conflict management (e.g. the use of compensation schemes; see Ravenelle and Nyhus 2017 for an overview), deeper exploration of the field can aid in the understanding and therefore more effective application of economic strategies in conservation (Hanley et al. 2019).

Financial incentives and compensation are popular tools used with which to alter stakeholder behaviour, commonly towards more pro-conservation or sustainable actions. Yet, their effectiveness in practice is questioned, as implementation has been challenging and, in many cases, difficult to monitor (Nyhus et al. 2005; Pozo et al. 2017). For example, in 2009, the Government of Botswana introduced a

scheme aimed at reducing conflicts between local livelihoods and the conservation of protected wildlife (i.e. lions, elephants and crocodiles) in the eastern Okavango Delta Panhandle. Local villagers were asked to report any negative impacts caused by wildlife—such as damage to property or livestock loss—within 7 days of the incident occurring, following which a government official would visit the site and assess the level of impact before initiating a compensation process (Songhurst 2017; Noga et al. 2018). However, the scheme has encountered several issues, including transportation difficulties, delays to payment and claimants attempting to cheat the system, leading stakeholders to declare it inadequate (Noga et al. 2018).

Economics asks how and why stakeholders respond to various incentive-based schemes and the extent to which individuals are willing to commit to them. For example, contingent valuations or choice experiments are used to determine Willingness to Pay (WTP) or Willingness to Accept Compensation (WTAC) for certain assets, under different scenarios (Hanley et al. 2019). For example, choice experiments have been used to compare public WTP for actions to either protect or manage the hen harrier—a raptor at the centre of an entrenched political conflict in the UK (see Box 3; Hanley et al. 2010). Experimental games can also offer a low-cost and low-risk tool for testing the influence of different economic instruments on stakeholder behaviour (Redpath et al. 2018). Such methods have been used to understand farmer behaviour in elephant-related conflicts in Gabon (Box 4).

Box 4 Experimental Games to Understand Farmer Behaviour in Relation to Elephant Conflict Management Efforts in Gabon

Conservation conflicts related to elephants can impose considerable social and financial costs on farmers in Africa and Asia, and the retaliatory killing of elephants is common (Mackenzie and Ahabyona 2012). Experimental games with rural

farmers in Gabon have helped to understand the impacts of subsidies and agglomeration payments on farmers' decision-making (Rakotonarivo et al. 2020). The games were framed around land-use management and played in groups of four, providing a relaxed atmosphere to explore local farmers' propensity to engage in lethal control.

The findings suggest that economic instruments were conducive to pro-conservation behaviour, with farmers opting to choose other methods over lethal control when a financial incentive was offered. However, results also implied that other factors influenced farmer decision-making. By combining game outcomes with household surveys, the study also shed light on the relationships between game decisions and key socio-economic and attitudinal factors, such as trust and equity attitudes. These factors have been identified as key determinants of farmer decision-making in other conflicts regarding wildlife and land management (Young et al. 2016b; Treves et al. 2017). This implies that addressing material, visible manifestations of conflict (such as wildlife impact) may not tackle underlying conflicts, and thus interventions must also seek ways and means of addressing issues like social equity.

Additionally, systematic economic evaluations of management actions—known as cost-benefit analysis (CBA)—can be used to map out the distribution of financial losses and gains, thereby helping to predict how different stakeholders will react to certain interventions (Hanley et al. 2019). For example, Mburu et al. (2003) analysed the transaction costs imposed on landowners by a collaborative management scheme in Kenya and were therefore able to recommend changes that could increase compliance.

A Political Sciences Perspective

Political science is also an extension of the social sciences, relating broadly to the mechanisms and structures that determine how society is governed and therefore studying the institutions, rules and norms that influence political activities, trends and behaviours (Chatturvedi 2005). Some major subfields include political theory, comparative politics and international relations. More recent developments include interdisciplinary studies that relate specifically to the environment and conservation, as their application to conservation conflicts can be extremely useful in the exploration of their underlying structural causes and dynamics.

One such field is political ecology. With roots in human geography, political ecology views conflict as socially mediated, with environmental factors providing the context, not the cause (LeBillon and Duffy 2018). Research interests lie within the history of conflicts, with particular focus on power theory and dynamics—for example, factors that foster resistance, collusion and repression (Koopman 2011) or stimulate cooperation and consent (Brock and Dunlap 2018). The potential application to conservation conflicts is therefore vast, as environmental injustices, power struggles and inequalities are argued as key drivers in their development and manifestation (Raik et al. 2008; Adams 2015; Von Essen and Allen 2017; Von Essen et al. 2014). Understanding the chain of political events that have resulted in conflict may help to explain current situations, as well as predict and prevent future occurrences (Mathevet et al. 2015). Key methodologies are ethnography (long-term immersion in knowledge and local cultures), oral or archival historical studies and analysis of policy narratives and discourses (LeBillon and Duffy 2018).

Another related—and extensive—field is peace and conflict studies. Much like political ecology, this field is vastly interdisciplinary, drawing on a wide range of theories from international relations, history, social sciences and politics (Rogers 2015). It could be argued that peace and conflict studies are perhaps the most

applicable to conservation conflicts, given their focus on the more structural root causes (see Fig. 1) and interest in prevention and resolution (Rodríguez and Inturias 2018; LeBillon and Duffy 2018). However, application to conservation has been somewhat limited (Madden and McQuinn 2014).

