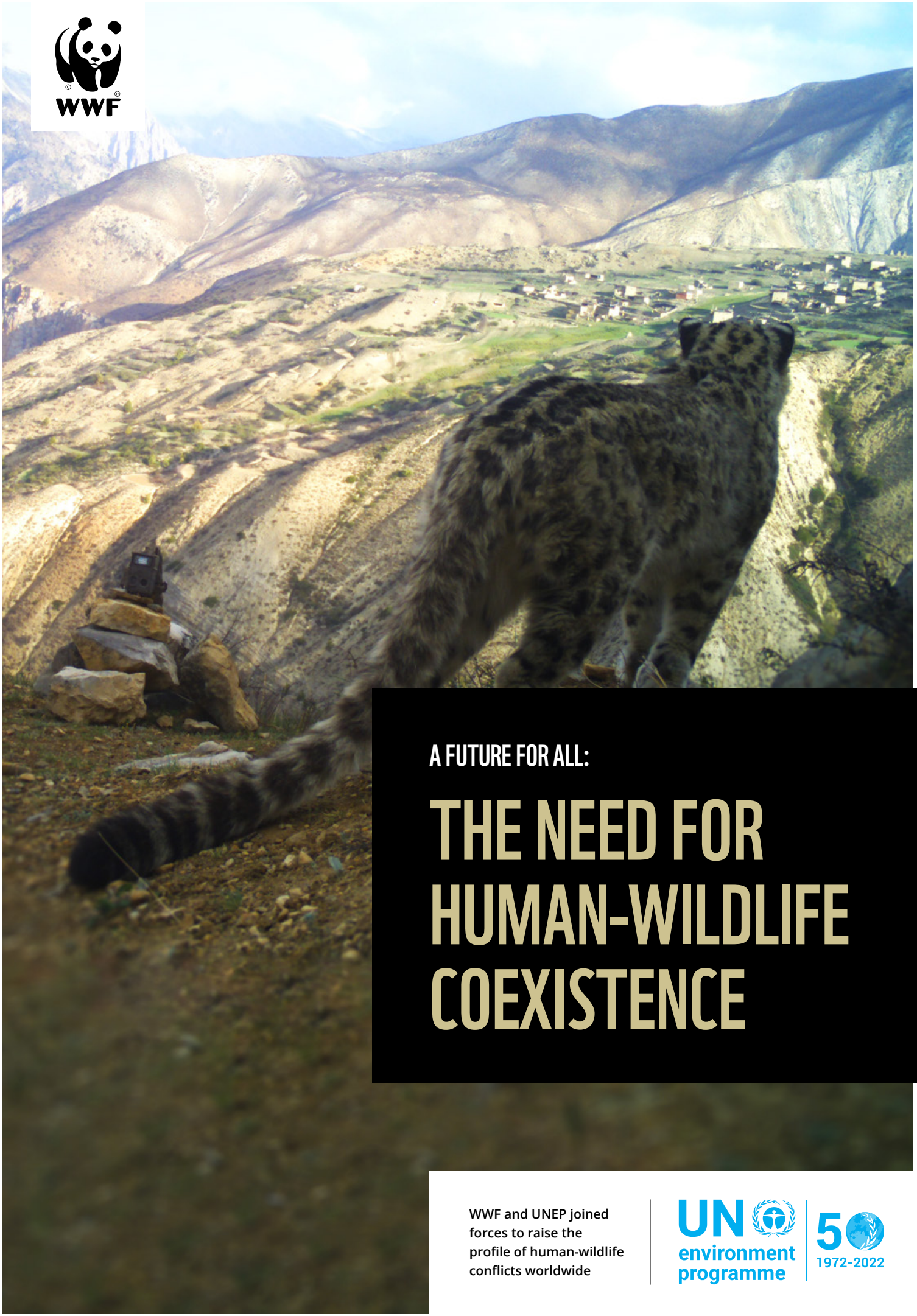


A FUTURE FOR ALL:

THE NEED FOR HUMAN-WILDLIFE COEXISTENCE

WWF and UNEP joined forces to raise the profile of human-wildlife conflicts worldwide

UN environment programme

50 1972-2022

WWF
WWF is an independent conservation organisation with over 30 million followers and a global network active in nearly 100 countries. Our mission is to stop the degradation of the planet's natural environment and to build a future in which people live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption. Visit panda.org/news for the latest news and media resources; follow us on Twitter @WWF_media.

UNEP
The United Nations Environment Programme (UNEP) is the leading global environmental authority that sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system and serves as an authoritative advocate for the global environment.

Citation
Gross E, Jayasinghe N., Brooks A., Polet G., Wadhwa R. and Hilderink-Koopmans F. (2021) A Future for All: The Need for Human-Wildlife Coexistence. (WWF, Gland, Switzerland).

Design and infographics by Levent Köseoglu, WWF- Netherlands
Text editing by ProofreadNOW.com
Cover photograph: DNPWC- WWF Nepal

Authors
Eva M. Gross, Linking Conservation and Development, Germany
Nilanga Jayasinghe, WWF-US
Ashley Brooks, WWF-Tigers Alive Initiative
Gert Polet, WWF-Netherlands
Rohan Wadhwa, Wageningen University, Netherlands
Femke Hilderink-Koopmans, WWF-Netherlands

Contributors
We are particularly grateful to the following 66 experts who gave their time to write or contribute to case studies or other sections of this report and without whose input the report would not have been possible. Contributors and authors of case studies are also mentioned in the respective sections.

Ahmed Baqai (WWF-Pakistan), Alexandra Zimmermann (IUCN SSC HWCTF), Amalia Alberini (WWF-Greece), Anna Behm Masozera (IGCP), Anna Songhurst (Ecoexist Trust), Antoinette van de Water (BTEH), Ashish Bista (WWF-India), Bharat Gotame (WWF-Nepal), Brandon Laforest (WWF-Canada), Bruce McLellan (IUCN SSC Bear Specialist Group), Carol M. Grossmann (Forest Research Institute Baden-Wuerttemberg), Cheryl Cheah Phaik Imm (WWF-Malaysia), Dave Garshelis (IUCN SSC Bear Specialist Group), David Owen (BTEH), Dipankar Ghose (WWF-India), Elisabeth Kruger (WWF-US), Esteban Payán (Panthera), Eva-Maria Cattoen (LechtAlps), Francine Madden (Centre for Conservation Peace Building), Ganesh Raghunathan (NCF- India), Graham McCulloch (Ecoexist Trust), Greg Stuart-Hill (WWF-Namibia), Henry Mutabaazi (IGCP Uganda), Hiten Baishya (WWF-India), Hizbullah Arief (Sumatran Tiger Project), Iftikhar Hussain (WWF-Pakistan), Ingelore Katjingisiua (WWF-Namibia), Jazz Kok (BTEH), Julian Blanc (UNEP), Julie Stein (Wildlife Friendly Enterprise Network), Kaare Winther Hansen (WWF-Denmark), Kai Elmauer (Elmauer Institute), Kanchan Thapa (WWF-Nepal), Ketil Skogen (NINA), Lana Ciarniello (Aklak Wildlife Consulting), Lise Hanssen (Kwando Carnivores Trust), M. Ananda Kumar (NCF- India), Margaret Nyein Nyein Myint (WWF-Myanmar), Marissa Balfour (Wildlife Friendly Enterprise Network), Marte Conradi (WWF-Norway), Melanie Lancaster (WWF-Arctic Programme), Michael Proctor (Trans-border Grizzly Bear Project), Molly Crystal (WWF-Denmark), Mudit Gupta (WWF-India), Muhammad Waseem (WWF-Pakistan), Muhammad Yayat Afianto (UNDP Indonesia), Neeraj Khera (GIZ India), Nitin Sekar (WWF-India), Noubbie Bahctiar (Sumatran Tiger Project), Nuno Videira (Nova University Lisbon), Nyambe Nyambe (KAZA Secretariat), Paula Swedeen (Conservation Northwest), Phil Franks (IIED), Pranav Chanchani (WWF-India), Rab Nawaz (WWF-Pakistan), Rafael Hoogesteijn (Panthera), Ram Nathan (Sabah Softwoods Berhad), Richard Diggle (WWF-Namibia), Sabita Malla (WWF-Nepal), Spyros Kotomatas (WWF-Greece), Sybille Klenzendorf (WWF-Germany), Valeria Boron (Panthera), Varvara Semenova (WWF-Russia), Vinod Krishnan (NCF- India), Virginia Frediani (WWF-US), Viviana Ceccarelli (BTEH), Wellard Makambo (IGCP)

Special thanks
We are also very thankful to the following 89 colleagues and experts, who shared their knowledge and experiences on human-wildlife conflict and coexistence with us during multiple interviews and discussions and gave their input in an extensive reviewing and editing process.

Alexander Nicolas (WWF-US), Alexey Kostyria (WWF-Russia), Althea Skinner (WWF-US), Andy Cornish (WWF-Hong Kong), Anna van der Heijden (WWF-International), Blanca Berzosa (WWF-Spain), Bram Buscher (Wageningen University), Charlotte Kwasi (WWF-International), Chimeddorj Buyanaa (WWF-Mongolia), Colman O'Criodain (WWF-International), Cristina Eghenter (WWF-Indonesia), David Lindley (WWF-South Africa), Dede Hendra Setiawan (WWF-Indonesia), Diana Caterine Forero Diaz (WWF-Mexico), Dibyendu Mandal (GIZ India), Diego Zarrate (ProCat), Dilys Roe (IIED), Doreen Lynn Robinson (UNEP), Drew McVey (WWF-Kenya), Eirik Skarsbo (WWF-Norway), Elaine Geyer-Allely (WWF-International), Elena Khishchenko (WWF-International), Elisa Bravo (Panthera), Elizabeth Davis (WWF-US), Ellen de Wolf (WWF-Netherlands), Enkhee Devee (WWF-Mongolia), Esther Turnhout (Wageningen University), Fabiola La Rosa (WWF-Peru), Fanni Barocsi (WWF-Arctic Programme), Grigory Mazmaniants (WWF-Russia), Guenther Haase (KfW), Indira Akoijam (WWF-India), Jim Higgs (WWF-Australia), John Beecham (IUCN SSC Bear Specialist Group), Joost van Montfoort (WWF-International), Jose Fernando Gonzalez Maya (ProCat), Karen Luz (WWF-International), Karen Richards (WWF-International), Katie Gough (WWF-International), Keiron Brand (WWF-Netherlands), Kevin Wallace (Tropical Biology Association), Khun Phansiri (UNDP Thailand), Leanne Clare (WWF-Arctic Programme), Lina Garcia (Panthera), Lisa Farroway (UNDP), Lorena Zarate (WWF-Mexico), Mandy Cadman (UNDP), Marco Costantini (WWF-MedPO), Margaret Kinnaird (WWF-International), Maria-Jose Villanueva (WWF-Mexico), Mario Vaupel (BCG), Marsden Momanyi (WWF-International), Maru Valdes (WWF-US), Michael Alexander (WWF-Singapore), Michelle Gan (WWF-Singapore), Midori Paxton (UNDP), Mike Knight (WWF-Namibia), Moritz Klose (WWF-Germany), Naresh Subedi (NTNC), Nathalie Houtman (WWF-Netherlands), Navaneethan Balasubramani (GIZ India), Nicky Robertson (WWF-UK), Nicolas Poolen (WWF-Netherlands), Nikhil Advani (WWF-US), Nuria Stoermer (KfW), Paul Steele (IIED), Piotr Chmielewski (WWF-Poland), Pradeep Mehta (GIZ India), Raffael Hickisch (WWF-Germany), Rebekah Karimi (Enonkishu Conservancy), Richard Leck (WWF- Australia), Rob Parry-Jones (WWF-International), Robert Fletcher (Wageningen University), Rodah Owako (WWF-International), Russell Taylor (WWF-Namibia), Samantha Putt del Pino (WWF-International), Sana Ahmed (WWF-Pakistan), Selenge Gantumur (WWF-Mongolia), Shaleyla Kelez (WWF-Peru), Stephanie O'Donnell (WILDLABS), Sugoto Roy (IUCN ITHCP), Sunarto (WWF-Indonesia), Susannah Birkwood (WWF-International), Tapiwa Makiwa (CCF Namibia), Thomas Gelsi (IUCN ITHCP), Vimarsh Sharma (GIZ India), Vince Shacks (WESSA), Wendy Elliot (WWF-International), Whitney Kent (WWF-US)

CONTENTS

FOREWORDS 5

DEFINITION OF TERMS RELATED TO HUMAN-WILDLIFE CONFLICT AND COEXISTENCE 6

EXECUTIVE SUMMARY AND CALL TO ACTION 7

1. SETTING THE SCENE 11

2. HUMAN-WILDLIFE CONFLICT: A WORLDWIDE CONCERN 15

3. THE GLOBAL IMPACT OF HUMAN-WILDLIFE CONFLICT 23
   - 3.1 IMPACT ON WILDLIFE AND ECOSYSTEMS 25
   - 3.2 IMPACT ON LOCAL COMMUNITIES 30
   - 3.3 IMPACT ON EQUITY 35
   - 3.4 IMPACT ON SOCIAL DYNAMICS 37
   - 3.5 IMPACT ON COMMODITY PRODUCTION AND BUSINESSES 40
   - 3.6 IMPACT ON SUSTAINABLE DEVELOPMENT 41

4. HUMAN-WILDLIFE COEXISTENCE: UNLOCKING SOLUTIONS, IDENTIFYING OPPORTUNITIES 43
   - 4.1 MOVING FROM CONFLICT TO COEXISTENCE 45
   - 4.2 BENEFITS TO WILDLIFE AND ECOSYSTEMS 58
   - 4.3 BENEFITS TO LOCAL COMMUNITIES 61
   - 4.4 BENEFITS TO SOCIAL DYNAMICS 68
   - 4.5 BENEFITS TO SUSTAINABLE DEVELOPMENT 75
   - 4.6 BENEFITS TO COMMODITY PRODUCTION, BUSINESSES, AND SUPPLY CHAINS 81
   - 4.7 OPPORTUNITIES FOR FINANCIAL INVESTMENT 88

5. A FUTURE FOR PEOPLE AND WILDLIFE 91

REFERENCES 94

FOREWORDS

Margaret Kinnaird,
Practice lead Wildlife WWF International

Imagine having your only corn crop destroyed in less than an hour by a troop of baboons, your best ram preyed on by a wolf, or the unthinkable – a loved one injured by a crocodile or killed by an elephant. Human-wildlife conflict (HWC) is not a comfortable subject – it involves loss of life and livelihoods, fear, anger, and wildlife killed in defence or retaliation. And the solutions are not simple or always permanent.

People have been seeking ways to shift our interactions with wild animals away from conflict towards something more beneficial, where not only do wildlife populations persist but also the people who live alongside them are safe and supported by healthy ecosystems.

To think that we can avoid all conflict would be naïve, but as this report demonstrates, we can create conditions where the interests of both people and wildlife are satisfied. Balancing social desires and ecological needs will shape the abundance and distribution of many of our iconic wildlife species, but as long as populations remain viable and are able to carry out their ecological roles, these sorts of trade-offs will be part of the required negotiations at various levels beyond just the conservation sector.

This report is based on the premise that the transition from conflict to coexistence occurs on a continuum where neither state is set as an inflexible point along a spectrum. As the authors point out, *'Attitudes and behaviour towards a species can change over time, across space, and in degree. Ideally, when a level of coexistence has been reached, ongoing negative interactions between people and wildlife become negligible.'*

Now is the time for us all to foster coexistence for the benefit of both people and wildlife.

Susan Gardner, Director
Ecosystems Division UNEP

Nature is the very foundation of our lives and our economies. Without the goods and services that nature provides, our very existence as a species would be in danger. Ecological systems are complex and interlinked, and not all that nature provides is of obvious or direct benefit to humanity. The lives and livelihoods of millions of people in rural communities around the world are frequently endangered by wild animals. These animals, which include many of the most iconic species, inflict untold damage on crops, livestock and property, and claim many tens of thousands of human lives annually. Tragically, the cost of human-wildlife conflict is disproportionally borne by many of the most impoverished rural communities on the planet; by those who can least afford it.

Human-wildlife conflict has traditionally been addressed through short-term mitigation and incident preparedness measures, such as the deployment of deterrents or lethal control methods for problem animals. These approaches only tackle the symptoms, but not the underlying causes. As an elephant ecologist once put it, treating human-wildlife conflict with deterrents is akin to treating brain tumours only with Aspirin.

This important report makes a plea to elevate the problem of human-wildlife conflict and give it the attention it deserves in national and international processes. It is a call for the adoption of approaches that identify and address the underlying causes of conflict while developing systemic solutions with affected communities as active and equal participants in the process. As many of the case studies in this report demonstrate, coexistence is both possible and attainable.

UNEP is proud to work closely with partners, including WWF, in advancing land use planning processes – with active participation of affected communities and other non-conservation sectors – with the aim of developing lasting policy solutions that yield net, tangible benefits to rural communities who coexist with wildlife. These benefits translate into positive incentives for conserving wildlife and nature.

It is our duty to put the coexistence of wildlife and people at the core of our economic and social systems. Now more than ever we must effectively address human-wildlife conflict to achieve the dual goal of wildlife conservation and enhanced human livelihoods.