From a peace research perspective, conflicts operate at multiple levels and stem from inequalities between stakeholders at these levels (Rodríguez and Inturias 2018). Therefore, subfields tend to have a more practical, applied framing—for example, conflict resolution, environmental peacebuilding and conflict transformation are all borne from peace studies (Lederach 2003; Madden and McQuinn 2014). Approaches range from quantitative and qualitative strategies, arbitration, mediation and facilitation (Rogers 2015) to addressing problematic power imbalances and injustices through, for instance, building local capacity and agency (Rodríguez and Inturias 2018). Environmental peacebuilding identifies different stages according to the level of polarisation between groups. ‘Technical’ solutions to environmental problems, for example, may be utilised as a starting point for dialogue between parties who are perhaps unable to engage in constructive mediation (Dresse et al. 2019). Further, peace studies commonly view conflict through a wider lens than political ecology, which typically concentrates on specific case studies (LeBillon and Duffy 2018). Peace studies search for global or more generalised trends and thus sometimes provide statistical analyses—which can be useful when thinking about conflict on a more global scale. Further, there is much we can learn from applied techniques and theories used in armed conflict (Box 5).

Box 5 Taking an Armed Conflicts Approach to Conservation Conflicts

Despite clear differences in the levels of violence involved, the development of conservation and armed conflicts share many similarities. Both involve the imposition of one, or several, interests over those of

(continued)

others, which results in situations of dominance, discord or power imbalance. Both are characterised by a combination of political discourse and concrete actions that contribute towards conflict escalation or de-escalation. Stakeholders in these conflicts may adopt antagonistic positions towards each other but may also act as third-party moderators or peacemakers. Lastly, like conservation conflicts, armed conflicts may show considerable variation in their historical or geo-political contexts. Yet, while research into the occurrence and characteristics of armed conflicts on a global scale has greatly benefitted from categorisations of conflict type and intensity (e.g. Metternich et al. 2019; Sundberg et al. 2012)—which, in turn, has enabled a better understanding of factors driving conflict dynamics (Hegre et al. 2019)—such frameworks are lacking for conservation conflicts.

Each conservation conflict will have its own unique historical and contextual characteristics. But focusing on the nature of human interactions may provide one way of generalising patterns across case studies. One potentially useful approach is the curve of conflict model (CCM), which is used in armed conflicts to track processes of escalation and de-escalation over time (Wallenstein 2018; Lund 1996; Crowley et al. 2017). The model was developed with the aim of guiding the prevention of armed conflicts and demonstrates how different conflict phases relate to one another, as well as to different kinds of third-party intervention. Figure 3 shows how the CCM can be adapted to conservation conflicts, thereby providing a classification for their intensity (Cusack et al. 2021).

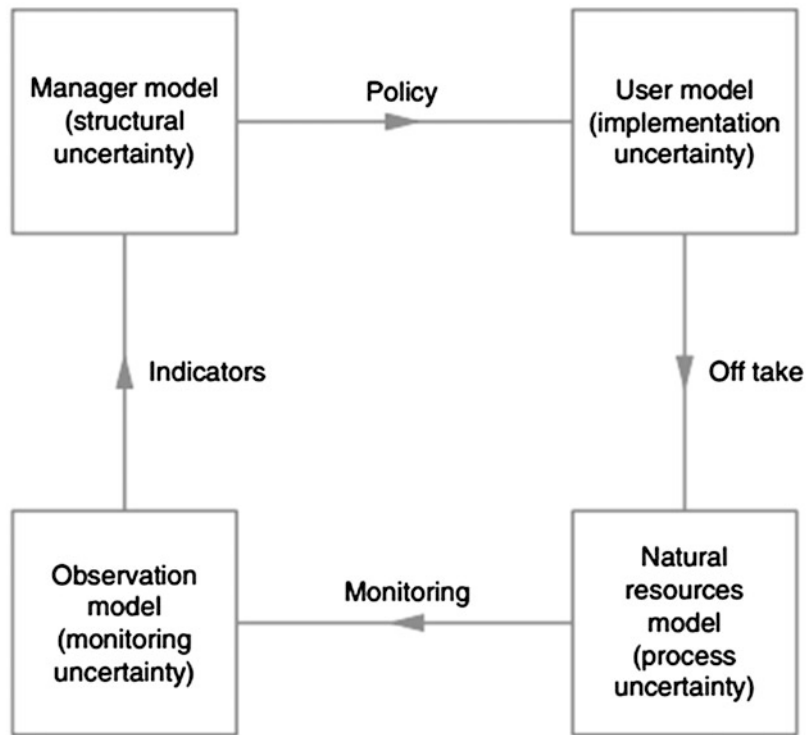
Socio-Ecological Modelling and Game-Theoretic Approaches

Conservation conflicts are, by nature, multifaceted, involving dynamics of both natural resource populations and human decision-making and the interactions between these. Resolution often relies on the ability to accurately predict phenomena and their effects, such as changes in population dynamics and the outcome of management interventions. Yet until recently, techniques that achieve this successfully have been scarce. In part, this may be due to the fact that while quantitative modelling is common-place in some areas of research related to conflicts (e.g. natural sciences and economics), other fields—some of which we have already discussed—are more reliant on qualitative approaches that do not lend themselves as easily to numerical models (White and Ward 2011). Integrated models—which cover multiple aspects of socio-ecological systems—do exist, but have remained relatively niche.

Socio-ecological models, and in particular management strategy evaluation (MSE) approaches (see Fig. 4), provide increasingly promising means to integrate the perspectives from, and advances in, different fields, predicting the dynamics of different components of socio-ecological systems (Bunnefeld et al. 2017). In doing so, they provide a modelling framework to understand how changes in one component of a system (e.g. the behaviour of users) are likely to affect another (e.g. the natural resource). Due to the complex and integrated nature of conflicts, such models are unlikely to resolve them directly, but they do provide a systematic and transparent way to predict dynamics and outcomes.

MSE was originally a tool for aiding the management of harvesting systems (Smith et al. 1999). However, it can accommodate sub-models for user and manager dynamics (i.e. decision-making), as well as natural resource dynamics (Fig. 4). This ability to incorporate

Fig. 4 Conceptual model representing management strategy evaluation (from Bunnefeld et al. 2017). This approach holistically models socio-ecological systems. Separate components model (1) the natural resource itself, (2) its observation, (3) management decisions and (4) users affecting the resource. While each of these can be modelled separately, their inputs and outputs are interdependent



social and ecological elements of systems makes it highly applicable to conservation conflicts (Bunnefeld et al. 2017). Indeed, the generalised MSE developed by Duthie et al. (2018) further extended this framework by integrating a game-theoretic approach to simulate user and manager decision-making in response to changes in, and impacts of, a natural resource population. Game theory is the mathematical study of strategic decision-making (Myerson 2013), where an individual’s decision is dependent upon the decisions of others (the ‘Prisoner’s Dilemma’ being a classic example). Incorporating this approach into the MSE framework allows for the quantitative modelling of decision-making of stakeholders (e.g. natural resource users and managers) in relation to specific goals, such as maximising yield, alongside models for the resource itself. Therefore, hypotheses relevant to conservation conflicts can be explicitly tested. For example, what are the consequences for the sustainability of natural resources when a manager’s decision-making is influenced by either the interests of conservation or those of

resource users, potentially through political acts such as lobbying (Cusack et al. 2020b)? More practical applications can include using the framework to provide decision support tools for real-world systems, where managers are frequently tasked with balancing trade-offs between resource exploitation and the protection of biodiversity (Cusack et al. 2020a).

In summary, holistic modelling frameworks that incorporate all aspects of socio-ecological systems are key in helping us understand the dynamics of conservation conflicts. They not only allow us to provide systematic and transparent predictions but are also an excellent means by which different perspectives and insights from different fields can be combined.

The Cognitive Sciences Perspective

As demonstrated in Fig. 1, conservation conflicts often forego surface disputes over species impact and have much deeper cognitive aspects (Redpath et al. 2013). These relate to how an individual

shapes reality, their perceptions of the world and what happens within it (Hodgson et al. 2018). The cognitive sciences (i.e. philosophy, psychology, linguistics, neurology) tell us how and why different people view and construct reality and the factors that influence, or are influenced by, these perceptions. ‘Cognition’ refers to different ways of knowing, in that judgements, reasoning and awareness differ from person to person. For example, socio-psychological theory describes a cognitive hierarchy of certain factors that collectively influence an individual’s worldview, consisting of values, beliefs, attitudes and norms, which ultimately result in behavioural actions (Vaske and Manfredi 2012). Examining the process of converting human thought into action can therefore help us to understand certain behaviours in conflict situations, such as the illegal killing of wildlife, refusal to comply with conservation measures and unwillingness to engage with other parties.

More recently, different theories and frameworks from the cognitive sciences have been applied to conservation conflicts. Barua et al. (2013) explored the ‘hidden’ impacts of conflicts related to wildlife on human well-being and found evidence that poor mental health, psychological trauma and severe stress are linked to such situations. Psychological theories (cognitive dissonance, reactance and motivation crowding) were used to understand historical shifts in attitudes towards wildlife by Maasai pastoralists of the Amboseli ecosystem in southern Kenya (Fernández-Llamazares et al. 2019). These findings demonstrated a history of cultural exclusion and marginalisation and highlighted the importance of building different meanings and conceptualisations of wildlife into conservation measures. Other explorations from a cognitive perspective have examined the concept of psychological ‘ownership’ of natural resources, and its importance in stakeholder cooperation (Matilainen et al. 2017), as well as the effect of different value orientations on stakeholder preferences for conflict management interventions (St John et al. 2019).

The mental model is an interesting technique, with multiple potential applications to conflict. In

a basic sense, mental models are graphical representations of the way in which people interpret reality and how this influences the reasoning behind certain decisions and behaviours (Moon et al. 2019b). Using a variety of methodologies—from interviews with individuals to group role-playing and map building—mental models are constructed from individual or group knowledge, experiences, values and belief systems (Jones et al. 2014). Although their application to conservation conflicts is currently limited, they have been used in diverse ways to better understand and overcome issues in conservation and natural resources management, such as the suitability of possible management interventions (Biggs et al. 2011), the understanding of conflicts, barriers to progress and possible solutions (Mosimane et al. 2014). They can also be used in the practical management of conflicts, providing a joint activity around which trust and relationships can be built among stakeholders (Halbrendt et al. 2014).

Applying Multi-disciplinary Approaches to Conflicts in the Field: Asking the Right Questions

Throughout this chapter, we have described a number of different approaches to conflict research and management, all stemming from broad, interdisciplinary fields and perspectives. This complexity matches the undeniable convolution and ‘wicked’ nature of conflicts (DeFries and Nagendra 2017; Mason et al. 2018). However, to say that makes researching and tackling such problems is overwhelming, even for those experienced in conflict management, would be an understatement.