DEFINITION OF TERMS

RELATED TO HUMAN-WILDLIFE CONFLICT AND COEXISTENCE

More than 250 peer-reviewed articles are published annually on the topics of human-wildlife interactions, coexistence, and conflicts [1], but the terms referencing these issues are used differently from writer to writer. Here, we define how these terms are used within this report.

Human-wildlife conflict (HWC) refers to struggles that arise when the presence or behaviour of wildlife poses actual or perceived direct, recurring threats to human interests or needs, often leading to disagreements between groups of people and negative impacts on people and/or wildlife [2].

Human-wildlife interaction is a neutral term referring to any encounter between people and wildlife [3].

Human-wildlife coexistence refers to people and wildlife existing in proximity to each other, whether in contentious, neutral, or beneficial coexistence [4]. In this report, human-wildlife coexistence describes a dynamic state in which the interests and needs of both humans and wildlife are generally met, though this coexistence may still contain some level of impact to both and is characterised by a level of tolerance on the human side.

HWC management includes all actions to reduce contact or conflict incidents and to minimise negative impacts on both people and wildlife. It encompasses actions to monitor, understand, predict, prevent, respond to, and mitigate HWC, all underpinned by strategic policy frameworks [5].

Holistic HWC approaches are those that take local development and conservation plans, human aspiration, social dynamics or flashpoints, sectoral plans, drivers of conflict, and local sociocultural contexts into consideration.

Integrated HWC approaches include actions from all elements of conflict management in project design.

HWC monitoring observes the frequency and severity of HWC and evaluates the progress of HWC management actions [5].

Understanding the conflict encompasses research into all aspects of the conflict profile, including drivers of the conflict, severity of the conflict, and the spatial, temporal, and social characteristics of HWC events, as well as how changes in community attitudes, trophic relationships, and land use may affect conflict levels [5].

HWC prevention refers to actions that help stop or minimise HWC before it occurs; this is the core tenet of effective HWC management. HWC prevention techniques include crop selection, early warning systems, strategic guarding, fencing, and the use of repellents [5].

HWC response refers to any actions taken to alleviate specific or ongoing HWC [6].

HWC mitigation refers to any measures that reduce the impact of HWC after it has occurred, such as compensation programmes, insurance schemes, or development of alternative livelihoods [5].

HWC policy refers to legal frameworks and guidelines addressing HWC drivers and HWC management [5].

Stakeholder refers to any interested individual or group that is directly or indirectly affected by or is affecting HWC [7]. Stakeholder groups are not always homogeneous, and individuals sometimes belong to more than one stakeholder group.

Tolerance is the passive or active acceptance of a wildlife population, and it depends on the risk-benefit beliefs people have towards a species. Tolerance levels are influenced not only by the magnitude of losses but also by the perception of and value attributed to the species [8 - 10].

WWF acknowledges the important discourse in the natural and social sciences on whether to replace the term 'human-wildlife conflict' with 'human-wildlife interaction' or 'human-wildlife coexistence'. The term human-wildlife conflict remains in our vocabulary because we believe it emphasises the severity and escalation of a global problem that affected stakeholders must address now and into the future.

WWF acknowledges that the term 'communities' cannot be generalised, as there are many types of groups that make up communities. In this report, Indigenous peoples have been included within the communities referenced throughout. WWF also recognises that Indigenous peoples do not have uniform attitudes and responses towards living with wildlife.

EXECUTIVE SUMMARY AND CALL TO ACTION

© Greg Dutoit

Around the world, human-wildlife conflict (HWC) challenges people and wildlife, leading to a decrease in people's tolerance for conservation efforts and contributing to multiple factors that drive species to extinction. HWC is a significant threat to conservation, livelihoods, and myriad other concerns and should be addressed at a scale equal to its importance. By allocating adequate resources and forming wide-ranging partnerships, we can move towards long-term coexistence that benefits both people and wildlife.

In a crowded world, people and wildlife are increasingly competing for space and resources. The encounters between them are more regular – and not all interactions are positive. It is a global issue, but people in some parts of the world are affected more significantly by wildlife than others. Sharing landscapes with wildlife is even more difficult when human lives and livelihoods are at risk. At the same time, as history has shown us, HWC can lead to the local or complete extinction of species. With the broader implications of HWC having a much wider reach than the communities and wildlife immediately impacted by it, it is important to note that HWC is as much a development and humanitarian issue as it is a conservation concern. In fact, HWC is an issue that impacts most of the United Nations Sustainable Development Goals (SDGs) but is not yet explicitly identified as such.

With the current global acceleration of climate change and further loss of habitat resulting from deforestation, etc., the detrimental impacts of HWC on both people and wildlife are increasing, and the current solutions do not match the magnitude of the problem. In order to achieve coexistence between people and wildlife, stakeholders must work together to address HWC more effectively while also emphasising that the benefits of living with wildlife outweigh the costs.

We know that achieving coexistence is possible. There are examples from across the globe of successful HWC management achieved through the implementation of integrated and holistic approaches backed by policies that create an enabling environment for coexistence. Considering the needs of people and the needs of wildlife concurrently in HWC management strategies creates synergies for both conservation and development.
In this report, we explain the complexity of HWC and its underlying drivers (Chapter 3), illustrate the direct impacts of HWC at various levels (Chapter 4), highlight ways to address them by unlocking solutions and moving towards coexistence (Chapter 5), and provide an outlook on the future of coexistence between people and wildlife (Chapter 6). Case studies not only illustrate impacts but also show how people all over the world have been able to build strong partnerships with nature in their own ways, and demonstrate how they have moved from conflict to coexistence. They illustrate that integrated HWC management and holistic coexistence strategies can benefit communities, society, governance, sustainable development, and businesses, all while securing the survival of threatened species and the ecosystems they depend on.

In total, 155 experts from 40 organisations based in 27 countries contributed to this report and shared their knowledge and expertise on HWC and its management. Many of these professionals also shared their experiences through case studies that help illustrate the multiple benefits derived from well-managed HWC and the successful deployment of coexistence strategies. While these success stories offer hope, we are aware that these outcomes are not always easy to achieve. However, setbacks, and even outright failure, can help pave the way to eventual success.

We are convinced that if we adapt, replicate, and scale up those successful efforts in a more concerted manner globally, while considering local contexts and needs, we may well be able to achieve some level of human-wildlife coexistence. The time has come for stakeholders to step back and rethink how they can reduce and manage conflict between people and wildlife and foster coexistence for the benefit of both wildlife and people.

That's why we, along with our conservation, development, and science colleagues around the world, are calling on various sectors to act.

CALL TO ACTION

We ask the international community to:

- Include human-wildlife coexistence as an explicit target of the Convention on Biological Diversity's (CBD) process aimed at achieving the 2050 vision of 'living in harmony with nature'.

- Integrate human-wildlife coexistence into the implementation of the SDG framework for long-lasting sustainable development and wildlife conservation.

We ask national and regional governmental authorities to:

- Incorporate coexistence considerations into the design and implementation of all relevant policies and programmes and provide financial means for their implementation.

- Address HWC as a global threat to sustainable development, food security, and conservation in the framework of relevant international conventions.

- Ensure that the creation and implementation of national and subnational development plans explicitly enhance coexistence and incorporate cross-sectoral natural resource management and biodiversity conservation through informed and integrated spatial planning that takes into account the long-term needs of both human and wildlife populations.

- Develop transparent and inclusive local and regional institutions to manage land use and HWC based on evidence and through a participatory process with affected parties, increase all parties' capacity for HWC management, and improve communication and partnerships between stakeholders.

- Develop laws and regulations, including impact assessments and incentives, which buffer affected people and businesses against the impacts of HWC and enable the benefits of coexistence with wildlife to accrue and be shared fairly and locally.

- Roll out nationwide HWC information programmes that include monitoring and education on impacts and solutions, as well as media guidelines to build national awareness and tolerance of wildlife, including among political and economic decision makers.

We ask companies and the wider private sector to:

- Lead the development of industry-wide innovations to mainstream all aspects of safe working conditions for staff working in places that are vulnerable to HWC.

- Reconsider developments or projects that will result in the exacerbation of HWC particularly in places where HWC can't be managed, while ensuring that all development complements the needs of local people.

- Develop innovations to manage HWC that are needs-based and co-designed with potential users.

- Adopt best management practices within the commodities sector to maintain or restore natural habitat connectivity across production sites so wildlife can pass freely, including ensuring connectivity is not lost to associated infrastructure.

- Integrate standards of HWC management and coexistence into certification schemes for products from agriculture, forestry, fishery, and aquaculture industries.

- Commission research to address HWC and demonstrate the benefits of HWC minimisation in value chains.

We ask donor agencies across all sectors to:

- Consider coexistence when developing their programmes.
- Create national and regional coexistence-related funding opportunities to fast-track the implementation and mainstreaming of HWC management systems in development plans and regional projects.
- Develop a pipeline of projects specifically aimed at HWC management and minimisation, especially in current and predicted future HWC hotspots.
- Recognise that HWC management requires long-term commitments to enable participatory and community-based processes and to achieve attitude and behaviour change.
- Develop internal coexistence safeguards, including impact assessments, and mainstream them across all programme designs, monitoring and evaluation frameworks, and project deliverables to ensure that no funding goes towards programmes that create negative HWC-related impacts, for instance through habitat alteration or infrastructure development.

We ask civil society organisations, including community-based organisations and non-governmental organisations, to:

- Provide organisational support and technical capacity to communities, governments, donors, and businesses so they can mainstream coexistence into their planning and management.
- Incorporate coexistence safeguards, including impact assessments, into existing programmes to achieve both socio-economic and biodiversity objectives.
- Use existing networks of programmes to innovate, scale up, and standardise HWC information systems, trends, and monitoring efforts.
- Enable and stimulate the exchange of lessons learned and institutionalisation of best management practices.
- Mainstream HWC management and coexistence strategies into all levels of development and conservation programmes and consider communities' mental health in areas with high HWC.
- Develop strategic partnerships between development, humanitarian, and conservation organisations to create synergies in HWC management and HWC risk prevention.
- Ensure gender equality and human rights in HWC management.

We ask communities and people of all genders, age groups, statuses, and income levels who are affected by wildlife to:

- Provide information to institutions and/or organisations that engage in addressing HWC and fostering coexistence so they have a better understanding of the local HWC situation to improve its management.
- Participate in capacity-building efforts to effectively manage HWC and foster coexistence.
- Learn and apply recommended HWC management strategies through capacity-building efforts.

We ask researchers and research institutions to:

- Strengthen inter- and transdisciplinary research, including close integration of social science, on HWC and coexistence.
- Create knowledge and understanding about processes, drivers, and direct and indirect impacts of HWC and coexistence in the larger context.
- Provide evidence for the success or failure of coexistence strategies.
- Contribute to the development of strategies that are beneficial to both people and wildlife.

We ask institutions and individuals engaged in raising public awareness, including educational institutions and the media, to:

- Disseminate fact-based and balanced information and news about human-wildlife interactions.
- Focus education and information on the value of wildlife and ecosystems and the benefits of living with wildlife.
- Develop specific education and information systems that help increase the safety of people and their assets in areas at high risk of HWC.
- Address misperceptions about wildlife and HWC management.

We ask all stakeholders to:

- Treat HWC as a human rights issue that particularly affects the human right to a safe and healthy environment and adopt rights-based approaches to its management.

CHAPTER 1

SETTING THE SCENE

© Aleksei Volkov, WWF

Humans have lived with wildlife for millennia, in both conflict and coexistence. And while we have become increasingly urbanised over time, we are still closely linked with and gain many benefits from nature. Some communities, especially of Indigenous peoples, may still live relatively harmoniously with wildlife and have long-established cultural practices and traditions that enable them to coexist.

However, their capacity to do so may be negatively impacted by the loss of their traditional territories to other forms of land use driven by logging, mining, and other consumptive land use practices that lead to habitat loss. Reduction, fragmentation, and degradation of habitats mean wild animals are also losing the space and resources they need to survive. This increases competition between people and wildlife, which can affect the well-being of all. Communities in this situation experience negative impacts on agricultural production and livelihoods, a decreased quality of life, and even loss of life, all of which erode tolerance of conservation that can lead to the removal, killing, and even eradication of the species involved in conflict.

This HWC can have repercussions that extend beyond the directly affected communities and wildlife. If not managed effectively, HWC has the potential to negatively affect not only the concerned people and animals but also conservation and sustainable development initiatives much more broadly. HWC can also weaken production systems and other businesses, as well as regional and national economies.

HWC is escalating around the world, on land and under water; it is a global concern that affects society at multiple levels. However, the current scale of solutions clearly does not match the scale of the problem. This report is a call to action to place HWC on the global governance, livelihood, development, and biodiversity conservation agendas. It is intended to elevate the issue to the highest levels and unlock the potential for the global community to come together to address related challenges at the scale required to achieve long-term impacts.

Currently, HWC management actions are often disparate and not implemented holistically or at scale. Working towards coexistence of people and wildlife requires connecting and reconciling sustainable development and biodiversity conservation and managing trade-offs between the two. Holistic and integrated responses that minimise and manage HWC – especially those developed at scale and emphasising the benefits of living with wildlife – can enable safe, stable, and prosperous coexistence between people and wildlife.

The SDGs and the CBD have provided international platforms to help achieve a sustainable future for all. However, attempts to stop biodiversity loss, poverty, inequality, and climate change and to achieve peace and justice through such efforts have failed to connect these goals and activate synergies at a large scale, especially as they relate to HWC. Mainstreaming HWC management and the aim of coexistence into global conventions and regional programmes is an urgent necessity.
This report contains the contributions of 155 experts from academic, policy, international development, and conservation organisations who have provided insights in the form of interviews and quotes. Of these, 66 experts have contributed the case studies highlighted in this report. In addition, we reviewed more than 250 scientific papers and grey literature to underpin our recommendations.

The report examines the complexity of HWC and its underlying drivers (chapter 3), illustrates the direct impacts of HWC at various levels (chapter 4), highlights ways to address them by unlocking solutions and moving towards coexistence (chapter 5), and provides an outlook on the future of coexistence between people and wildlife (chapter 6). Relevant case studies illustrate how people all over the world have been able to build strong partnerships with nature in their own ways and demonstrate how they have moved from conflict to coexistence to achieve benefits on multiple levels.

ZOONOSES AND HWC

While this report was being produced, a fundamental crisis was shaking the world – the COVID-19 pandemic – sparked by a zoonotic disease that very likely originated in wild animals and then spread to people. At the time of this report's publication, COVID-19 has already resulted in more than 3.9 million deaths worldwide [11] and an estimated US$16 trillion in economic losses [12].

Zoonoses, diseases transmitted from wildlife to humans and vice versa, can be considered a subset of HWC [13]. It is driven by the close association of people, their livestock, and wildlife and by the unregulated consumption of wild animals. With closer and more frequent and diverse contact between animals and people, the probability of animal microbes being transferred to people increases. As wildlife-borne infections increase, the probability of outbreaks – and pandemics – grows as infectious disease spreads along road networks, in urban centres, and via global travel and trade routes [12].

The majority (70%) of emerging diseases (e.g. Ebola, Zika, Nipah encephalitis) and almost all known pandemics (e.g. avian influenza, HIV/AIDS, COVID-19) are zoonoses that have spilled over due to contact among wildlife, livestock, and people [14]. The risk of pandemics is increasing rapidly; more than five new diseases emerge in people every year. The spread of zoonoses is essentially driven by exponentially increasing anthropogenic changes such as those in land use. While wildlife serve as hosts to a number of diseases, it's important to note that such disease emergence is caused by human activities and the impacts of these activities on the environment [12].

The extent of the unfolding COVID-19 pandemic makes the continuation of business as usual impossible. It shows that intensive handling of wildlife and the keeping of large numbers of domestic animals in an industrial manner create an environment ripe for virus outbreaks and the development of super viruses. This situation calls for urgent transformation: We must reassess the relationship – and especially the direct interactions – between people and wildlife to ensure their safe coexistence in the future.