A common problem that stems from this inherent complexity is that ‘conflict management’ strategies—especially those focused on cognitive or structural elements—generally lack a cohesive framework to aid the development, implementation and monitoring of such processes (Redpath et al. 2013; Young et al. 2016a; Bunnefeld et al. 2017). Further, strategies are rarely evaluated—meaning there is often no concrete idea of what ‘success’ looks like and there is a lack of robust,

empirical evidence to support future recommendations and improvements (Eklund et al. 2017). Many researchers and practitioners have advocated for a transformation in how both how conservation conflicts are perceived and approached, moving towards more long-term, adaptive and evaluative strategies that include opportunities for social learning (Redpath et al. 2013, 2015b; Eklund et al. 2017; Bunnefeld et al. 2017; Mason et al. 2018; Hodgson et al. 2020). However, integrating diverse perspectives and methodologies into an adaptive management process remains a significant challenge.

In recent years, stepwise frameworks have emerged, designed to aid in the design and implementation of management strategies (see Young et al. 2016a and Ainsworth et al. 2020). In agreement with a growing body of literature, such frameworks emphasise the fact that, before any strategy is implemented, key questions must first be addressed. For instance, what situation are we dealing with, and what is it about? Conflicts are not uncommon; however, it has been argued that the term is often used inappropriately (e.g. Peterson et al. 2013). For example, a scenario deemed a 'conflict' may in fact be a dispute over human-wildlife impacts, whereas the actual underlying conflict, which may consider social or political elements, may be unacknowledged (Young et al. 2010). This framing is vital, as it dictates which type of management intervention may be appropriate and can save valuable resources that may be better utilised elsewhere (Baynham-Herd et al. 2018). As previously discussed, a human-wildlife impact may be settled through technical, legislative, monetary or dialogic means; the human-human conflict may require more effort. Another important question is: who is involved? This question is particularly difficult, as some stakeholders involved in conflict may not be immediately obvious, or 'hidden'. Particularly in sensitive scenarios, such as problems where crime is involved, or in communities or cultures, where certain groups are traditionally hindered from participation, groups or individuals may be unable, or

unwilling, to come forward. Furthermore, conflicts can occur at multiple different levels and within various sectors of society.

Once these questions have been established, it may be possible to ascertain relevant and appropriate management interventions (Young et al. 2016a), as well as how they may be implemented, and who should be responsible for their implementation. As indicated in this chapter, a wealth of techniques, strategies and approaches are available; however, their delivery and governance are of equal importance. For instance, community-based conservation schemes are growing increasingly popular, but can fail if governed by weak or centralised institutions, and/or are susceptible to corruption (Bluwstein et al. 2016). Closely linked is the query of how to evaluate and adapt strategies, i.e. are there methods in place to monitor conflict management and to address problems as they arise? Ideally, the process and the institutions that govern them must have an investment in the long-term, must be flexible and allow for adaptation to different scenarios. Conservation conflicts are by nature dynamic, i.e. constantly evolving, in relation to new developments, including management efforts (Redpath et al. 2013). Strategies must therefore reflect this uncertainty.

Uncertainty is a significant component to consider in future approaches to conflicts in conservation (Bunnefeld et al. 2017), due to the effects changes may have in such complex systems. For instance, it is well known that impacts of climate change will affect more adversely vulnerable and poorer agriculturalist communities, in particular women (UNDP 2013; Arora-Jonsson 2011; FAO 2017). These groups will be directly impacted by water scarcity, reductions in yields of forest biomass, land-use change and/or increased disease risk, all of which contribute to a perpetuation of poverty in vulnerable groups. Communities vulnerable to climate change are generally also more exposed to conflicts over natural resources, as they have a more direct dependence on them (FAO 2017; Lipper et al. 2014). Therefore, strategies aiming to create coexistence must be

designed in order to adapt as well as to provide sustainable solutions for communities living in resilient environments.

In summary, conservation conflicts, in their entirety, are multi-dimensional, multi-levelled and dynamic, and this key concept should be reflected in the efforts made to manage and resolve them. A wealth of information, knowledge, tools and techniques exist—which we have merely brushed upon in this chapter—and there is no one way of utilising all of the tools in such a vast toolbox. However, acknowledging the breadth and complexity of conservation conflicts is a good starting point.