KEY DRIVERS OF NEW ZOONOTIC DISEASES

Environmental risk	Human activity	Outcome	Impact
1 Illegal and high-risk trade and consumption of wildlife	• Wild meat consumption as a delicacy or as alternative protein • Unsafe and unhygienic practices in trade	• Increased **exposure** to animal pathogens at the interface between nature, humans and livestock • Increased **vulnerability** to animal pathogens	• Increased risk of zoonotic disease emergence • Broader negative environmental consequences, including climate change and biodiversity loss
2 Unsustainable food systems	• Land-use change for agriculture • Habitat fragmentation • Agriculture intensification		

DIRECT IMPACT OF HWC

AREAS OF OVERLAP [15]

Human-dominated areas

Areas largely devoid of people

Land shared by wildlife and people

PEOPLE AND WILDLIFE KILLED DUE TO HWC

121 Number of people killed by wild elephants in Sri Lanka in 2019 [17]

405 Number of elephants killed due to HWC in Sri Lanka in 2019 [17]

60 Number of people killed by lions in Tanzania per year [18]

150* Number of lions killed due to HWC in Tanzania per year [19]

80,000 - 138,000 People killed annually by snake bites in Africa and Asia [20]

* Figure includes ritual and retaliatory killing

COMPENSATION PAID IN EUROPE FOR LIVESTOCK DAMAGE [21]

Average annual compensation for all livestock damage by carnivores in Europe between 2005-2012

US$41.38 million

Average cost per year per wolf
US$ 3,500

Average cost per year per bear
US$ 2,600

Average cost per year per lynx
US$ 1,000

LOSSES CAUSED BY HWC

US$56

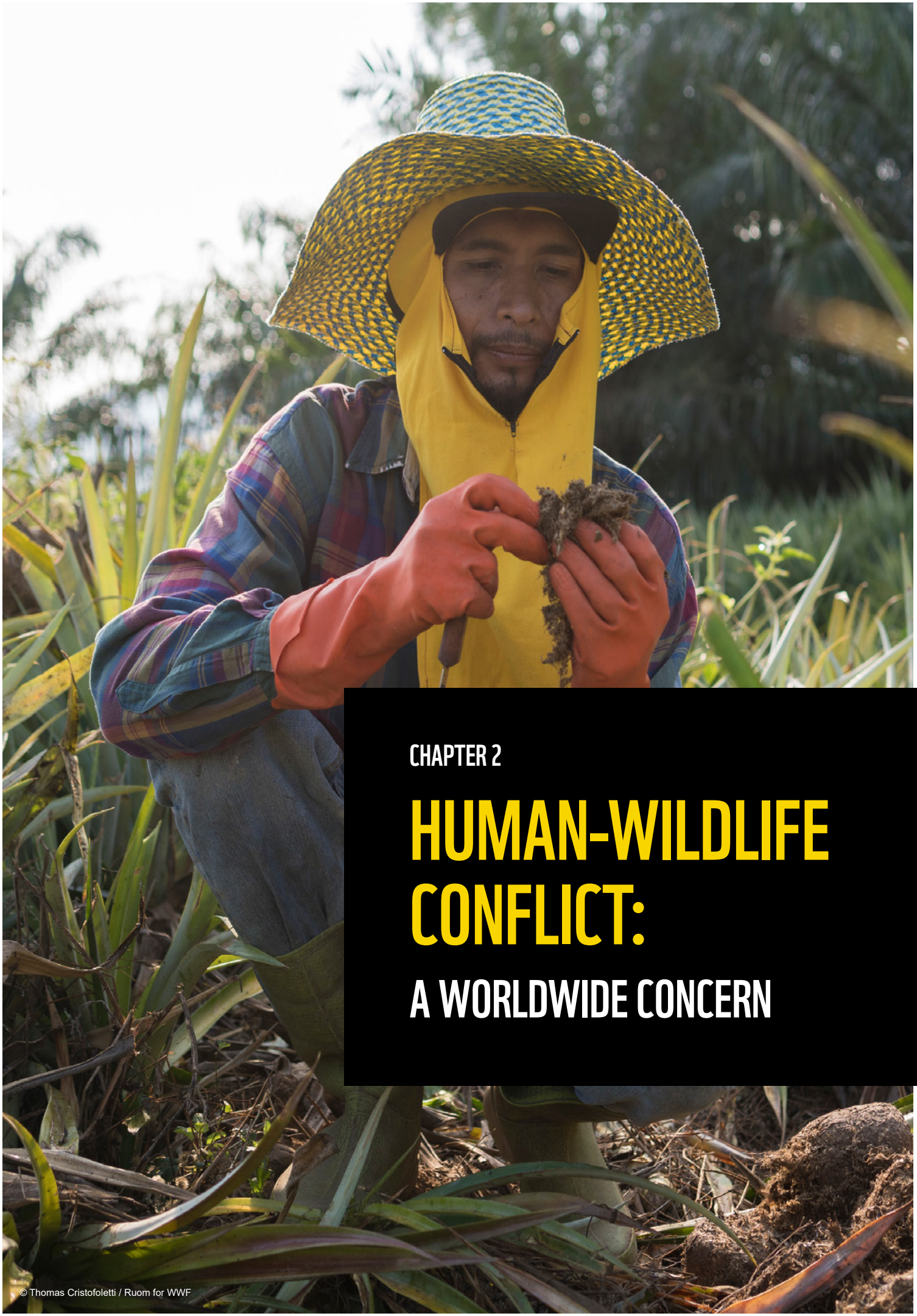
Average monthly income per capita in Bardia, Nepal [22]

US$20

Average per-species cost of crop damage per household and incident in Bardia, Nepal [23]

US$73

Average cost of property damage by elephant per household and incident in Bardia, Nepal [24]



CHAPTER 2

HUMAN-WILDLIFE CONFLICT:

A WORLDWIDE CONCERN

© Thomas Cristofoletti / Ruom for WWF

Conflict between people and wildlife is a constant. Fight-or-flight stress responses were a normal part of daily existence for early humans, who lived in a persistent state of alertness to avoid being killed or consumed by the wildlife they lived alongside.

These conflicts escalated when humans started cultivating plants in 13,000 B.C. [25] and domesticating animals for food in 8,000 B.C. [26]. Communities in all parts of the world have tried to minimise encounters with wildlife that lead to crop and livestock losses and threaten personal safety. As humans migrated around the world, they systematically eradicated large mammals, in particular, which led to local or complete extinction of species such as wolves in Europe [27], Balinese and Javan tigers in Indonesia [28], and thylacines in Tasmania, Australia [29].

Today, the rising demand for space is triggering increased competition between wildlife and people, with habitat loss and fragmentation driving further negative interactions. Depending on culture, social norms, and tolerance, wild animals that harm or kill people and damage their crops, livestock, and other assets are usually perceived as pests and, thus, are removed. HWC has led to the significant decline of species that were once abundant, and species that are naturally less abundant have been pushed to the brink of extinction. In fact, a number of species that regularly come into contact with people are endangered and, therefore, protected by law. Of the more than 260 species of terrestrial vertebrates recorded to have had negative interactions with people, 53 have been declared as threatened [30]. In addition, conflicts with marine species are increasing, though these interactions are comparatively understudied [31, 32].

Marine and terrestrial protected areas cover only 9.67% of the globe [33], and most of these protected areas are disconnected from each other. Therefore, many species depend on human-dominated spaces for their survival, and shared landscapes where both humans and wildlife exist outside protected areas play an increasingly important role for the survival of key species such as large predators and herbivores. Currently, 35% of India's tiger range [34], 40% of the African lion range [35, 36], and 70% of the African and Asian elephant ranges [37, 38] are outside protected areas. Marine species, such as turtles and whales, that travel thousands of kilometres annually, are also increasingly interacting with people [39]. With so much overlap, effective HWC management becomes increasingly necessary.

HWC can also lead to conflict among people over wildlife and HWC management. Disagreement about, or even strong opposition to, the conservation and management of species involved in conflict is influenced by the underlying social interactions among, and political interests of, different groups of people, which adds to the complexity of HWC [40].

Within this complexity, it is important to acknowledge that human activities and land use changes have pushed many species to the brink of extinction. In a crowded world where HWC is accelerating this rate of loss and pitting people against wildlife, we must find pathways to coexistence. The time has come to step back and rethink how we can work together to reduce and manage conflicts between people and wildlife and foster coexistence for the benefit of both.

WILDLIFE IN CULTURE AND TRADITION

Not every human-wildlife relationship is contentious. In many cultures, wildlife played and continues to play an important role in customs, traditions, and religion. The Nanai and Udege people living in the Russian Far East believe that seeing an Amur tiger is auspicious, and hunters leave behind parts of ungulate carcasses as offerings to it. In India, the goddess Durga is believed to ride a lion or tiger while fighting demons. In the Mesoamerican Mayan culture, people considered the jaguar a god and worshipped it as a wanderer between the living and spirit worlds. In the Hindu cultures of South Asia, elephants are associated with Ganesha, the beheaded god whose head was replaced by that of an elephant. Ganesha, said to be the remover of obstacles, is still one of the most popular deities, with the elephant worshipped as his living embodiment.

WHAT DRIVES HWC?

HWC results from a variety of ecological and anthropogenic drivers that exert pressures on landscapes where humans and wildlife share space. Ecological drivers include seasonal changes, natural calamities, and animals' life cycles, as well as the movement patterns of animals [41]. Anthropogenic drivers, such as habitat loss, changes in land use, livestock management, expansion of agricultural practices, climate change, resource extraction, infrastructure development, and urbanisation, increase the potential for HWC [1, 42, 43]. Generally, an increase in the area of land and sea that is shared by people and wildlife – usually caused by diminishing areas available for wildlife to exist away from human disturbance – drives HWC. History, perceptions, attitudes, and cultural beliefs also shape the dimensions of this conflict [44], making it even more unpredictable.

Each driver of conflict generates multiple pressures, which, in turn, have several negative impacts on biodiversity and human welfare. Each negative impact emerges from a complex web of interactions between drivers, making it extremely difficult, if not impossible, to view the effect of one driver in isolation. For instance, if forests are cleared for settlements or agriculture, or roads are cut into previously inaccessible areas, habitat loss and fragmentation result [45], forcing wildlife and people into closer proximity to each other. This problem may be further compounded by the degradation of wild habitat caused by suburbanisation and the expansion of livestock grazing [46, 47]. Such changes also drive species to shift their territorial and movement behaviour, and once that old habitat is lost, wild species invariably come into more frequent contact with people. This habitat loss imposes biotic pressures on wildlife populations and, at the same time, these pressures may be exacerbated by the effects of factors such as climate change or the increase in wildlife populations resulting from ongoing conservation efforts [41].

Combined, these multiple pressures may result in wildlife threatening or destroying human life or property, thereby setting off social and economic repercussions. In order to understand HWC and develop strategies for coexistence, we need a holistic overview of its drivers and an understanding of how they interact with one another.

A SELECTION OF KEY DRIVERS AND PRESSURES THAT LEAD TO HWC

DRIVERS

- Human population dynamics
- Human resource requirements
- Land use change
- Extractive industries
- Linear infrastructure
- Perceptions of nature
- Market forces
- Policy effects
- Wildlife population dynamics
- Wildlife behaviour
- Climate change

PRESSURES

- Habitat loss and fragmentation
- Disturbance of wildlife
- Blocking of wildlife corridors
- Extreme weather events
- Natural calamities
- Invasive species
- Economic hardship
- Attractants such as waste, human food, highly palatable crops, and livestock

IMPACTS

- Crop damage
- Property damage
- Livestock damage
- Food and livelihood insecurity
- Human loss of life and injuries
- Decreased human well-being and health
- Change in tolerance of wildlife
- Non-lethal control of wildlife
- Translocation of wildlife
- Culling of wildlife
- Retaliatory or defensive killing of wildlife

DEFORESTATION DRIVES HWC IN SRI LANKA

In the 1920s, nearly 50% of Sri Lanka was covered by forest, but by 2019, this coverage had dropped to about 21% [48]. On a 65,000 km² island with a human population of 21.6 million, approximately 6,000 elephants, disappearing habitats, increased human activities, and growing road networks, space is at a premium. Elephants frequently come into conflict with people when passing from one forest patch to another or when feeding on crops outside their shrinking natural habitat. Between 2010 and 2019, researchers recorded an increase in conflicts, with a growing number of people and elephants killed [17]. Even though deforestation and land conversion are not the only causes of increasing human-elephant conflict in Sri Lanka, they are important drivers and root causes.

CLIMATE CHANGE DRIVES AN INCREASE IN HUMAN–POLAR BEAR CONFLICTS

Message:	Melting sea ice increases the probability of negative human–polar bear interaction.
Location:	Arctic
Species:	Polar bear
Organisations:	WWF-Arctic Programme
Contributors:	Melanie Lancaster (WWF-Arctic Programme); Sybille Klenzendorf (WWF-Germany); Kaare Winther Hansen (WWF-Denmark); Brandon Laforest (WWF-Canada); Elisabeth Kruger (WWF-US); Varvara Semenova (WWF-Russia)

The negative effects of climate change are becoming increasingly significant. In fact, climate change is altering entire ecosystems. For wild animals that have adapted over thousands of years to their habitats and food and water sources, even small alterations pose extreme challenges. Polar bears are the largest bears in the world and the Arctic's top predators. Inhabiting Canada, Greenland, Norway, Russia, and the United States, they have evolved to live mainly on sea ice and are reliant on it for practically all aspects of their lives, including hunting, travelling, and finding mates.

Polar bears and coastal Indigenous Peoples of the Arctic have lived alongside each other for thousands of years, and the region's predictable and reliable sea ice habitat was an area of limited interaction between people and polar bears – until recently [49]. Global climate change is warming the Arctic at more than twice the rate of the rest of the world [50], and this is having a profound effect on the extent, age, and seasonal duration of sea ice. The sea ice that remains is younger and thinner, melts earlier, and refreezes later [51], which allows for more human activity in the Arctic in the form of offshore oil and gas exploration and extraction, trans-Arctic shipping, and recreational activities such as tourism [49]. At the same time, this loss of critical habitat for polar bears is forcing them onto land, which brings them into closer proximity to people [52]. Additionally, scientists have registered an increased number of nutritionally stressed bears that spend longer periods of time on land near people [53]. While on land, polar bears in some parts of the Arctic are supplementing their diet with terrestrial food sources, including eggs from bird colonies, which can bring them closer to the local people who harvest birds and bird eggs [54]. Polar bears are also getting more accustomed to the anthropogenic food sources they find in villages and communities, including food waste in landfills and food stored for human and domestic animal consumption.

Occurring in parallel with this diminishing sea ice habitat, improved polar bear protection measures have resulted in local increases in polar bear numbers in some areas [55]. Some Indigenous communities in Canada have also observed changes in polar bear behaviour; some bears have become less afraid of people and are more likely to have negative or even dangerous interactions with them.

Multiple factors lead to polar bears spending more time in close proximity to people, which then forces community members to alter their habits and take safety precautions. In some places, the increasing frequency of human–polar bear conflict is resulting in deadly consequences on both sides, and various initiatives have been implemented to address the problem. Response teams in several coastal villages within the polar bears' range are active in protecting their residents, and trials to construct bear-safe food storage facilities and improve waste management systems are under way.

GLOBAL OVERVIEW OF RECENT DEVELOPMENTS

Throughout history, people who live with wildlife have developed practical approaches to address HWC. In more recent years, researchers and conservationists have also started to recognise HWC as a critical issue that must be addressed.

The 2004 International Union for the Conservation of Nature (IUCN) World Parks Congress held in Durban, South Africa, brought the issue of HWC to the global stage for the first time [56]. Thereafter, the broader conservation community recognised the need for addressing the growing challenges of HWC for protected area management and conservation and published recommendations for governments, institutions, and organisations [57]. The recommendations included strengthening HWC management through the establishment of a national forum, capacity development, national and international cooperation, and national and international funding.

Since then, research on HWC has increased exponentially [1], and conservation groups and other stakeholders have launched multiple projects. The IUCN species specialist groups on elephants, cats, and bears included the topic as part of their work and initiated the development of a suite of HWC management methods, many with a technical focus [58]. Where political and economic responses were developed, HWC management programmes focused on areas adjacent to protected areas, multiple use zones, and wildlife corridors [59]. In 2008, the conservation community began to identify and discuss the need to better integrate the human dimension into HWC management [60]. Scientists have since come to recognise conflicts between different groups of people over the issue of wildlife as part of HWC [40, 61]; in response, capacity trainings were developed aimed at scaling up conservationists' participatory methods for conflict assessment and mediation [62]. This need to understand the underlying issues driving HWC and address them at the local, regional, and national levels has led to the use of more holistic approaches to achieving human-wildlife coexistence [62, 63]. An increasing number of countries have launched official policies and governance initiatives to address HWC by implementing land use planning and developing uniform HWC management strategies [41]. In 2016, the IUCN Species Survival Commission (SSC) Human-Wildlife Conflict Task Force was established as an interdisciplinary advisory group offering guidance, resources, and capacity building.

TIMELINE

selected milestones in the development of HWC management

1990-2005

IUCN African elephant specialist group gave recommendations on human-elephant conflict management.

2005

Book People and Wildlife: Conflict or Coexistence? broadens the discussion on HWC.

2009

Human-wildlife conflict collaboration, later renamed CPeace, launches capacity-building programme on conflict transformation.

2016

IUCN SSC Human-Wildlife Conflict Task Force is set up to support professionals working on HWC.

1987

The International Bear Association and the IUCN Bear Specialist Group start to focus on HWC.

2004

IUCN World Parks Congress, South Africa, recognises the need to address growing challenges of HWC.

2008

Pathways Conference discusses the need to better integrate the human dimension into HWC management.

2010-2015

Scientists and conservation practitioners recognise HWC as including conflicts among different groups of people regarding wildlife.

2019

Book Human-Wildlife Conflicts and the need to Include Coexistence broadens the discussion of coexistence concepts.

Despite all these efforts, we are failing to significantly reduce HWC and create sustainable and mutually beneficial coexistence between people and wild animals. There is a general lack of standardised monitoring of HWC and its drivers. Plus, the local, topical focus on technical measures, such as those that are funded by small grants and use local resources to prevent herbivores from entering crop fields or to decrease livestock predation, is disproportionate to the magnitude of the problem. The piecemeal application of interventions and the absence of scaled-up and tailored holistic approaches leave local communities to carry the burden of conservation and the global responsibility of protecting endangered species and biodiversity.

As learning and knowledge exchange increase among local communities, conservation and development managers, economists and educators, and social and natural scientists, the global dimensions of positive and negative impacts of human-wildlife interactions and the need to foster human-wildlife coexistence are continuing to come to light. For instance, efforts are under way to develop IUCN HWC guidelines and a HWC standard, led by Griffith University and supported by Luc Hoffmann Institute [64], and to define broader, new conservation models such as 'Convivial Conservation' (led by Wageningen University) that place human-nature coexistence at the centre of broader transformations [65]. In addition, great community-led initiatives are continuously being developed and implemented.

Today, we understand that the future of wildlife, particularly that of large and emblematic key species, depends on the capacity and willingness of humans to coexist with these animals. We need to recognise not only that human-wildlife conflict is a wide-ranging concern that must be addressed by the global community but also that people who live with wildlife and manage the human-wildlife interface on a daily basis should play a leading role in shaping HWC models into the future.

THE IUCN SSC HUMAN-WILDLIFE CONFLICT TASK FORCE

Contributor:
Alexandra Zimmermann (IUCN SSC HWCTF)

The IUCN SSC Human-Wildlife Conflict Task Force (HWCTF) is a global advisory group and think tank that aims to support professionals working on HWC by providing interdisciplinary guidance, resources, and capacity building. The IUCN established the HWCTF to foster connection between policymakers, scientists, and communities and to assimilate knowledge and capacity for HWC management across IUCN members and the wider conservation community.

The HWCTF endeavours to increase understanding and awareness of the complexities of conflict; facilitate collaboration among practitioners, policymakers, scientists, and communities; catalyse resources and efforts committed to good HWC management; encourage preventive mitigation of emerging HWC; and integrate effective policies for HWC into major biodiversity and development agendas.

The HWCTF website, at www.hwctf.org, includes the most comprehensive and continually updated free, open-source library of recommended literature, manuals, and materials on HWC and coexistence. Since its launch in 2017, the site has received over 38,000 visitors from 190 countries. The HWCTF also leads global policy work, including the production of the IUCN SSC Position Statement and the IUCN Guidelines on Human-Wildlife Conflict. The group frequently provides advice to organisations, individuals, and governments and liaises across IUCN commissions and groups on this highly interdisciplinary subject.

CHAPTER 3

THE GLOBAL IMPACT OF HUMAN-WILDLIFE CONFLICT

© Staffan Widstrand WWF

People and wildlife share half the Earth's terrestrial surface [15], and these shared spaces are growing.

The resulting competition for space and resources means that the impacts of HWC are being felt around the world – not just by communities that suffer from crop or livestock loss or by wildlife living in biodiverse areas but also by the whole global community, which indirectly experiences the effects of HWC through the global supply chain and the production of goods. This chapter further illustrates the various impacts of HWC, grouped into six categories.

Chapter 3.1 (Page 25)

IMPACT ON WILDLIFE AND ECOSYSTEMS

HWC threatens the survival of various terrestrial and marine species. While apex predators and emblematic key species are most at risk, more-common species and wider conservation landscapes are also impacted.

Chapter 3.2 (Page 30)

IMPACT ON LOCAL COMMUNITIES

Local communities bear the costs of living with wildlife. These negative impacts shape people's risk perceptions, while cultural and social norms also influence people's tolerance of wildlife. The hidden costs resulting from safety concerns and increased investment in HWC management measures exacerbate the direct financial losses communities experience from HWC.

Chapter 3.3 (Page 35)

IMPACT ON EQUITY

Living with wildlife involves costs, which are unevenly distributed and disproportionately fall to those who live near that wildlife; on the other hand, the benefits of a species' survival are often more widely distributed.

Chapter 3.4 (Page 37)

IMPACT ON SOCIAL DYNAMICS

HWC can pit people against each other when diverse societal needs and responses are inadequately addressed. Such conflicts can be detrimental to communities and undermine the political credibility of governments.

Chapter 3.5 (Page 40)

IMPACT ON COMMODITY PRODUCTION AND BUSINESSES

HWC can negatively affect businesses producing agricultural goods and other commodities, leading to localised food insecurity and decreased productivity and competitiveness for producers.

Chapter 3.6 (Page 41)

IMPACT ON SUSTAINABLE DEVELOPMENT

HWC is as relevant for sustainable development as it is for wildlife conservation, since HWC creates adverse ecological, social, and economic impacts. Moreover, most SDGs have connections to HWC, although that connection is not explicitly mentioned in any formal SDG statements.

Chapter 3.1

IMPACT ON WILDLIFE AND ECOSYSTEMS

Chronic and unmanaged HWC can have detrimental and, in some cases, permanent impacts on ecosystems and biodiversity. People might kill animals in self-defence, or as pre-emptive or retaliatory killings, which can drive species involved in conflict to extinction, as demonstrated by northern hemisphere inhabitants' systematic eradication of bears, wolves, and lynx in the 19th and 20th centuries in order to prevent livestock predation and increase human safety. Such conflicts were devastating for these species, especially those with naturally low densities and slow reproduction.

Every species fulfils a role in its ecosystem; therefore, that species' removal usually has negative consequences for the system. The loss of apex predators, for example, causes cascading effects on the entire system. Their absence can lead to an increase in prey species such as deer and wild boar, which then results in negative impacts on ecosystems' vegetation. Intensive grazing or browsing by these herbivores hampers the natural rejuvenation of forests [66]. For example, the reduction of large carnivores in many African protected areas resulted in a population increase of baboons that caused massive damage to crops [67].

Conversely, the elimination of wild ungulates and changes in predator population dynamics may change the hunting behaviour of predators, leading to livestock predation. In Pakistan, when communities controlled the population of crop-feeding deer, the common leopard began preying on livestock [68].

In mosaic landscapes that include protected and mixed land use areas such as agricultural land and human settlements, natural habitats are fragmented, with wildlife travelling through human-dominated landscapes as they move between protected areas. Far-ranging species such as tigers, which leave the crowded home range of their mother to find their own territories, are often killed in adjacent anthropogenic landscapes [69, 70].

If dispersing individuals are consequently removed from these human-dominated areas, populations of species even within the protected areas may be significantly impacted.

This is particularly the case for species with a naturally low density, such as jaguars, leopards, lions, and bears [71-74]. Globally, conflict-related killing affects more than 75% of the world's felid species, as well as many other terrestrial and marine carnivore species and large herbivores [75]. In light of this, HWC must be acknowledged as one of the major threats to the long-term survival of some of the world's most emblematic species.

While HWC management efforts often focus on charismatic and threatened species, HWC also regularly involves more common species, such as various birds, insects, ungulates, and rodents. These abundant generalist species have high reproductive output but rarely receive public attention even though they often cause significantly higher levels of damage [13]. For instance, the annual agricultural damage by wild boar (2,500 km2) totalled US$670,000 in Luxembourg alone between 1997 and 2006 [76], suggesting that wild boar likely cause millions of dollars in damage every year throughout Europe. But because boar are abundant, they are not under protected status; farmers are therefore unable to receive compensation or HWC management interventions for any damage they cause, as these schemes focus on damage by threatened species. Instead, wild boar are often classified as vermin or agricultural pests and are removed through poisoning, trapping, or shooting.

The sparse attention paid to managing the significant damage caused by more common species can influence people's perception of the risk posed by emblematic protected species, which then become scapegoats for any damage caused by wildlife [77]. Research has revealed that damage caused by wild boar in Eurasia and Africa [78, 79], deer species in the United States 80, and antelopes on the African and Asian continents [81, 82] is often attributed to protected species. Farmers in Asia who experience frequent crop damage from wild boar (a common species with low protection status) may over-report the damage caused by an elephant (a species with high protection status) because that is the only way they can obtain compensation for their losses [83].

While killing wildlife because of HWC has direct effects on species, HWC may also lead to indirect consequences, such as behavioural change. Some species become more active at night [84, 85], reduce the size of their home range in human-dominated areas [86], or shift their territory to avoid people. Such changes in behaviour result in fewer negative human-wildlife interactions, which is often perceived as an indicator of successful coexistence; however, these behavioural changes can also result in higher costs for wildlife. On the coast of the eastern Mediterranean Sea, for example, fishers killed monk seals that occupied open beaches for decades – including by dynamiting their breeding caves – because the competition for fish was so intense [87]. The seals stopped using open beaches for breeding and began occupying smaller, less suitable caves that were not as accessible to humans. Though negative interactions with humans decreased, the seals' breeding success also declined [88, 89].

THREATENED SPECIES AND RECENT HWC TRENDS

1 **African lion** - *Panthera leo*

Lions are killed in retaliation for damage to livestock – due to misperceptions when other species are, in fact, responsible for the livestock predation – or out of fear [90].

2 **Cheetah** - *Acinonyx jubatus*

Although cheetahs seldom prey on livestock, 48% of cheetah mortality in Namibia has been attributed to retaliatory killing [91].

3 **African elephant** - *Loxodonta africana*

African elephants are a far-ranging species and can cause damage in areas where farmland and human habitation have replaced natural habitat. Depending on the jurisdiction, they can be legally killed as problem animals when damage is high, and they are sometimes illegally killed in retaliation [92].

4 **Gorilla** - *Gorilla spp.*

Gorillas consume fruits and leafy vegetables cultivated by communities living adjacent to their forest habitats. When they leave protected areas to consume crops, they become the target of retaliation [93].

5 **Mauritius fruit bat** - *Pteropus niger*

Fruit bats feed on wild fruits but are also attracted to fruit trees on farms and in orchards, where they are culled due to fear of disease transmission [94].

6 **Asian elephant** - *Elephas maximus*

Asian elephants migrate long distances and can cause crop and property damage and threaten lives, which often results in retaliatory killing. HWC is a significant threat to this species and has caused population declines in the past few decades [95].

7 **Tiger** - *Panthera tigris*

Tigers generally avoid encounters with people but can prey on livestock or attack humans. Retaliatory killing by people makes up 50% of tiger mortality [96].

8 **Philippine crocodile** - *Crocodylus mindorensis*

Rural fishing communities in the Philippines regard crocodiles as vermin, as they compete for fish and may attack people. Deliberate killing of crocodiles is a major threat to their survival [97].

9 **King cobra** - *Ophiophagus hannah*

The king cobra, the longest venomous snake in the world, is indiscriminately killed by people. Deaths from snake bites and misperceptions about snakes make coexistence difficult in most parts of the world [98].

10 **Snow leopard** - *Panthera uncia*

Snow leopards increasingly come into conflict with herders due to livestock predation. Of all snow leopard killings worldwide, 55% resulted from HWC [99].

11 **Common leopard** - *Panthera pardus*

Leopards frequently stray close to human habitations, prey on dogs and livestock, and occasionally kill people. In Pakistan, their numbers have significantly declined as a result of retaliation [68].

12 **Great white shark** - *Carcharodon carcharias*

There is a significant tension in Australia between the need to conserve and recover depleted shark populations and the issue of human safety, particularly because frequent high-profile shark attacks have occurred in recent years [100].

13 **Jaguar** - *Panthera onca*

Jaguars tend to prey on livestock; 88% of ranchers interviewed in the Brazilian Pantanal believe that jaguars are shot to prevent cattle losses [101]. Local extinctions, like those in El Salvador and Uruguay, are a result of such killings.

14 **Amazon river dolphin** - *Inia geoffrensis*

Dolphins break artisanal fishing nets and feed on the fish, causing economic losses for fishers [102]. In the Amazon, fishers kill river dolphins in retaliation, which places further pressure on the threatened population.

15 **Polar bear** - *Ursus maritimus*

Polar bears are now more frequently found close to human settlements along the coast due to the loss of sea ice habitat. Conflict leads to the death of people and polar bears [53].

16 **Grey wolf** - *Canis lupus*

In several European countries, the wolf had been eradicated due to HWC. Wolf populations are now making a comeback, but because of deep-rooted intolerance, they are still illegally killed [103].

17 **European hornet** - *Vespa crabro*

Population dynamics and conservation status of insect species are poorly monitored. The hornet in Germany is an exception; it has been placed under strict protection to avoid its extinction due to nest destruction by people who are afraid of hornets [104, 105].

18 **Mediterranean monk seal** - *Monachus monachus*

The Mediterranean monk seal, the only seal species in the region, is under threat; 20% of the species' mortality is attributed to deliberate killing by fishers who see them as competitors [87].

19 **Bearded vulture** - *Gypaetus barbatus*

These vultures only consume the bones of carcasses but have been hunted to extinction in the Alpine region due to the misperception that they prey on lambs and small children [106].

Footnote: The level of conflict varies significantly by species and by geographical area.

THE CONNECTION BETWEEN HWC AND WILDLIFE CRIME

Poaching and the illicit trade of wildlife are major threats to the survival of many species [107, 108], and in the past decade, improved protection measures and investigations into illegal wildlife trade have been employed to address the issue [109, 110]. Wildlife trafficking occurs at a significant scale and is global in nature, with organised criminal syndicates known to be involved in wildlife trafficking while trading in contraband such as narcotics and arms [111]. Due to a lack of research, scant available information, evidence, and data, the connection between illicit trade of wildlife and HWC is not fully understood, although there are some documented connections [112]. For example, TRAFFIC's study on the snow leopard trade suggested that about 60% of the pelts that are on the market originate from animals killed in conflict [99]. Also, thanks to increased study of community perceptions and attitudes, the connection between HWC and wildlife crime has become more evident [113].

When governments do not provide a timely and adequate response to the problems of large herbivores destroying crops, carnivores preying on livestock, and fear-provoking animals straying too near human settlements, they inadvertently create an enabling environment for poaching. When communities that generally embrace conservation goals feel ignored by local authorities, they may, in some cases, collaborate with poachers to rid themselves of the problem wildlife. The disappearance of conflict-causing animals or their body parts has been reported all around the world [103, 114].

Adding to this, inadequate judicial processes make it difficult to accurately differentiate between wildlife crime and killing in self-defence. Many jurisdictions regard the killing of a protected species in defence of one's crops, property, or life as a moderate offence, but the defence claim can also be used to cover up illegal activities. Balanced and effective judicial systems and a stronger focus on evidence are necessary to avoid such false claims.

THE CONNECTION BETWEEN HWC AND WILDLIFE CRIME

Message:	If not addressed adequately, HWC may drive wildlife crime.
Location:	Myanmar
Species:	Asian elephant
Organisations:	WWF-Myanmar; Forest Department; Forest Police; Emergency Elephant Response Units of Myanma Timber Enterprise; Friends of Wildlife
Contributors:	Margaret Nyein Nyein Myint and Paing Soe (WWF-Myanmar)

With its vast, forested landscapes, Myanmar is a South East Asian stronghold for Asian elephants, but dwindling habitat resulting from deforestation is leading to increasing crop damage [115]. Simultaneously, an alarming trend in elephant poaching – not for ivory but for skin – has come to light [116, 117]. Investigations revealed that poachers received valuable information about the presence of elephants from local people who were affected by human-elephant conflict, such as farmers, grocery store owners, and tea shop keepers. Non-local poachers looking to obtain elephant skin came from afar to offer their 'services': to rid the community of the damage-causing elephants in exchange for information on the elephants' location and community members' silence [118]. In 2017, WWF joined with national and local partners to launch elephant protection efforts in three poaching hotspots in Myanmar.

There are also efforts underway to help farmers and local people manage and reduce conflicts with elephants for long-term conservation benefits. As a result of these efforts to work intensively with communities to implement crop protection measures, develop livelihoods, and monitor elephants while simultaneously improving law enforcement efforts, both poaching and HWC rates have declined significantly.

© Myanmar government field team

Chapter 3.2

IMPACT ON LOCAL COMMUNITIES

Wildlife directly affects communities living in or near protected areas, wildlife corridors, or other human-wildlife interfaces. Individual impacts vary from person to person within communities. The most evident and direct negative impacts to people from wildlife are injuries and the loss of lives and of livestock, crops, or other property. Herders within multiple-use zones experience livestock predation; farmers living near remote wild areas lose crops to herbivores; and people fishing, hunting, or moving on foot or bicycle from one settlement to the next have fatal encounters with predators or large herbivores. The level of conflict and magnitude of damage depend on the context and can negatively affect food security, livelihoods, and well-being throughout the community. Such negative impacts of HWC are exacerbated in vulnerable, poor, and marginalised communities that may lack alternative income sources [113].

DIRECT IMPACTS ON COMMUNITIES

© Marten van Dijl

Globally, at least 24 species of terrestrial carnivores regularly prey on nine common species of livestock [119]. Species like wolves in Europe; leopards, hyenas, and lions in Africa; tigers, leopards, and snow leopards in Asia; jaguars in Latin America; and cougars and coyotes in North America hunt livestock, mostly at dusk or dawn. Marine carnivores, such as seals, dolphins, and otters, and avian species such as cormorants prey on fish stocks in fish farms and other fisheries, such as those that employ gill netting [120-122].