References

- Adams WM (2015) The political ecology of conservation conflicts. In: *Conflicts in conservation*. Cambridge University Press, Cambridge, pp 64–75
- Ainsworth GB, Redpath SM, Wilson M, Wernham C, Young JC (2020) Integrating scientific and local knowledge to address conservation conflicts: towards a practical framework based on lessons learned from a Scottish case study. *Environ Sci Pol* 107:46–55
- Aramo-Immonen H (2011) Mixed methods research design. In: *World summit on knowledge society*. Springer, New York, pp 32–43
- Arora-Jonsson S (2011) Virtue and vulnerability: discourses on women, gender and climate change. *Glob Environ Chang* 21(2):744–751
- Ban NC, Mills M, Tam J, Hicks CC, Klain S, Stoeckl N, Bottrill MC, Levine J, Pressey RL, Satterfield T (2013) A social–ecological approach to conservation planning: embedding social considerations. *Front Ecol Environ* 11(4):194–202
- Barua M, Bhagwat SA, Jadhav S (2013) The hidden dimensions of human–wildlife conflict: health impacts, opportunity and transaction costs. *Biol Conserv* 157:309–316
- Bax V, Francesconi W, Delgado A (2019) Land-use conflicts between biodiversity conservation and extractive industries in the Peruvian Andes. *J Environ Manag* 232:1028–1036
- Baynham-Herd Z, Redpath S, Bunnefeld N, Moloney T, Keane A (2018) Conservation conflicts: Behavioural threats, frames, and intervention recommendations. *Biol Conserv* 222:180–188
- Bennett NJ, Roth R, Klain SC, Chan K, Christie P, Clark DA, Cullman G, Curran D, Durbin TJ, Epstein G, Greenberg A, Nelson MP, Sandlos J, Stedman R, Teel TL, Thomas R, Veríssimo D, Wyborn C (2017a) Conservation social science: understanding and integrating human dimensions to improve conservation. *Biol Conserv* 205:93–108
- Bennett NJ, Roth R, Klain SC, Chan KM, Clark DA, Cullman G, Epstein G, Nelson MP, Stedman R, Teel TL (2017b) Mainstreaming the social sciences in conservation. *Conserv Biol* 31(1):56–66
- Bhatia S, Redpath SM, Suryawanshi K, Mishra C (2019) Beyond conflict: exploring the spectrum of human–wildlife interactions and their underlying mechanisms. *Oryx* 2019:1–8
- Biggs D, Abel N, Knight AT, Leitch A, Langston A, Ban NC (2011) The implementation crisis in conservation planning: could “mental models” help? *Conserv Lett* 4(3):169–183
- Bluwstein J, Moyo F, Kicheleri RP (2016) Austere conservation: understanding conflicts over resource governance in Tanzanian wildlife management areas. *Conserv Soc* 14(3):218–231
- Brittain S, Ibbett H, de Lange E, Dorward L, Hoyte S, Marino A, Milner-Gulland E, Newth J, Rakotonarivo S, Veríssimo D (2020) Ethical considerations when conservation research involves people. *Conserv Biol* 34:925–933
- Brock A, Dunlap A (2018) Normalising corporate counterinsurgency: engineering consent, managing resistance and greening destruction around the Hambach coal mine and beyond. *Polit Geogr* 62:33–47
- Brox O (2000) Schismogenesis in the wilderness: the reintroduction of predators in Norwegian forests. *Ethnos* 65(3):387–404
- Bunnefeld N, Nicholson E, Milner-Gulland EJ (2017) Decision-making in conservation and natural resource management: models for interdisciplinary approaches. Cambridge University Press, Cambridge, UK
- Chaturvedi J (2005) Political governance: comparative politics. Gyan Publishing House, New Delhi
- CICR (2000) *Becoming a third-party neutral: resource guide*. Ridgewood Foundation for Community-Based Conflict Resolution, Ottawa, Canada
- COED (2011) *Concise Oxford English Dictionary*. Oxford University Press, Oxford, UK
- Crowley SL, Hinchliffe S, McDonald RA (2017) Conflict in invasive species management. *Front Ecol Environ* 15(3):133–141
- Cusack JJ, Kohl MT, Metz MC, Coulson T, Stahler DR, Smith DW, MacNulty DR (2020a) Weak spatiotemporal response of prey to predation risk in a freely interacting system. *J Anim Ecol* 89(1):120–131
- Cusack JJ, Duthie AB, Minderman J, Jones IL, Pozo RA, Rakotonarivo OS, Redpath S, Bunnefeld N (2020b) Integrating conflict, lobbying, and compliance to predict the sustainability of natural resource use. *Ecol Soc* 25(2):13
- Cusack JJ, Bradfer-Lawrence T, Baynham-Herd Z, Castelló y Tickell S, Duporge I, Hegre H, Moreno Zárate L, Naude V, Nijhawan S, Wilson J, Zambrano Cortes DG (2021) Measuring the intensity of conflicts in conservation. *Conserv Lett*:e12783