Herbivores cause damage to crops by directly consuming or trampling them. In Asian and African countries, elephants cause significant damage to farms by feeding on or moving through a large variety of crops and crop fields, including maize, rice, oil palms, and fruit trees [82]. Deer and antelopes are known to feed on the young leaves of plants, while monkeys, despite their small size, can cause massive damage, particularly to freshly sown fields [123]. The wild boar is a species known globally to cause extensive damage to farms adjacent to forests or wooded areas [79].

© James Morgan/ WWF-US

© Femke Hilderink/ WWF-Netherlands

While moving through or searching for food in villages, elephants damage houses and grain stores [24]. In arid areas, they sometimes break water tanks to get to the water within [124]. Brown and black bears occupy a wide range of habitats and are generalist feeders, consuming livestock and crops, damaging beehives, or causing collateral damage while searching for food [125]. Large-bodied marine species, such as turtles, sharks, or whales, damage costly fishing gear while trying to feed on fish caught in the nets [126].

The most severe impact from negative encounters with wildlife is death of or injury to people. Apex predators such as leopards, tigers, lions, polar bears, and sharks attack people relatively infrequently [59], but these attacks can be lethal. In Asia and Africa, venomous snakes cause the highest proportion of wildlife-caused human fatalities [127]. Crocodiles, elephants, and, in some areas, hippos account for a large portion of the human fatalities involving wildlife on the African continent [128, 129]. Globally, most fatalities occur as a result of incidental encounters with wildlife, such as while people are travelling on foot or bicycle or carrying out subsistence activities in wildlife-rich landscapes, or as a result of vehicle and wildlife collisions [130, 131]. Added to the sorrow of losing a family member is the economic impact on the family of losing a breadwinner and the costs associated with funeral or medical expenses in the event of injury. Such costs can be substantial, particularly for low-income families [132].

© WWF-Nepal

Whether it is livestock, crop, or property damage or human casualties, damage frequency can be highly variable within and among geographic regions and can fluctuate over time [13, 133]. While some farms within a community may suffer little damage, neighbours may experience surplus predation in which a predator may kill many animals in one attack or a group of, for example, elephants may damage the entire harvest overnight [134]. Generally, the damage small-scale landholders experience may be more severe than that suffered by bigger enterprises that can afford proper protection measures and have the economic capacity to buffer against losses.

HIDDEN COSTS TO COMMUNITIES

Added to the more obvious impacts of HWC on communities are the more obscure effects, which are largely psychological, physical, or social in nature [135, 136]. Any unexpected loss of crops, livestock, or life can have cascading financial, psychological, and social effects over generations, especially for the more vulnerable members of society, such as those with minimal savings and limited household income [137].

HWC can result in changes in workload and gender roles, and it can leave those affected burdened with the stigma associated with losses. Opportunity costs arise when community members must alter their daily livelihood routines and duties to avoid wildlife interactions or manage HWC [136, 138]. Damage to agriculture and infrastructure caused by wildlife increases the workload for men and women because they are forced to replant and rebuild. Often, men face pressure to leave the village in search of work to supplement lost income, and women take on the physically demanding role of salvaging damaged crops [139]. The threat of wildlife encounters drives farmers to guard their fields day and night, which results in additional labour and loss of sleep [140]. Additional and unforeseen transaction costs from HWC result from, among other things, purchasing more food due to loss of food supplies, borrowing money, applying for loans to fix damaged infrastructure, and purchasing medication to treat health issues resulting from conflict events, all of which place added burdens on a family's finances [132, 138, 141].

Psychologically, many communities that live near wildlife experience chronic fear and stress over wildlife encounters [138]. Fear restricts social interactions; children miss school when potentially dangerous wildlife is around; and people become reluctant to travel in case they experience similar conflicts again – and the psychological effects of chronic fear and stress are often permanent [132]. Casualties from HWC can also result in significant psychological suffering for family members, who not only deal with mourning their loss but also face disruptions to the family's economic labour force and social structure and suffer associated cultural stigma [135]. A study in India found that over 50% of widows of tiger and crocodile attack victims suffered from poor physical and mental health [135], and others viewed them as unlucky [142, 143].

If a family's sole income earner is killed or injured as a result of HWC, remaining family members have to take on disproportionate responsibilities in order to secure the family's livelihood. In many societies with high HWC, traditional gender roles dictate that those left shouldering most of the burden are usually the women in the family, who must take on additional responsibilities despite limited education, opportunity, and physical ability to do so [132, 136, 138, 141].

HOW PERCEPTIONS SHAPE TOLERANCE

Culture, tradition, perceptions, and attitudes towards wildlife shape tolerance, which is central to achieving coexistence. Attitudes are influenced by various factors – and the magnitude of damage caused by a species is just one such factor.

Perceptions towards wildlife vary widely culturally, geographically, and between rural and urban areas [1, 144] and are influenced by positive or negative wildlife interactions, cultural and religious values, social factors, education, and knowledge. Urban populations generally experience fewer wildlife interactions, so their perceptions tend to be more positive towards emblematic wildlife species, whose beauty and strength they admire rather than fear [145-147]. Rural populations that rely on nature-based resources and are more exposed to wildlife have higher risks of damage and carry the day-to-day costs of living with wildlife. Their corresponding perceptions towards wildlife can be more unfavourable [148]. However, indigenous communities tend to have complex, nuanced relationships with wildlife and nature, on which their lives and livelihoods traditionally depend [149, 150].

While all risks and costs shape attitudes, studies have shown that intangible costs (such as the need for hypervigilance, the inability to move freely, and regularly feeling unsafe) are highly important in explaining attitudes towards wildlife – possibly even more important than direct losses [151, 152]. Even in the absence of immediate threats or negative experiences with wildlife, misperceptions and fear can cause communities to develop negative perceptions. Consequently, the actual impact of a species on human property and safety is not the only factor that influences perceptions of and tolerance towards species. This explains, to some extent, the disproportionate connection between wildlife damage and HWC level. In fact, in some areas, wildlife tolerance is high despite the significant damage animals cause, whereas in other areas, tolerance of wildlife is low even though the damage is minor [63, 153, 154]. This factor is crucial in understanding why management measures to decrease damage may not necessarily result in a proportional increase in tolerance of wildlife and support for its conservation.

MISPERCEPTIONS OF SPECIES

In some cases, perceived conflict leads to the killing of species that are misunderstood. Red colobus monkeys of Zanzibar, Tanzania, were nearly eradicated because people believed they were damaging palm plantations, which was actually not the case [155]. In the South African Soutpansberg mountains, ranchers killed leopards because they believed the leopards were preying on cattle and farmed impala. However, researchers conducted scat analysis that revealed that leopards were, in fact, not responsible for these losses [156]. In Europe, the wolf's negative image is influenced not just by the livestock damage it causes but also by fairy tales like 'Little Red Riding Hood' [157]. The influence of misperceptions and misbeliefs calls for stronger science-based communication and education, as well as opportunities for positive nature experiences in an increasingly urbanised world.

REACHING THE THRESHOLD OF TOLERANCE

Message:	Local communities are key to the survival of tigers.
Location:	Pilibhit Tiger Reserve, Uttar Pradesh, India
Species:	Bengal tiger
Organisations:	The Uttar Pradesh Forest Department; WWF-India; Wildlife Trust of India; Global Tiger Forum
Contributors:	Dipankar Ghose, Pranav Chanchani, Mudit Gupta, and Ashish Bista (WWF-India)

In India, the prevalence of significant populations of wildlife that live alongside a burgeoning human population is evidence of high levels of tolerance towards wildlife. The limits of such tolerance are constantly being tested in Pilibhit Tiger Reserve, where tigers frequently stray into the agricultural landscape beyond forest boundaries. The Pilibhit area is a study in contrasts. The tiger population is thriving, and tigresses that have established territory in human-inhabited areas have given birth to cubs and raised successive litters in agricultural fields set amidst villages only a few kilometres away from the tiger reserve. The persistence of such farmland tigers suggests that local communities have adapted remarkably to coexistence with tigers. However, such coexistence is brittle and understandably shifts to public fear when people are injured or killed, especially when conflicts recur. More than 60 people have lost their lives to tigers around Pilibhit Tiger Reserve in the past decade. The aftermath of such events can culminate in mob violence; for example, community members have set fire to the camps and vehicles of the Forest Department, which people blame for the HWC incidents. The retaliatory killing of tigers by poisoning and other means is periodically reported, though the exact extent of such events cannot be ascertained.

© Dr. Daksh Gangwar

Despite these devastating losses and occasional eruptions of anger, the public appears to be benevolent towards tigers that do not cause harm. Tiger numbers have steadily increased in Pilibhit in the past decade, and the species is only supported in the area because there is continued social support, conflict notwithstanding. Such tolerance is woven into the fabric of many communities living alongside large mammal habitats in India. In Pilibhit, tolerance has undoubtedly also been fostered through committed efforts to address public grievances and fears through conflict management. When a tiger starts killing people, the management authorities act quickly to track down and capture the 'problem tiger' in complicated multi-week operations. Multiple project partners have worked to manage HWC in and around Pilibhit Tiger Reserve while also working to conserve tigers. For trust and tolerance to be maintained, communities that share space with tigers need continued support. Foremost, human lives must be protected. Additionally, authorities must speedily mitigate economic losses from the predation of livestock. Work is under way to build a comprehensive conflict management strategy for Pilibhit, including streamlined rapid response mechanisms that involve multiple government departments and other agencies. Local people and their tolerance for the tigers they share their space with play a central role in the success story of Pilibhit Tiger Reserve and the conservation of threatened wildlife more widely.

Chapter 3.3

IMPACT ON EQUITY

HWC reinforces inequities at various scales. The economic and psychological costs of living with wildlife disproportionately fall to those who live near that wildlife, while the benefits of a species' survival are often more widely distributed [158]. This uneven distribution persists at various scales both locally and globally [135, 151]. In countries with significant wildlife populations that include large predators and herbivores, Indigenous peoples and rural communities regularly encountering such wildlife carry the burden of living with them. This is especially the case in biodiversity-rich developing nations, while the benefits of maintaining these wildlife populations often flow to developed nations and urban dwellers [144, 159].

Governance may also inadvertently reinforce this inequity. Protection of wildlife, especially endangered species, is typically the responsibility of governments, as they are mandated with executing nationally and internationally determined conservation laws. Often, wildlife protection policies safeguard conservation goals at the expense of the (frequently Indigenous) communities' rights and interests, which causes resentment towards the policies and the government that enforces them, and this exacerbates conflict.

Unmanaged and chronic HWC can also undermine the political credibility of governments. Communities generally blame governments for HWC because they believe wildlife is the government's responsibility. However, many government agencies tasked with managing such conflicts in HWC hotspots lack the resources or capacity to deliver effective HWC management strategies. Where government response to HWC is lacking or considered insufficient, communities lose tolerance of both the wildlife and the government for not acting in support of their needs. In some cases, local communities and Indigenous peoples perceive that governments only take action when, for instance, poachers kill an elephant and not when an elephant kills a person [132, 160]. Such situations can create discontent within local communities and distrust of government and its policies, leading to decreased effectiveness of HWC management, discouragement of civil engagement, and harm to the reputation of the state, all of which impacts the development of local communities.

IN CONFLICT WITH GENTLE GIANTS

Message:	Conflicts over gorillas were deep-rooted in Bwindi and resulted in strong opposition to conservation, requiring the development of fair and inclusive coexistence strategies.
Location:	Bwindi Impenetrable National Park, Uganda
Species:	Mountain gorilla
Organisations:	Uganda Wildlife Authority (UWA); International Gorilla Conservation Programme (IGCP); International Institute for Environment and Development (IIED)
Contributors:	Anna Behm Masozera, Wellard Makambo, and Henry Mutabaazi (IGCP DR Congo, Rwanda, Uganda); Phil Franks (IIED UK)

Bwindi Impenetrable Forest is home to an estimated 459 mountain gorillas that make up one of only two populations of this endangered species. When the national park was set up by an act of parliament in 1991, local people resisted the change because they were subsequently excluded from the area and its resources [161]. As more tourists came to the area and gorillas became habituated to people, crop damage outside the protected areas increased [158]. The Nkuringo gorilla group, in particular, spent more time outside the park feeding on bananas and other crops than they did inside, causing substantial losses to subsistence farmers. By that time, neither governmental nor civil-society structures were prepared to mount adequate responses, so farmers felt ignored. The community's perception that gorillas were valued more than the local people reflected a loss of trust in the government, as they felt the community was not treated equally.

In 1997, the IGCP, which is a coalition of conservation organisations working to protect gorillas, facilitated dialogue in collaboration with the UWA, local government, private-sector businesses, and members of the affected community; the groups agreed upon concerted actions to reduce the impact of crop damage by mountain gorillas and other wildlife species.

An attempt was made to generate income for the community by developing a revenue-sharing scheme in which 20% of the park's entrance fees and a portion of the income from a high-end tourism lodge benefited the community.

Even though tourism revenues were generated and distributed and the lodge was operating, public-private community partnerships proved challenging, as they did not create the desired revenues for those most in need [162, 163]. The tourism revenues were not enough to compensate families that regularly faced crop damage by wildlife. As a result, further development of tourism in and around Bwindi Impenetrable National Park led to increased tensions. Efforts under way to assess the social dimensions of human-wildlife interactions, identify gaps and opportunities for improvement in well-being, create fair access to benefits, and improve participation in decision making are now paving the way to the coexistence of gorillas and people in Bwindi (see also page 80).

© Wellard Makambo, IGCP

Chapter 3.4

IMPACT ON SOCIAL DYNAMICS

HWC can result in diverse societal responses that lead to disagreements among people or groups. If the species in conflict is threatened and, therefore, protected by law, opinions and feelings can be divided among various stakeholders (farmers, Indigenous or local communities, professional hunters, tourism operators, businesspeople, government agents, conservation representatives, and community leaders) [164]. When a HWC event affects a farmer, that farmer may blame the government for protecting the perpetrator that damages crops, while a conservation practitioner may blame industry and farmers for clearing wild habitats and creating the HWC in the first place. Each associated stakeholder may have a different perspective on the wildlife species involved in the conflict; thus, a single event can quickly lead to complex arguments that involve all strata of society.

Such disagreements among different groups of people over wildlife can be significant and result in heated debates, destructive behaviour, and even the total breakdown of communication [132, 165] – none of which is conducive to the collaboration needed for effective HWC management and coexistence. Conflicts among people over wildlife and its management can be highly intense, especially when people unequally share the costs and benefits of coexisting with wildlife and when differences in status and power, as well as deep-rooted communal conflicts, complicate matters [144, 166].

HUMAN DIMENSIONS IN NORWEGIAN WOLF MANAGEMENT

Message:	In Norway, conflicts over wolves and their management have become highly political.
Location:	Norway
Species:	Wolf
Organisations:	Government of Norway; WWF-Norway
Contributors:	Marte Conradi (WWF-Norway) and Ketil Skogen (Norwegian Institute for Nature Research)

Norway shares its wolf population with Sweden; about 85 wolves live in Norway and about 365 wolves live in Sweden. The wolf is listed as critically endangered in Norway and endangered in Sweden. In Norway, wolves are only tolerated within the so-called wolf management zone, which makes up less than 5% of the total land area. This zone is connected to the Swedish wolf areas and has limited livestock husbandry. An extensive national scheme exists to compensate farmers for livestock predation by wolves. Practically any wolf that leaves the zone is culled. To prevent the population from growing beyond the targeted four to six wolf litters per year, hunters are also allowed to kill wolves within the management zone.

With plenty of suitable wolf habitat and top ranking in the United National Human Development Index [167], Norway is very well positioned for the return of large carnivores such as wolves. The country's high HDI ranking is tied to its ability to effectively maintain stable communities in rural areas through extensive government support to primary industries such as farming and forestry. Yet, centralisation and rural decline have recently set in at full force. This has led to national concerns over the loss both a traditional way of life and support for rural communities, along with and strong political opinions – and the wolf is getting caught up in the controversy.

Although wolves do relatively little damage to livestock compared with other large carnivores, the wolf conflict in Norway has become increasingly tense and political in recent years. The conflict has strong social and political causes, originates from different values, and stems from community members not feeling consulted, heard, or included [168]. The conflict over wolves has become a symbol for the rural-urban divide: The hardworking rural communities firmly rooted in traditional land use practices do not feel recognised by what they see as the urban elite. The tension is an unintended consequence of focusing wolf conflict management mainly on livestock farmers while largely ignoring other affected parties, like hunters and landowners [169].

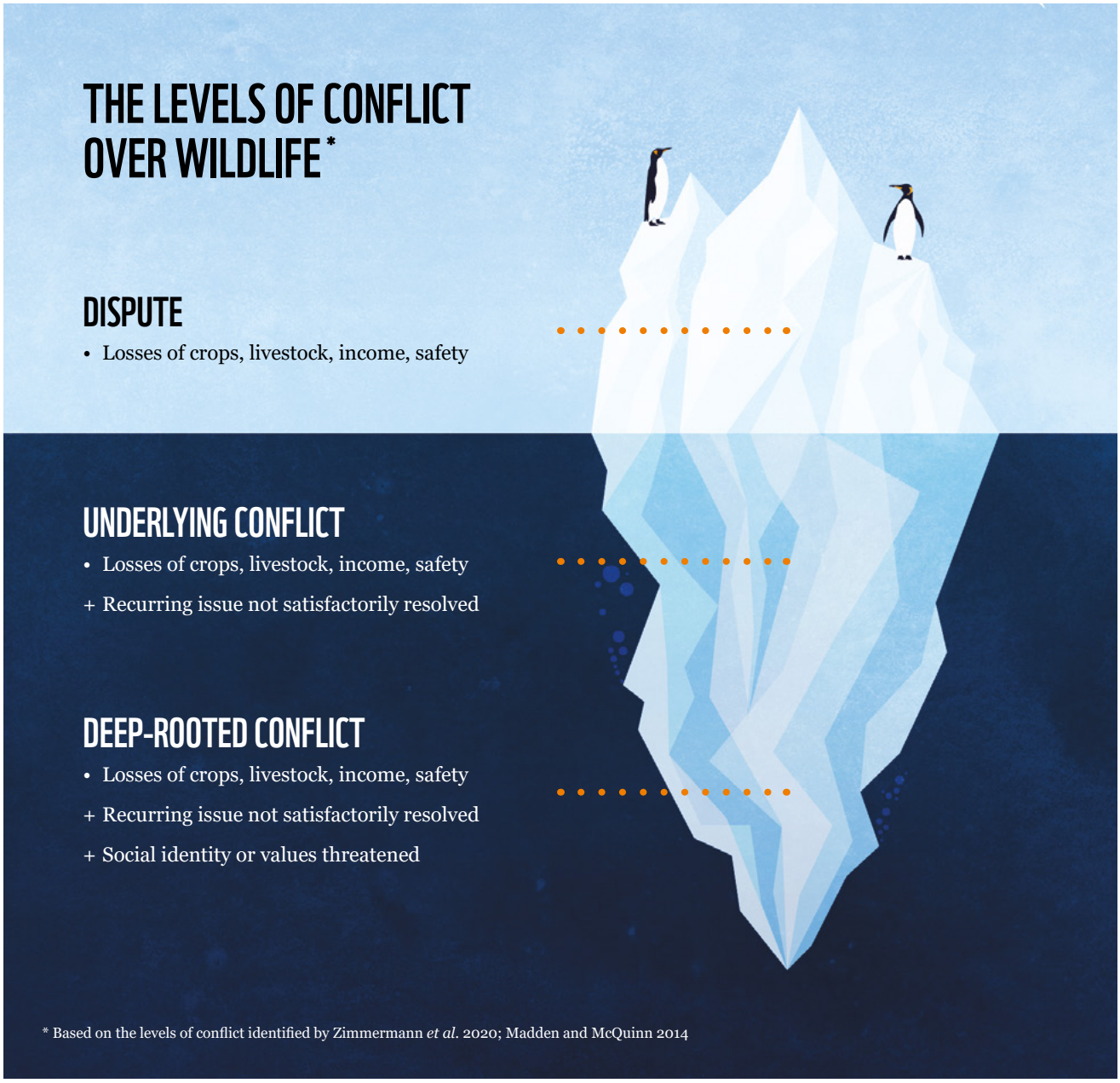
What sets Norway apart from other countries is the attention the wolf issue receives on the national political stage. Conservation, including wolf protection, is becoming a target for political groups that aim to capitalise on rural discontent all over Europe. This effort is gradually bringing human-wolf conflict to a national political level in several countries. Thus, the case of Norway might be seen as a cautionary tale for Europe: HWC cannot be resolved by the conservation sector alone, and HWC management must consider all underlying drivers.

© Wild Wonders of Europe / Widstrand / WWF

THE IMPACT OF UNDERLYING SOCIAL ISSUES ON HWC

Three levels of conflict have been described in the context of HWC [63, 166]. First, anger and distress over losses caused by wildlife are easy to observe and understand, and those immediate reactions are considered to be disputes that make up conflict level 1. Second, community members who experience crop or livestock losses frequently mention additional, underlying issues, such as poor governmental response or compensation for HWC incidents, that complicate the aftermath of such incidents. In Kenya, for example, farmers affected by livestock predation mentioned feeling that governmental authorities do not adequately respond to their losses [170]. This can be an indicator of underlying conflicts that are not visible at first glance and are identified as conflict level 2. Deep-rooted conflicts, which make up level 3, involve the complex social, cultural, and historical contexts of a conflict situation. Often, past or current injustices, such as unfair resettlement of people from protected areas, restricted access to culturally important places, or the criminalisation of hunting by local communities, exemplify the deep-rooted conflicts that then impact how open communities are to addressing HWC management with stakeholders they may view as being responsible for past grievances [160].

The three levels of conflict over wildlife can be visualised as an iceberg, where the visible tip is the evident HWC, and the values, beliefs, and identities shaping the underlying conflict levels are below the water's surface.



Chapter 3.5

IMPACT ON COMMODITY PRODUCTION AND BUSINESSES

Various species significantly impact agriculture and other commodity production, often resulting in food insecurity and negative economic impacts. Insects, weeds, and pathogens wreak havoc on crops and lead to an average 40% loss in annual yields in South Asia and South Africa [171]. However, the impact on commodity production from charismatic and protected wildlife species can also be widely felt and can, for instance, lead communities to abandon traditional crops or even abandon the area entirely [172]. Artisanal fishers suffer significant losses to marine predators, such as in Peru and Uruguay, where southern sea lions forage in the shallow waters of coastal fishery grounds. In more than half of all coastal fishing activities, researchers observed predation of catches by sea lions that resulted in losses of up to 46% [173] and made artisanal fishing unprofitable. In areas where people share their neighbourhood with elephants, farmers can lose up to 100% of their annual harvest of staple crops [174], leading to food insecurity. For subsistence farmers who primarily live on the agricultural produce they cultivate and who generally have access only to a low diversity of crops and no additional income to buffer against losses, such events cause existential hardship [95]. Adjacent to the Bhadra Tiger Reserve, India, each household lost approximately 11% of their annual grain production to elephants between 1996 and 1999 [175].

Besides localised catastrophic crop damage to individual farmers, the food security of a wider region can be jeopardised when damage by wildlife adds to other uncontrollable devastation caused by drought, crop failure, or war. This was the case in north-east Nigeria in October 2020, when a herd of 250 elephants damaged the crops of 8,000 internally displaced people just before the harvest [176].

Commodity production losses resulting from HWC also negatively impact profit margins for the companies that source the products. Furthermore, HWC potentially disrupts operations and causes threats to worker safety [177, 178]. Since HWC impacts the initial stages of economic supply chains, it can have cascading effects on entire value chains. The expansion of agricultural estates and industrial cropping into previously natural ecosystems is leading to an increase in HWC in various places. The blockage of migratory routes, the replacement of natural forage with attractive agricultural products, the introduction of livestock into predators' habitats, and aquaculture in near-shore waters may result in high losses for businesses and wildlife. While these industries' primary focus is on generating a profit, they also must maintain ecosystem functions for a sustainable future and respect the protection status of wildlife species. While operating in areas with a high potential for HWC, businesses may face reputational risk if they don't address the issue appropriately.

In Sabah, Malaysia, Bornean elephants cause large-scale damage on oil palm plantations, which leads to severe conflict and retaliatory killing. The highest mortality was reported in 2018; over the course of that year, 30 elephants were found dead in different locations, mostly due to gunshot wounds and suspected poisoning due to various human-elephant conflict scenarios [179]. From the oil palm concessions' perspective, losses attributable to elephants are significant. In 2012, the company Sabah Softwoods Berhad reported an annual loss of up to US$145,000 (US$426/km2) due to elephants damaging its oil palm crops before the company could implement management measures [180] (for details on solutions see chapter 4, page 86).

Such losses are not unique to Malaysia. The average annual compensation for all livestock damage by carnivores in Europe between 2005 and 2012 was US$41.38 million [21]. At a global level, aquaculture producers of shellfish and finfish estimate losses of up to 10% caused by marine mammals [126]. These marine mammals not only prey on finfish directly but also destroy aquaculture gear, sometimes causing massive fish escapes through torn pens [181].

Chapter 3.6

IMPACT ON SUSTAINABLE DEVELOPMENT

Because HWC is centred on the interaction between wildlife and humans, there is no other theme in conservation that is as strongly linked to the SDGs as that of human-wildlife coexistence, even though it is not explicitly mentioned as one. These connections mean that HWC, if not adequately addressed, can have a considerable negative impact on most SDGs. Correspondingly, sustainable development activities may cause or reinforce HWC if its drivers are not identified and adequately managed.

Human-wildlife coexistence's links with SDGs demonstrate that HWC is not solely a conservation challenge. HWC is as much a humanitarian concern and an issue for social and economic development as it is a conservation issue; thus, HWC management requires multi-sectoral collaboration. In order to further human-wildlife coexistence, the business, economic, and social development sectors must pay attention to the issue and integrate coexistence measures into all their planning and operations. HWC management must be mainstreamed into sustainable development in all regions where wildlife and people share landscapes.

SUSTAINABLE DEVELOPMENT

Sustainability includes the three dimensions of economic, social, and ecological development, which are interdependent and, in the long run, cannot exist without one another. In 2016, under the ambit of the United Nations-led 2030 Agenda for Sustainable Development, 17 SDGs and 169 accompanying targets were agreed upon. Biodiversity conservation goals are summarised under Goal 14 (Life Below Water) and Goal 15 (Life on Land) and share some common aspects with the CBD.

THE CONNECTION BETWEEN HWC AND 15 OF THE 17 SDGS

HWC affects the income of farmers, herders, artisanal fishers, and Indigenous peoples, particularly those living in poverty and without resilience [135].

Wildlife damages food stores, crops, and livestock and puts subsistence farmers at risk of hunger [41].

HWC impacts people's health – both directly, when attacks lead to injury, and more indirectly, for example, when malaria rates increase as a result of farmers' need to protect their crops through the night [135, 136].

Children are often responsible for time-consuming crop and livestock guarding, which decreases school attendance and lowers education standards for pupils in HWC-impacted areas, creating potentially lifelong inequalities [182, 183].

Women carry the highest burden of HWC due to their role in society and culturally defined tasks and responsibilities; for example, not only are they vulnerable to attack by wildlife while collecting natural resources but also, if they are widows, they may suffer high losses because it is culturally unacceptable for them to guard at night [137].

In arid parts of the world, water access may be reduced and risky for people as they compete with wildlife for water sources [184].

HWC can drive the vicious circle of poverty and low livelihood diversity, resulting in the unavailability of occupational work in HWC hotspots [185].

HWC can increase as a result of linear infrastructure development that fails to consider the migratory routes and spatial distribution of wildlife, resulting in vehicle collisions with wildlife or displacement of wildlife [186].

HWC drives inequality of cost and benefit distribution if those who pay the price for living with wildlife do not receive the benefits of coexistence [144].

Facing shrinking natural habitats, wildlife increasingly utilises green spaces in urban areas and pursues non-traditional food sources, which leads to urban HWC, such as human-leopard conflict in the city of Mumbai [187].

Climate change alters habitats and drives human and wildlife behaviour changes, bringing humans and wildlife into closer proximity to each other, which can lead to HWC [188].

Marine HWC negatively impacts the survival of many marine species, including sharks, whales, sea turtles, seals, and polar bears [39].

The survival of multiple terrestrial species, particularly apex predators and megaherbivores, depends on successful HWC management and coexistence [75].

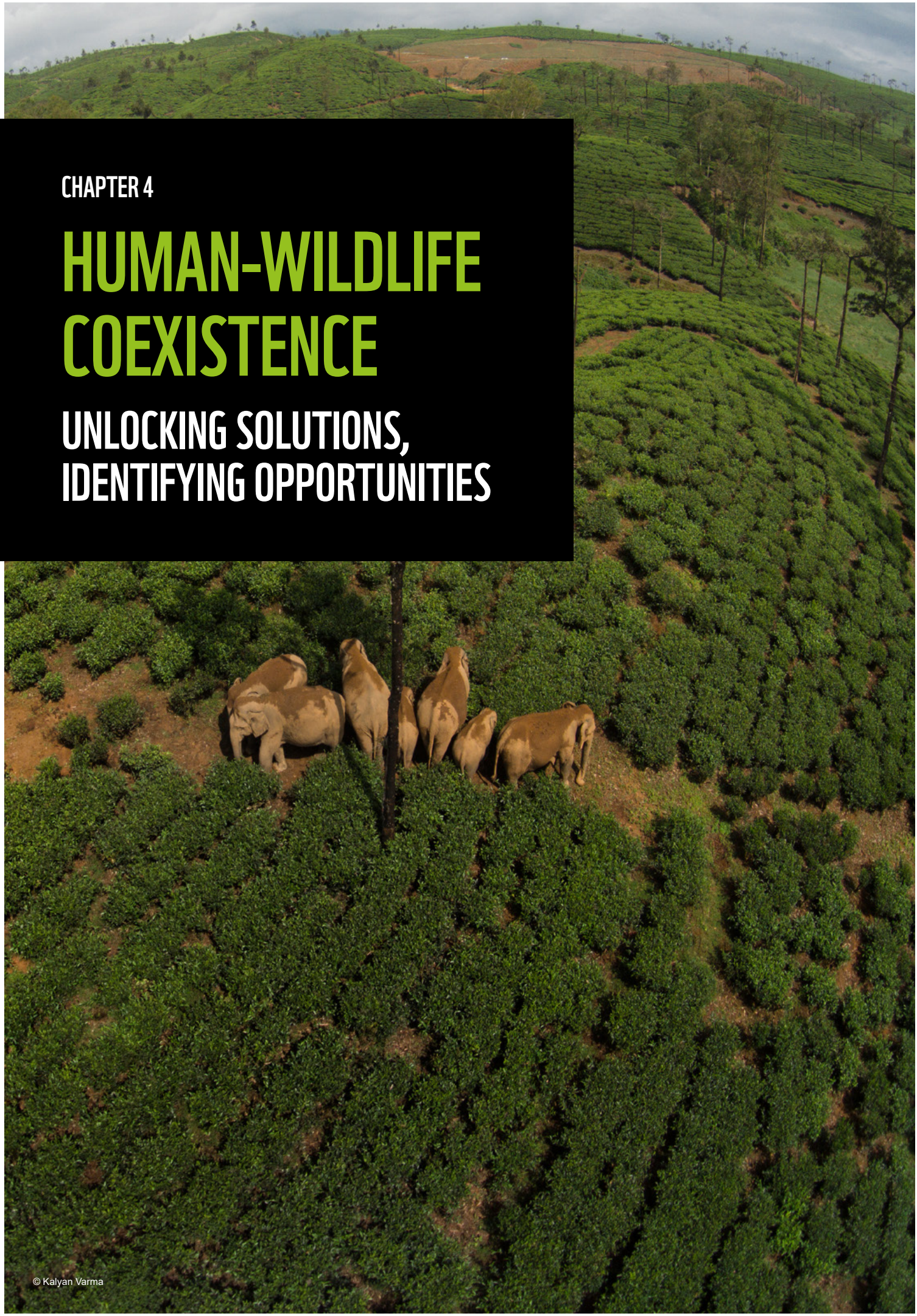
Carnivores and megaherbivores create immediate safety concerns. Also, HWC can lead to demoralising conflicts between groups of people and result in inequities and societal destabilisation [141, 158].

Human-wildlife coexistence and sustainable development both require integrated decision making, participation, and good governance at international, national, and regional levels, plus the involvement of civil society [138, 139, 189].

CHAPTER 4

HUMAN-WILDLIFE COEXISTENCE

UNLOCKING SOLUTIONS, IDENTIFYING OPPORTUNITIES



© Kalyan Varma

Various strategies have been used over the past several decades to manage and minimise the negative impacts of HWC and to move from conflict towards coexistence.

However, approaches that fail to consider the larger context have had limited success in sustaining long-term management of HWC. While completely eradicating HWC is not possible, a successful approach will bring different elements together to create opportunities and benefits not only for biodiversity and impacted communities but for society, sustainable development, production, and the global economy at large. This chapter's selection of case studies and examples illustrates only a fraction of the benefits of comprehensively managed conflict and coexistence strategies. These examples, which demonstrate benefits at the local and regional scale, highlight the need for breaking down silos, bringing various affected sectors together, and using integrated, holistic approaches to address HWC for sustainable impact.

Chapter 4.1 (Page 45)

MOVING FROM CONFLICT TO COEXISTENCE

Moving towards coexistence requires successful HWC management using integrated and holistic approaches that take multiple elements of HWC management into consideration. Two important but often overlooked strategy elements are monitoring and the creation of an enabling policy environment.

Chapter 4.2 (Page 58)

BENEFITS TO WILDLIFE AND ECOSYSTEMS

Human-wildlife coexistence allows wild species to survive in safe places, which allows natural processes to occur and enhances ecosystem services.

Chapter 4.3 (Page 61)

BENEFITS TO LOCAL COMMUNITIES

HWC management can reduce losses and risk to local communities, creating direct, positive impacts on safety, health, livelihoods, and the social life of communities sharing the landscape with wildlife.

Chapter 4.4 (Page 68)

BENEFITS TO SOCIAL DYNAMICS

Holistic HWC management leads to greater stakeholder involvement, better communication, and conflict transformation.

Chapter 4.5 (Page 75)

BENEFITS TO SUSTAINABLE DEVELOPMENT

HWC management can positively impact sustainable development through improving community livelihoods, income, and resilience.