- d'Harcourt E, Ratnayake R, Kim A (2017) How can the sustainable development goals improve the lives of people affected by conflict? *Bull World Health Org* 95(2):157
- De Pourcq K, Thomas E, Elias M, Van Damme P (2019) Exploring park–people conflicts in Colombia through a social lens. *Environ Conserv* 46(2):103–110
- DeFries R, Nagendra H (2017) Ecosystem management as a wicked problem. *Science* 356(6335):265–270
- Dickman AJ, Hazzah L (2016) Money, myths and man-eaters: complexities of human–wildlife conflict. In: *Problematic wildlife*. Springer, New York, pp 339–356
- Dresse A, Fischhendler I, Nielsen JØ, Zikos D (2019) Environmental peacebuilding: towards a theoretical framework. *Cooperation Conflict* 54(1):99–119
- Duthie AB, Cusack JJ, Jones IL, Minderman J, Nilsen EB, Pozo RA, Rakotonarivo OS, Van Moorter B, Bunnefeld N (2018) GMSE: an R package for generalised management strategy evaluation. *bioRxiv*. <https://doi.org/10.1101/221432>
- EC (2020) Natura 2000. https://ec.europa.eu/environment/nature/natura2000/index_en.htm. Accessed 26 Mar 2020
- Eklund A, López-Bao JV, Tourani M, Chapron G, Frank J (2017) Limited evidence on the effectiveness of interventions to reduce livestock predation by large carnivores. *Sci Rep* 7(1):1–9
- FAO (2017) Tackling climate change through rural women's empowerment. Food and Agriculture Organisation of the United Nations. <http://www.fao.org/3/ca0178en/CA0178EN.pdf>
- Fernández-Llamazares Á, Western D, Galvin KA, McElwee P, Cabeza M (2019) Historical shifts in local attitudes towards wildlife by Maasai pastoralists of the Amboseli ecosystem (Kenya): insights from three conservation psychology theories. *J Nat Conserv*. <https://doi.org/10.1016/j.jnc.2019.125763>
- Fox AD, Elmberg J, Tombre IM, Hessel R (2017) Agriculture and herbivorous waterfowl: a review of the scientific basis for improved management. *Biol Rev* 92(2):854–877
- Gerique A, López MF, Pohle P (2017) Sitting on a ticking bomb? A political ecological analysis of conservation conflicts in the Alto Nangaritza Valley, Ecuador. *DIE ERDE J Geogr Soc Berlin* 148(2–3):134–149
- Halbrendt J, Gray SA, Crow S, Radovich T, Kimura AH, Tamang BB (2014) Differences in farmer and expert beliefs and the perceived impacts of conservation agriculture. *Glob Environ Change* 28:50–62
- Hanley N, Czajkowski M, Hanley-Nickolls R, Redpath S (2010) Economic values of species management options in human-wildlife conflicts hen harriers in Scotland. *Ecol Econ* 70(1):107–113
- Hanley N, Shogren J, White B (2019) *Introduction to environmental economics*. Oxford University Press, Oxford
- Harris J, Mirande C (2013) A global overview of cranes: status, threats and conservation priorities. *Chin Birds* 4(3):189–209
- Harrison HL, Kochalski S, Arlinghaus R, Aas Ø, Bailey M (2019) Do you care about the river? A critical discourse analysis and lessons for management of social conflict over Atlantic salmon (*Salmo salar*) conservation in the case of voluntary stocking in Wales. *People Nat* 1(4):507–523
- Hegre H, Allansson M, Basedau M, Colaresi M, Croicu M, Fjelde H, Hoyles F, Hultman L, Höglbladh S, Jansen R (2019) ViEWS: a political violence early-warning system. *J Peace Res* 56(2):155–174
- Hicks CC, Levine A, Agrawal A, Basurto X, Breslow SJ, Carothers C, Charnley S, Coulthard S, Dolsak N, Donatuto J (2016) Engage key social concepts for sustainability. *Science* 352(6281):38–40
- Hill CM e, Webber AD e, Priston NEC e (2017) *Understanding conflicts about wildlife: a biosocial approach*, 1st edn. Berghahn Books, New York
- Hodgson ID (2018) *A conflict with wings: understanding the narratives, relationships and hierarchies of conflicts over raptor conservation and grouse shooting in Scotland*. Doctoral dissertation. University of Aberdeen
- Hodgson ID, Redpath SM, Fischer A, Young J (2019) Who knows best? Understanding the use of research-based knowledge in conservation conflicts. *J Environ Manag* 231:1065–1075
- Hodgson ID, Redpath S, Sandstrom C, Biggs D (2020) The state of knowledge and practice on human-wildlife conflicts. The Luc Hoffman Institute
- IUCN (2020a) *Anser erythropus*. The IUCN Red List of threatened species. <https://www.iucnredlist.org/species/22679886/23603064>. Accessed 24 Mar 2020
- IUCN (2020b) IUCN SSC human-wildlife conflict task force: what we do. <http://www.hwctf.org/about/what-wedo>. Accessed 23 Feb 2020
- Jani V, De Wit AH, Webb NL (2019) Disputes, relationships, and identity: a 'levels of conflict' analysis of human-wildlife conflict as human-human conflict in the mid-Zambezi valley, northern Zimbabwe. *S Afr Geogr J* 102(1):59–76
- Jones NA, Ross H, Lynam T, Perez P (2014) Eliciting mental models: a comparison of interview procedures in the context of natural resource management. *Ecol Soc* 19(1):1
- Jones I, Whytock R, Bunnefeld N (2017) Assessing motivations for the Illegal Killing of Lesser White-fronted Geese at Key Sites in Kazakhstan
- Koopman S (2011) Alter-geopolitics: other securities are happening. *Geoforum* 42(3):274–284
- LeBillon P, Duffy RV (2018) Conflict ecologies: connecting political ecology and peace and conflict studies. *J Polit Ecol* 25(1):239–260
- Lederach J (2003) *Key issues in peace and reconciliation studies*. Centre for the Study of Forgiveness and Reconciliation