Chapter 4.6 (Page 81)

BENEFITS TO COMMODITY PRODUCTION, BUSINESSES, AND SUPPLY CHAINS

HWC management enhances worker safety and increases revenues for businesses, while certified supply chains connect consumers with producers that live in harmony with wildlife.

Chapter 4.7 (Page 88)

OPPORTUNITIES TO FINANCIAL INVESTMENT

Investing in human-wildlife coexistence offers donor agencies and companies the opportunity to support both people and wildlife.

Chapter 4.1

MOVING FROM CONFLICT TO COEXISTENCE

In a world where people and wildlife increasingly share the same space, the goal of HWC management is to enhance the safety of people and wildlife and to create mutual benefits of coexistence. How people and wildlife interact depends on the specific context of the interaction. Levels of conflict can also vary, with ebbs and flows over space and time based on how people respond to incidents. When a community has low tolerance for such incidents, people may retaliate against wildlife, and conflicts may escalate. At this stage, conflicts might decrease only when wildlife has been extirpated from the area. In such cases, the outcome of zero conflict equates to the extinction of species. However, in many parts of the world, community tolerance of species involved in HWC is high despite the intensity of the conflicts, allowing wildlife numbers to remain high even in human-dominated landscapes. These examples of escalations and of tolerance illustrate the complex nature of HWC.

Despite the complexities, the consensus is that effective HWC management can and must occur for the benefit of all involved. To explore how conflicts can be reduced to a point where people accept wildlife in close proximity, we need to understand the relationships between humans and wildlife.

Conflict between people and wildlife is dynamic. While completely stopping such conflict is not possible in most cases, a well-planned and integrated approach can reduce conflict, leading to coexistence [164]. Moving from conflict to coexistence can be described as a continuum in which neither conflict nor coexistence is locked at a fixed point along the scale [4]. Attitudes and behaviour towards a species can change over time, across space, and in degree. Ideally, when a level of coexistence has been reached, ongoing negative interactions between people and wildlife become negligible.

THE FUNDAMENTALS OF HWC MANAGEMENT

To help those affected by HWC achieve some level of coexistence, holistic and integrated HWC management approaches are needed. Effective management should also lead to communities benefitting from wildlife so that the value of living with wildlife outweighs its costs.

Holistic approaches
Holistic approaches are those that take local development and conservation plans, human aspiration, social dynamics or flashpoints, sectoral plans (e.g. agriculture, commodities, and mining), drivers of conflict, and local sociocultural contexts into consideration.

Integrated approaches
Integrated approaches consider and include actions from all six elements of conflict management (see graphic) in project design. In this vein, an ideal project would include actions to prevent HWC events; mitigate the impact of events after they occur; respond to events when they are reported; research the drivers and nuances of HWC in the area to gain an understanding of the specific conflict context; monitor occurrences over time; and support policy and regulations that strengthen HWC management locally [5].

THE SIX ELEMENTS OF HWC MANAGEMENT

1. **Understanding the conflict:** Researching all aspects of the conflict profile to understand the context for conflict in any given situation (hotspot mapping, community attitudes, spatial and temporal characteristics, etc.)

2. **Mitigation:** Reducing the impacts of HWC after it occurs (compensation, insurance, alternative livelihoods, etc.)

3. **Response:** Addressing an ongoing HWC incident (response teams, reporting mechanisms, standard operating procedures, etc.)

4. **Prevention:** Stopping or preventing HWC before it occurs (fences, early detection tools, safe working environments, etc.)

5. **Policy:** Enabling HWC management through protocols, principles, provisions, and measures stipulated in legislation and undertaken by authorities (international and national law, national and local HWC management plans, spatial plans, etc.)

6. **Monitoring:** Measuring the performance and effectiveness of HWC management interventions over time (data collection, information sharing, adaptive management, etc.)

Of the six elements, the first four are those most frequently employed in HWC management, while monitoring and policy are not as frequently applied or considered. However, monitoring and policy are important elements of integrated conflict management.

THE ROLE OF MONITORING IN HWC MANAGEMENT

In integrated HWC management approaches, monitoring plays a central, but all too often neglected, role [160]. Designing coexistence strategies requires a holistic understanding of drivers and factors influencing HWC. Still, not all determinants of HWC have been fully understood, and strategies that are successful in one area may fail in another because of the unique nature of each conflict incident [2]. Therefore, to fully understand HWC and determine how best to address it, monitoring and assessing ecological and social factors using comparable, standardised sets of indicators is essential.

Data on the frequency and magnitude of damage caused by wildlife and the spatial distribution of conflict incidents are the basis for informed and evidence-based decision making [82, 160]. However, while anti-poaching data collection involves uniform and real-time systems, HWC monitoring systems are nowhere near that level of efficiency. Various research and conservation organisations have developed monitoring schemes and tools to evaluate HWC, and while some of these have been effective at collecting and monitoring data at the local level, these efforts have been patchy, generally lack standardisation, make limited use of computational tools [164], and lack the structure or mechanisms to share data internationally.

The Polar Bear–Human Information Management System (PBHIMS) is one system that has been developed to overcome the challenge of sharing data across countries. Through this standardised approach, polar bear range states have implemented a unified data collection protocol to document human–polar bear conflict incidences for exchanging information on interactions with polar bears and the tools that have been successfully used to manage the conflict [53]. This protocol has been adopted by some but not all jurisdictions across the entire range.

Furthermore, integrating HWC data monitoring into established spatial conservation monitoring systems such as SMART* is technically feasible and already implemented in several countries, and can be accomplished by involving the communities and industry partners in whose areas the data are collected.

* The SMART (Spatial Monitoring and Reporting Tool) is an open-source, non-proprietary, and freely available tool to measure, evaluate, and improve effectiveness of wildlife law enforcement patrols and site-based conservation activities.

TRANSPARENCY IN HWC MONITORING: NAMIBIA'S EVENT BOOK SYSTEM

Message:	A monitoring system, which is self-owned and managed by the conservancy communities, is used to effectively monitor and record HWC damage.
Location:	Namibia
Species:	Multiple
Organisations:	WWF-Namibia; NACSO (Namibian Association of CBNRM Support Organisations)
Communities involved:	Communities of 86 communal conservancies
Contributors:	Greg Stuart-Hill (WWF-Namibia)

In Namibia's communal conservancies, communities are entitled to the benefits of a wildlife economy in return for the responsibility of managing and protecting the natural resources within the conservancy. This responsibility includes monitoring a whole range of parameters that are necessary for adaptive management and compliance reporting. The Event Book System [190], a self-owned and -managed community monitoring system that each conservancy operates, was developed to monitor and record HWC damage. The community determines which factors need to be monitored in the Event Book, and then conservancy support workers provide the necessary monitoring materials to help conservancy members accurately collect the data and perform data analysis. The community also hires local game guards, who work to stop poaching, support the community's HWC management, and manage the Event Book. When there are cases of wildlife-caused damage, the game guards respond and record the date, location, species that caused the damage, and type and magnitude of damage. The event cards and data belong to the conservancy and remain at its administration offices.

This decentralised and transparent monitoring system promotes information sharing in the community and supports community members' feeling of ownership over the wildlife on their lands. The Event Book's records of human fatalities and of crop, property, and livestock damage correlated with the species involved enable the comparison of data over months and years. The data (which also contain information about a wide range of conservancy attributes, including evidence of endangered species, mortalities of wildlife species, poaching incidents, etc.) are summarised at the end of each year; reviewed through an independent, annual, audited process; and, ultimately, recorded in a national central database. These summary data per conservancy are then used at the national level to evaluate conservancy performance, set hunting quotas, implement adaptive management interventions, and compile Namibia's annual State of Conservancies report.

'Our main tasks are to carry out patrols to monitor endangered wildlife species and HWC. We also provide an advisory service to our farmers on how to reduce HWC.'

– Environmental Shepherds in ≠Khoadi//Hôas Conservancy

© WWF / Folke Wulf

LEGAL FRAMEWORKS THAT ENABLE COEXISTENCE

Policies and regulations governing HWC and coexistence have yet to reach international conventions and frameworks, as they currently exist only within the domain of national and regional regulations. Legal regulations and policies play an essential role in defining how people perceive wildlife, not only as a coercive force but also by providing authority and legitimacy to the idea of coexistence [158]. Regional and national legal instruments surrounding HWC are largely focused on protection of species and on preventing people from causing harm to them. These instruments may take the form of policies such as standards, action plans, declarations, and laws [64].

At present, international treaties and policies address a wide range of impediments to conservation of wildlife, such as wildlife trafficking, habitat loss, and transboundary pollution, while leaving out HWC almost entirely. The issue of HWC continues to be overlooked or side-lined by international policies despite the far-reaching ramifications it has on global biodiversity targets, food security, human rights, and market supply chains. In an attempt to address this gap, organisations like WWF and the IUCN HWC Task Force have helped develop a new target to incorporate HWC in the CBD Post-2020 Biodiversity Framework. This target will assist in mainstreaming HWC as one of the top global priorities for biodiversity conservation and, thereby, encourage nations to cooperate with one another and formulate regional legislative frameworks to move towards a state of coexistence with wildlife. Furthermore, mainstreaming human-wildlife coexistence as a goal into high-level conventions, even beyond conservation, is needed to address the issue at scale and in an integrated way.

In most cases, even national laws and policies fail to address HWC entirely due to a lack of resources or a failure to officially recognise HWC, which keeps the goal of coexistence from becoming a pressing national priority [5, 191, 192]. Superficial HWC policies are not effective; what's needed are policies that specifically address HWC while accounting for the myriad complexities and sensitivities that surround the idea of coexistence between humans and wildlife. Effective HWC legislation should:

- Target HWC with a clear delegation of authority for facilitating and/or enforcing the legislation/policy.
- Have an appropriate financial foundation that provides funding for the management of HWC.
- Involve stakeholders and relevant local parties in the development of legislation that is representative of local realities and contexts.
- Clearly delegate authority amongst the strata of the government, including local and community-based administration, while ensuring decentralised control.
- Harmonise with policies from other sectors that may otherwise exacerbate HWC by influencing its drivers.
- Acknowledge the various sets of realities and contexts regarding HWC on provincial/state, city, town, and neighbourhood levels.

Several national governments are developing laws and policies to regulate HWC, and they are inspiring others to follow suit. While these success stories cannot be identically replicated in every national and legislative environment, lessons and inspiration can, nevertheless, be drawn to help others develop context-specific adaptations that move towards a common goal – ensuring coexistence through an institutional structure that is supported by the pillars of law and policy.

BACK TO THE PEOPLE – NAMIBIA

Message:	With its progressive environmental protection and conservancy laws, Namibia has laid the foundation for the coexistence of people and wildlife.
Location:	Namibia
Species:	Multiple
Organisation:	Government of Namibia
Contributors:	Richard Diggle and Greg Stuart-Hill (WWF-Namibia)

Namibia is considered very successful in developing a legal and operational framework for the management of chronic HWC, as the country has some of the most progressive environmental protection and conservancy laws in the world [193]. It is one of the very few countries where the constitution itself promotes the adoption of policies aimed at maintenance of ecosystems, ecological processes, and biodiversity [194]. With such an enabling policy environment and as a response to a substantial increase in complaints of damage by wildlife, the Namibian Ministry of Environment and Tourism (MET) recently developed a milestone policy to integrate aspects of HWC within one all-encompassing document – Namibia's National Policy on Human-Wildlife Conflict Management [195]. This policy sets out a framework to manage HWC, wherever possible, at a local level. It includes objectives such as the development of legislative frameworks to address HWC, best management practices for prevention and mitigation, financial mechanisms to manage conflict, educational programmes for the public, and procedures that allow for rapid response in cases of conflict.

Furthermore, Namibian community-based natural resource management (CBNRM) [196] policies provide for decentralised rights over wildlife and tourism to be bestowed upon communal area conservancies, which are self-governing legal entities [197]. The conservancies, represented by an elected committee, work to protect their wildlife and environment and earn revenue from the sustainable use of natural resources, including tourism and hunting. The people are, thus, the stewards of wildlife and are responsible for its sustainable management in their area [195]. This form of management and ownership over wildlife is what sets Namibia apart from other countries, where wildlife is usually the responsibility of the state, and Namibia's resounding success in its conservation efforts has been attributed to this decentralised approach [198]. Since the establishment of conservancies in the 1990s, the elephant population has tripled, the largest population of free-roaming black rhinos has been secured, and conservation has contributed approximately US$86 million to Namibia's net national income. In 2018, conservancies alone generated approximately US$10 million from tourism and trophy hunting [199].

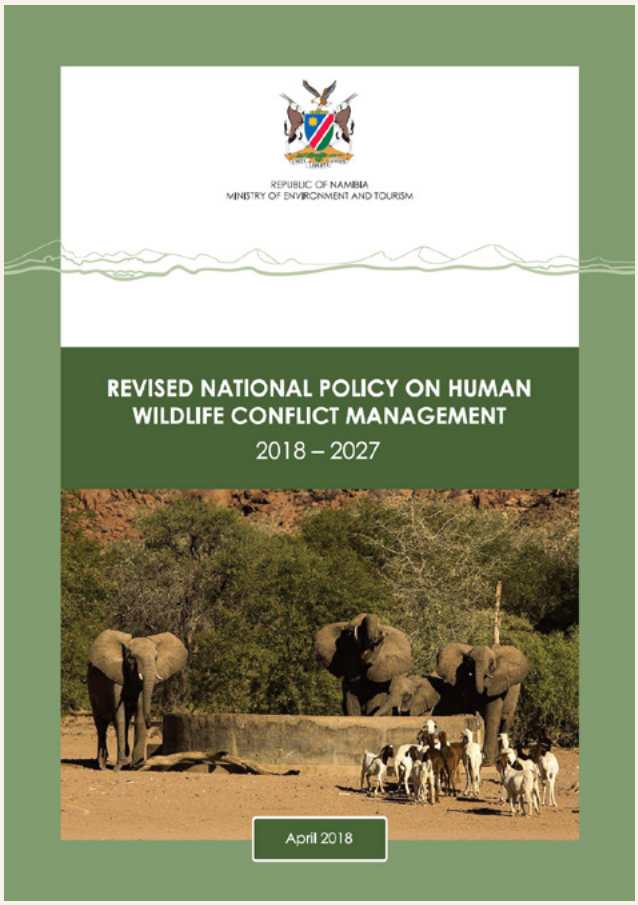
The government does not provide compensation for losses caused by wildlife but has instead established a HWC Self-Reliance Scheme. The scheme applies to all communal areas and provides the means to partially offset the verifiable losses of landholders' livestock, crops, and lives if a number of preconditions are met (e.g. implementation of wildlife damage prevention measures). Conservancies are encouraged to maintain a fund with income derived from tourism and hunting [200] and to draw from that fund to offset HWC losses. When necessary, the MET assists conservancies and independent landholders in communal areas to obtain additional funding [201].

'I directly benefit from our natural resources by having a job and receiving an income, from which my family benefits as well. I encourage my family to learn more about nature and how to conserve it, because without it, there would be no jobs and no benefits.'

– Jerome Mwilima, Manager, Bamunu Conservancy, Namibia

'The Namibian Government recognizes that living with wildlife often carries a cost and that HWC has always existed where people and wildlife live together and will continue to do so in the future. This means that it will not be possible to eradicate all conflict, but that it has to be managed in the most effective and efficient ways possible. It is for this purpose that the National Policy on Human Wildlife Conflict Management was developed in 2009 and updated again in 2018, to manage HWC in a way that recognizes the rights and development needs of local communities while at the same time recognizing the need to promote biodiversity conservation'.

– Based on the foreword of the revised national HWC policy, by Pohamba Shifeta, Minister of Environment and Tourism, Namibia.



© Ministry of Environment and Tourism, Namibia

DIVERSE APPROACHES FOR A DIVERSE COUNTRY – INDIA

Message:	HWC management policy frameworks acknowledge the scale of inter-state diversity and respond by decentralising their powers.
Location:	India
Species:	Multiple
Organisations:	Government of India; state governments of India; Deutsche Gesellschaft für Internationale Zusammenarbeit (German Agency for International Development (GIZ)); Wildlife Institute of India; WWF-India
Contributors:	Neeraj Khera (GIZ India) and Dipankar Ghose (WWF-India)

In India, HWC has become an increasingly pressing concern over recent decades. Key drivers of HWC include development pressures, such as a growing human population and high demand for land and natural resources, resulting in loss, fragmentation, and degradation of wildlife habitats. These pressures intensify the interactions between people and wildlife because they often share living space without a clear demarcation of boundaries. Most of India's states have some form of HWC management policy, such as advisories issued by the central government, state governments, and state forest departments; ex gratia schemes; and declaration of certain species in conflict as vermin for fixed periods of time. This focused attention demonstrates the scale of country-wide efforts to address conflict. Furthermore, some states have been successful in integrating HWC management measures into national development schemes, such as the Mahatma Gandhi National Rural Employment Guarantee Act, in order to involve more stakeholders besides conservation groups in working towards human-wildlife coexistence [202].

India is one of the few countries in the world that have explicitly addressed coexistence and HWC in their national laws. The Wild Life (Protection) Act of India, 1972, empowers the Chief Wildlife Wardens of the States to enable measures for the peaceful coexistence of humans and wildlife inside and outside national parks and sanctuaries [203].