- Lipper L, Thornton P, Campbell BM, Baedeker T, Braimoh A, Bwalya M, Caron P, Cattaneo A, Garrity D, Henry K (2014) Climate-smart agriculture for food security. *Nat Clim Change* 4(12):1068–1072
- LPO (2020) Informations about migration sites and common cranes. <https://champagne-ardenne.lpo.fr/grue-cendree/grus-en>. Accessed 26 Mar 2020
- Lund MS (1996) Early warning and preventive diplomacy. In: *Managing global chaos*. United States Institute of Peace Press, Washington, DC, pp 379–402
- Mackenzie CA, Ahabyona P (2012) Elephants in the garden: financial and social costs of crop raiding. *Ecol Econ* 75:72–82
- Madden F, McQuinn B (2014) Conservation's blind spot: the case for conflict transformation in wildlife conservation. *Biol Conserv* 178:97–106
- Marchant JH, Musgrove AJ (2011) Review of European flyways of the Lesser White-fronted Goose *Anser erythropus*. *BTO Res Rep* 595:2
- Mason TH, Pollard CR, Chimalakonda D, Guerrero AM, Kerr-Smith C, Milheiras SA, Roberts M, Ngafack RP, Bunnefeld N (2018) Wicked conflict: using wicked problem thinking for holistic management of conservation conflict. *Conserv Lett* 11(6):e12460
- Mathevet R, Peluso NL, Couespel A, Robbins P (2015) Using historical political ecology to understand the present: water, reeds, and biodiversity in the Camargue Biosphere Reserve, southern France. *Ecol Soc* 20(4):17
- Matilainen A, Pohja-Mykrä M, Lähdesmäki M, Kurki S (2017) "I feel it is mine!" – psychological ownership in relation to natural resources. *J Environ Psychol* 51:31–45
- Mburu J, Birner R, Zeller M (2003) Relative importance and determinants of landowners' transaction costs in collaborative wildlife management in Kenya: an empirical analysis. *Ecol Econ* 45(1):59–73
- Metternich NW, Çiflikli G, Ali A (2019, March 28) Predicting the severity of civil wars: an actor-centric approach. *SocArXiv*
- Mkonyi FJ, Estes AB, Msuha MJ, Lichtenfeld LL, Durant SM (2017) Local attitudes and perceptions toward large carnivores in a human-dominated landscape of northern Tanzania. *Hum Dimens Wildl* 22(4):314–330
- Montràs-Janer T, Knappe J, Nilsson L, Tombre I, Pärt T, Månsson J (2019) Relating national levels of crop damage to the abundance of large grazing birds: implications for management. *J Appl Ecol* 56(10):2286–2297
- Moon K, Blackman DA, Adams VM, Colvin RM, Davila F, Evans MC, Januchowski-Hartley SR, Bennett NJ, Dickinson H, Sandbrook C, Sherrin K, St. John FAV, van Kerkhoff L, Wyborn C, Ellison A (2019a) Expanding the role of social science in conservation through an engagement with philosophy, methodology, and methods. *Methods Ecol Evol* 10(3):294–302
- Moon K, Guerrero AM, Adams VM, Biggs D, Blackman DA, Craven L, Dickinson H, Ross H (2019b) Mental models for conservation research and practice. *Conserv Lett* 12(3):e12642
- Moon K, Adams VM, Cooke B (2019c) Shared personal reflections on the need to broaden the scope of conservation social science. *People Nat* 1(4):426–434
- Mosimane AW, McCool S, Brown P, Ingrebretson J (2014) Using mental models in the analysis of human–wildlife conflict from the perspective of a social–ecological system in Namibia. *Oryx* 48(1):64–70
- Myerson RB (2013) *Game theory*. Harvard University Press, Cambridge
- Nilsson L, Bunnefeld N, Persson J, Månsson J (2016) Large grazing birds and agriculture—predicting field use of common cranes and implications for crop damage prevention. *Agric Ecosyst Environ* 219:163–170
- Nilsson L, Bunnefeld N, Persson J, Žydelis R, Månsson J (2019) Conservation success or increased crop damage risk? The Natura 2000 network for a thriving migratory and protected bird. *Biol Conserv* 236:1–7
- Noga SR, Kolawole OD, Thakadu OT, Masunga GS (2018) 'Wildlife officials only care about animals': farmers' perceptions of a Ministry-based extension delivery system in mitigating human-wildlife conflicts in the Okavango Delta, Botswana. *J Rural Stud* 61:216–226
- Nyhus PJ, Osofsky SA, Ferraro P, Madden F, Fischer H (2005) Bearing the costs of human-wildlife conflict: the challenges of compensation schemes. *Conserv Biol Ser* 9:107
- Peterson MN, Peterson MJ, Peterson TR, Leong K (2013) Why transforming biodiversity conservation conflict is essential and how to begin. *Pac Conserv Biol* 19(2):94–103
- Pozo RA, Coulson T, McCulloch G, Stronza AL, Songhurst AC (2017) Determining baselines for human–elephant conflict: a matter of time. *PLoS One* 12(6):e0178840
- Raik DB, Wilson AL, Decker DJ (2008) Power in natural resources management: an application of theory. *Soc Nat Resour* 21(8):729–739
- Rakotonarivo OS, Jones IL, Bell A, Duthie AB, Cusack J, Minderman J, Hogan J, Hodgson I, Bunnefeld N (2020) Experimental evidence for conservation conflict interventions: the importance of financial payments, community trust and equity attitudes. *People Nat*. <https://doi.org/10.1002/pan3.10155>
- Ravenelle J, Nyhus PJ (2017) Global patterns and trends in human-wildlife conflict compensation. *Conserv Biol* 31(6):1247–1256
- Redpath SM, Young J, Evelyn A, Adams WM, Sutherland WJ, Whitehouse A, Amar A, Lambert RA, Linnell JDC, Watt A, Gutierrez RJ (2013) Understanding and managing conservation conflicts. *Trends Ecol Evol* 28(2):100–109
- Redpath SM, Gutiérrez RJ, Wood KA, Young JC (2015a) *Conflicts in conservation: navigating towards solutions*. Cambridge University Press, Cambridge

- Redpath SM, Bhatia S, Young J (2015b) Tilting at wild-life: reconsidering human-wildlife conflict. *Oryx* 49 (2):222–225
- Redpath SM, Keane A, Andren H, Baynham-Herd Z, Bunnefeld N, Duthie AB, Frank J, Garcia CA, Mansson J, Nilsson L, Pollard CRJ, Rakotonarivo OS, Salk CF, Travers H (2018) Games as tools to address conservation conflicts. *Trends Ecol Evol* 33 (6):415–426
- Rodríguez I, Inturias ML (2018) Conflict transformation in indigenous peoples territories: doing environmental justice with a 'decolonial turn'. *Dev Stud Res* 5 (1):90–105
- Rogers P (2015) Peace research and conservation conflicts. In: *Conflicts in conservation: navigating towards solutions*. Cambridge University Press, Cambridge, p 168
- Runge CA, Watson JE, Butchart SH, Hanson JO, Possingham HP, Fuller RA (2015) Protected areas and global conservation of migratory birds. *Science* 350(6265):1255–1258
- Rust NA, Abrams A, Challender DW, Chapron G, Ghoddousi A, Glikman JA, Gowan CH, Hughes C, Rastogi A, Said A (2017) Quantity does not always mean quality: the importance of qualitative social science in conservation research. *Soc Nat Resour* 30 (10):1304–1310
- Salvi A (2010) Eurasian crane (*Grus grus*) and agriculture in France. In: *Cranes, agriculture and climate change, Muraviovka Park, Russia*, pp 65–70
- Sandbrook C, Adams WM, Büscher B, Vira B (2013) Social research and biodiversity conservation. *Conserv Biol* 27(6):1487–1490
- Schoonenboom J, Johnson RB (2017) How to construct a mixed methods research design. *Kolner Z Soz Sozpsychol* 69(2):107–131
- Smith A, Sainsbury K, Stevens R (1999) Implementing effective fisheries-management systems—management strategy evaluation and the Australian partnership approach. *ICES J Mar Sci* 56(6):967–979
- Songhurst A (2017) Measuring human–wildlife conflicts: comparing insights from different monitoring approaches. *Wildl Soc Bull* 41(2):351–361
- St John FA, Steadman J, Austen G, Redpath SM (2019) Value diversity and conservation conflict: lessons from the management of red grouse and hen harriers in England. *People Nat* 1(1):6–17
- Sterling EJ, Betley E, Sigouin A, Gomez A, Toomey A, Cullman G, Malone C, Pekor A, Arengo F, Blair M (2017) Assessing the evidence for stakeholder engagement in biodiversity conservation. *Biol Conserv* 209:159–171
- Studds CE, Kendall BE, Murray NJ, Wilson HB, Rogers DI, Clemens RS, Gosbell K, Hassell CJ, Jessop R, Melville DS (2017) Rapid population decline in migratory shorebirds relying on Yellow Sea tidal mudflats as stopover sites. *Nat Commun* 8(1):1–7
- Sundberg R, Eck K, Kreutz J (2012) Introducing the UCDP non-state conflict dataset. *J Peace Res* 49 (2):351–362
- Thirgood S, Redpath S (2008) Hen harriers and red grouse: science, politics and human–wildlife conflict. *J Appl Ecol* 45(5):1550–1554
- Thompson PS, Amar A, Hoccom DG, Knott J, Wilson JD (2009) Resolving the conflict between driven–grouse shooting and conservation of hen harriers. *J Appl Ecol* 46(5):950–954
- Tindall D, Piggot G (2015) Influence of social ties to environmentalists on public climate change perceptions. *Nat Clim Change* 5(6):546–549
- Treves A, Chapron G, López-Bao JV, Shoemaker C, Goekner AR, Bruskotter JT (2017) Predators and the public trust. *Biol Rev* 92(1):248–270
- UN, United Nations (2015) Transforming our world: the 2030 Agenda for Sustainable Development (A/RES/70/1)
- UNDP (2013) Overview of linkages between gender and climate change. [Policy Brief], New York, U.S. <https://www.undp.org/content/dam/undp/library/gender/Gender%20and%20Environment/PB1-AP-Overview-Gender-and-climate-change.pdf>
- UNEP/AEWA (2018) Agreement on the conservation of African-Eurasian Migratory Waterbirds (AEWA). UNEP/AEWA Secretariat, Bonn, Germany, pp 1–41
- Vargas SP, Castro-Carrasco PJ, Rust NA (2019) Climate change contributing to conflicts between livestock farming and guanaco conservation in Central Chile: a subjective theories approach. *Oryx*:1–9
- Vaske JJ, Manfredo MJ (2012) Social psychological considerations in wildlife management. *Human dimensions of wildlife management*, pp 43–57
- Veríssimo D, Campbell B (2015) Understanding stakeholder conflict between conservation and hunting in Malta. *Biol Conserv* 191:812–818
- Von Essen E, Allen MP (2017) Reconsidering illegal hunting as a crime of dissent: implication for justice and deliberative uptake. *Crim Law Philos* 11 (2):213–228
- Von Essen E, Hansen HP, Nordström Källström H, Peterson MN, Peterson TR (2014) Deconstructing the poaching phenomenon: a review of typologies for understanding illegal hunting. *Br J Criminol* 54 (4):632–651
- Wallensteen P (2018) *Understanding conflict resolution*. Sage, London
- White PC, Ward AI (2011) Interdisciplinary approaches for the management of existing and emerging human–wildlife conflicts. *Wildl Res* 37(8):623–629
- Wright JS (2019) Re-introducing life history methodology: an equitable social justice approach to research in education. In: *Research methods for social justice and equity in education*. Springer, New York, pp 177–189
- Young JC, Marzano M, White RM, McCracken DI, Redpath SM, Carss DN, Quine CP, Watt AD (2010)

- The emergence of biodiversity conflicts from biodiversity impacts: characteristics and management strategies. *Biodivers Conserv* 19(14):3973–3990
- Young JC, Thompson DB, Moore P, MacGugan A, Watt A, Redpath SM (2016a) A conflict management tool for conservation agencies. *J Appl Ecol* 53(3):705–711
- Young JC, Searle K, Butler A, Simmons P, Watt AD, Jordan A (2016b) The role of trust in the resolution of conservation conflicts. *Biol Conserv* 195:196–202
- Young JC, Rose DC, Mumby HS, Benitez-Capistros F, Derrick CJ, Finch T, Garcia C, Home C, Marwaha E, Morgans C (2018) A methodological guide to using and reporting on interviews in conservation science research. *Methods Ecol Evol* 9(1):10–19