© Nitish Madan / WWF-International

The year 2017 marked the latest development in the policy environment of India, when the National Wildlife Action Plan 2017-2035 (NWAP) [204] was launched, with a dedicated chapter focused on managing HWC. It allocates responsibilities to India's Ministry of Environment, Forests, and Climate Change, non-governmental organisations, and scientific institutions to develop national and regional conflict management plans, streamline the process of providing post-conflict relief, and gather relevant ecological information for the formation of local action plans. In addition to equipping professional rapid response teams, the NWAP calls for an inclusive approach to managing human-wildlife interactions that engages local community members. This approach may include providing community members with extensive training, education, and remuneration. This form of institutionalised community participation empowers local communities to manage and protect their lands.

The national government, in collaboration with the GIZ, state forest departments, Wildlife Institute of India, and local partners, is currently developing a national HWC management strategy and action plan (HWC-NAP) and guidelines, using an extensive multi-stakeholder process. The relationship of the HWC-NAP to national goals and targets related to SDGs, climate change, and biodiversity is being mapped out, and synergies and potential trade-offs with the plans and programmes of key relevant sectors are being examined. Effective communication, collaboration, and partnership between forest departments and other key sectors and stakeholders, as well as strong science-management interlinkages, are some of the central elements of the HWC-NAP. The national-level plan serves as a common framework for the formulation of state strategies and action plans, along with division-level HWC management action plans, to ensure that the approach of the national plan is aligned at the state and division levels while providing enough flexibility and anchoring points to accommodate state-specific contexts and situations.

HARMONISING POLICIES FOR HUMAN-WILDLIFE COEXISTENCE, KAZA TFCA

Message:	Involved organisations initiated critical cross-sectoral processes at a transboundary scale towards preventing land use change and development from negatively impacting coexistence, or exacerbating HWC.
Location:	Hwange-Kazuma-Chobe Wildlife Dispersal Area in the Kavango-Zambezi (KAZA) Transfrontier Conservation Area (TFCA), Botswana and Zimbabwe
Species:	Multiple
Organisations:	KAZA Secretariat; Department of Wildlife and National Parks (Botswana); Zimbabwe Parks and Wildlife Authority; UN Environment Programme (UNEP); University of Bergen (Norway); Nova University Lisbon (Portugal); Boğaziçi University (Turkey); Cairo University (Egypt); supported by the European Union
Contributors:	Julian Blanc (UNEP); Nuno Videira (Nova University Lisbon); Nyambe Nyambe (KAZA Secretariat)

Moving from conflict to coexistence requires harmonisation of policies across multiple sectors. To achieve this in the KAZA landscape, UNEP is implementing the Africa's Coexistence Landscapes (ACL) project. Following a multi-sectoral systems approach, the project brings together different sectors and levels of government and society in a process to co-develop a coherent policy framework. Nearly 100 stakeholders, including local community leaders and practitioners from the agriculture, forestry, tourism, water, and wildlife management sectors, from the Hwange-Kazuma-Chobe Wildlife Dispersal Area (22,000 km²), were brought together in a six-day workshop to apply their sectoral knowledge to the development of causal loop diagrams that capture the dynamics of natural and social processes operating in the landscape.

Using system dynamics, a powerful mathematical modelling methodology, experts converted these diagrams into computer simulation models and combined them with multiple datasets to create an integrated simulation model. An interactive and user-friendly interface [205] was then built to enable stakeholders and policymakers to interact with the model and develop hypothetical or real scenarios to understand how various policies across sectors can interact with one another, thus enabling the design and evaluation of multi-sectoral policy packages that maximise synergies and minimise trade-offs between people and wildlife.

This participatory, bottom-up approach, therefore, aims to ensure biodiversity conservation alongside net, tangible, and present benefits for people coexisting with wildlife. In addition to the ACL project's utility in understanding and developing sound policy, a key outcome of the project is the development of a shared understanding of the problem across stakeholder groups, the broadening and integration of their perspectives, and collaboration across otherwise siloed sectors.

© Pål Davidsen

CONSIDERING MARINE HWC MANAGEMENT IN LEGAL FRAMEWORKS

Message:	International regulations have been developed to minimise disturbance of large marine mammals from direct human activities, such as collisions with ships and incidental catches in fishing gear, and to enable stakeholders to collaborate to reduce activities that cause marine HWC.
Location:	European Union (EU)
Species:	Sharks, sea turtles, pinnipeds, cetaceans
Organisations:	EU member states; national governments; other organisations in the EU
Contributors:	Spyros Kotomatas and Amalia Alberini (WWF-Greece)

Beyond the terrestrial realm, marine megafauna, such as sharks, sea turtles, cetaceans, and seals, often come into conflict with fisheries when they compete for fish and damage fishing gear and, occasionally, boats. These types of conflict have been prevalent for decades but have not, as of yet, found their way into most national legal frameworks, thereby resulting in the issue of marine HWC being largely underreported and unregulated. Of late, legal tools, such as zoning and spatial planning, have been used to prevent conflict with large marine mammals [206].

In the European context, the Habitats Directive enables collaboration between member states and relevant bodies at national and regional levels to exchange information, expertise, and technologies to reduce activities that cause marine HWC. These measures translate into legal frameworks at the national level, as is the case in Greece. Greece's presidential decree 67/1981, on the 'Protection of Indigenous Fauna and Flora and the Regulation of Relevant Research' [207], assigns a strong protection status for priority species, including marine species, forbidding the infliction of any harm upon them. Furthermore, Law 3937/2011, on the 'Conservation of Biodiversity and other regulations' [208], introduced provisions for the protection of the habitats of endangered marine species, thus reducing the risk of interactions that cause HWC.

Generally, marine legislation tends to focus on protecting wildlife by restricting human activity without taking into consideration people's livelihoods and to lack clear management guidance to address marine HWC. This reflects, in part, the fact that marine HWC, unlike terrestrial HWC, lacks clear delineation of property ownership, so tools such as compensation are more complicated. In an attempt to afford marine HWC some management measures that are usually the domain of the terrestrial HWC management toolkit, WWF-Greece is advocating for the establishment of a fair national compensation system for small-scale fishers who sustain damage to their gear and lose their catch because of marine mammals [209].

© Alexis Rosenfeld

'Interaction and conflict with these animals are unavoidable. We cannot easily escape from it, as we are in their environment. But most often, I return from a fishing trip with almost nothing. Fish have diminished, and such attacks make things even worse. It's time to deal with this issue and find ways to resolve it for the benefit of them and of our livelihoods.'

– Panos L., professional small-scale fisher from Cephalonia, Greece

THE SAFE SYSTEMS APPROACH FOR HWC MANAGEMENT

The WWF Tigers Alive initiative developed an integrated HWC management approach in 2016 to address the dual challenge of recovering tiger numbers and addressing a potential increase in human-tiger conflict. Designed initially for human-tiger conflict, the approach is applicable to all species involved in conflict. The SAFE approach is a risk management approach. By assessing conflict in a landscape through a structured stakeholder consultation process, the approach allows managers, decision makers, and practitioners to develop HWC strategies that gradually remove immediate risks and, over time, make the area safe for people, their assets, wildlife, and its habitat. The approach is inspired by lessons from the global transport safety sector going back to the 1960s.

INTEGRATED HWC MANAGEMENT IN CHITWAN, NEPAL

Message:	An integrated approach has been used to reduce HWC while simultaneously recovering wildlife populations.
Location:	Chitwan National Park, Nepal
Species:	Tiger, elephant, rhino, leopard, sloth bear, deer
Organisations:	Government of Nepal; WWF-Nepal; National Trust for Nature Conservation (NTNC); Zoological Society of London (ZSL)
Communities involved:	Buffer Zone User Committees and Buffer Zone Community Forest User Groups
Contributors:	Kanchan Thapa, Bharat Gotame, and Sabita Malla (WWF-Nepal)

In the buffer zones of Chitwan National Park, Nepal, an integrated approach to managing HWC has helped decrease rates of livestock predation by tigers by 75% over the past 10 years [210]. At the same time, tiger populations grew from 38 tigers in the year 2000 [211] to 92 tigers in 2018 [212]. Not only was the approach comprehensive across all elements of conflict management but also the actions it coordinated strongly reinforced each other.

At the policy level, the Government of Nepal provided an enabling condition for coexistence between people and wildlife by mandating that 30% of Chitwan National Park's entry fee revenue go towards supporting buffer zone communities around the park. According to the national buffer zone management guidelines, this amount is to be invested in community development activities that reduce pressure on forests and enhance human-wildlife coexistence [213]. In addition, the government endorsed national relief guidelines in 2009 to compensate communities for wildlife-induced damage [214], and an ex gratia programme was established to cover losses caused by wildlife species such as elephants, tigers, rhinoceros, leopards, and bears.

Research that provides an understanding of wildlife behaviours and community tolerance in Chitwan underpins policy regulations. The research continues to be conducted by multiple national and international organisations with the support of local communities, and findings are delivered to governmental institutions and conservation managers. The knowledge it has provided on the root causes of HWC has helped these stakeholders design well-targeted and effective HWC management actions.

Compensation and insurance schemes to mitigate financial losses caused by wildlife have evolved over time to cover most wildlife species and incidents. Preventive measures such as electric fences, walls, and predator-proof corrals have also been supported locally to increase the safety of people, farms, and livestock. On-the-ground rapid response teams, formed by local people and supported by national park authorities, have been working to prevent HWC from escalating by conducting wildlife rescues and helping affected communities access ex gratia relief funds.

The monitoring of HWC in Chitwan is a comprehensive system led by the government and supported by non-governmental organisations. Well-trained response teams work in concert with national park staff to conduct the monitoring. Monitoring results are fed back to the government to inform adjustments to guidelines and regulations. HWC management in Chitwan continuously improves and remains adaptive to adjust to changing situations, and lessons learned are used to scale up interventions in other HWC-affected areas in Nepal.

'Tigers now go back to the forest from the village empty-handed because of the good preventive measures in place. This has motivated community members, especially youth, to get involved in HWC management.'

– Sapika Magar, Coordinator, Rapid Response Team, Thori Buffer Zone User Committee in Chitwan National Park, Nepal

© Shayastha Tuladhaar, WWF Nepal

Chapter 4.2

BENEFITS TO WILDLIFE AND ECOSYSTEMS

Integrated and holistic HWC management approaches allow species to survive in areas where they otherwise would have declined or become extinct. While any species has an inherent right to survive, all species on our planet also are essential for maintaining ecosystem health and functions. Therefore, the benefits of coexistence can be reflected well beyond the survival of individual animals and species. Large marine and terrestrial predators and megaherbivores are among the species most affected by HWC. These are also key species that play critical roles in their ecosystems, support the survival of other species, and create benefits for their habitats. These species, as much as any other, are part of the complex web of life that provides the natural systems we depend on for clean air and water, fertile soils, and a stable climate. Healthy ecosystems give us food, medicines, and materials, and support millions of jobs.

Carnivores, which are often at the top of the food chain, have a balancing effect on prey species, through either direct predation or the effect of fear. The latter keeps herbivore prey populations from remaining in the same area and overconsuming the vegetation, which enables the natural regeneration and plant growth that create important habitats for many species [215]. Herbivores like elephants can shape whole landscapes like no other species by felling trees, creating paths through dense vegetation for other species, supporting ecosystem rejuvenation, digging waterholes, and maintaining plant species diversity [216].

While national parks provide core habitats for some far-ranging species, their ranging habits often take them into human-dominated areas. Tolerance towards the species and effective coping strategies, which are achieved through integrated and holistic HWC management, allow predators and megaherbivores to move through wider, human-dominated landscapes. Depending on the ability and willingness of humans to coexist with wildlife, these areas can serve as corridors between landscapes – a crucial function – as wildlife needs to move to different areas and connect with different populations. The development of coexistence strategies, including the professional management of HWC, therefore, further strengthens wildlife conservation.

MAINTAINING A CONTIGUOUS LION POPULATION IN THE KAZA TFCA

Message:	Managing human-lion conflict allowed resident lion populations to recover and young adult male lions to disperse, some over long distances, which led to positive impacts for both the lion population and the ecosystem.
Location:	Kwando Wildlife Dispersal Area in Kavango-Zambezi (KAZA) Transfrontier Conservation Area (TFCA)
Species:	African lion
Organisation:	Kwando Carnivore Project Zoological Society of London (ZSL)
Communities involved:	Kwandu, Mashi, Mayuni, and Sobbe Conservancies in the Mudumu North Complex; Balyerwa, Bamunu, Dzoti, and Wuparo Conservancies in the Mudumu South Complex; Kabulabula, Kasika, Lusese, Nakabolelwa, and Salambala Conservancies along the Chobe Floodplains
Contributors:	Lise Hanssen (Kwando Carnivore Project, Namibia) and Nyambe Nyambe (KAZA Secretariat)

Lion territories are vast and can spread over hundreds of square kilometres [217, 218]. Their dispersal across borders and between national parks is supported by the KAZA TFCA Treaty, signed by all five member states, which simultaneously ensures that wild species are protected and that the livelihoods and well-being of people living within those areas are enhanced. In the Kwando area, small national parks are surrounded by farmland and cattle pasture, which serve as important stepping stones for dispersing lions and connect diverse lion populations. In their quest to establish their own territories, younger dispersing lions often cross community areas, where cattle farming is an important livelihood and cultural practice for local communities. In 2012 and 2013, cattle predation in community conservancies adjacent to two smaller national parks (Mudumu National Park and Rupara National Park) peaked at 135 livestock kills. In retaliation, 17 lions from one national park were killed [219]. Human-lion conflict continued, and by the end of 2014, only a single, adult female from one pride remained [220]. However, lions are an essential part of the ecosystem: not only do top predators such as lions maintain the health of prey populations by removing weak and ill individuals but also they have cascading effects on all trophic levels because they prevent the over-abundance of one species and regulate the presence of smaller carnivores.

As lions can only survive in this area if lion-related conflict is managed and reduced to a tolerable level, the Kwando Carnivore Project started addressing the issue in 2013 by analysing the situations in which lion-livestock conflict occurred. It became evident that predations occurred when free-ranging, unprotected cattle roamed the area during the evening and at night.

© Lucious Kukuwe and Coster Sililo, Kwando Carnivore Project

Through a rapid documentation of losses by monitoring teams, strong community involvement, and the identification of high-risk conflict areas, an effective response was designed. The installation of fixed and mobile lion-proof corrals for night-time protection in risk-prone areas led to an effective reduction of cattle predation by lions. This practice also opened new opportunities for sustainable agriculture, since the manure produced by these corralled cattle could be used as fertiliser. The conservancy approach, with its enabling policies, monitoring, mitigation through the offsetting of losses, and tourism income, adds to the system. Overall, livestock predation by lions was reduced by 95% in the initial focal area, which led to far greater tolerance of lions in general, as well as zero retaliatory killings of lions [219]. Today, eight stable and reproducing prides of lions are found in the Kwando landscape, and young adult males are dispersing to Botswana and Angola.

The successful human-lion conflict management in the Kwando area not only supports the survival of this charismatic species in the heart of the African continent but also serves as an indicator of healthy ecosystem services. Furthermore, lions are an important tourism attraction for parks and conservancies and, thus, benefit the community. The Kwando Carnivore Project has demonstrated that effective HWC management enables lions to thrive in an agricultural landscape inhabited by 100,000 people and 150,000 cattle, resulting in multiple ecosystem services benefits. While HWC monitoring continues, human-lion conflict management needs to be scaled up widely into future lion dispersal areas to enable coexistence on a wider landscape level.

Chapter 4.3

BENEFITS TO LOCAL COMMUNITIES

Managing and minimising HWC offer multiple benefits for communities, including saving lives and preventing losses from crop and livestock damage or destruction of other assets. Decreasing, or altogether removing, the risks of dangerous wildlife encounters through strong prevention, mitigation, and response increases the safety of local people, making them feel more secure in their daily lives. Communities that are further supported by strong HWC policies and backed by official processes and support systems are empowered to coexist with wildlife. Ultimately, the perception of wildlife can also improve locally, leading to higher tolerance of wildlife and reduced likelihood of species extinction.

Empowered, trained, and well-equipped communities can effectively manage HWC at the local scale. In many cases, community-led HWC management not only is better for the local community – as it offers sustainable (and wildlife-friendly) income generation – but also has a better chance of success, as the local community members know the area, know what they need to sustain their livelihoods, and know the species' behaviour. In many places, people and wildlife have a common history, making protecting local species important to local communities. Encouraging people to reconnect with traditions, tales, and beliefs concerning their history with wildlife opens opportunities for communities to develop pride in living with a species.

COMMUNITY ENGAGEMENT FOR PROFESSIONAL TIGER RESPONSE IN SUMATRA

Message:	Communities living in tiger corridors and dispersal areas outside protected areas have reduced human casualties to zero by implementing an integrated HWC management system.
Location:	Provinces of Lampung, Jambi, Aceh, Bengkulu, and North Sumatra, Indonesia
Species:	Sumatran tiger
Organisations:	Ministry of Environment and Forestry; Fauna & Flora International (FFI); World Conservation Society (WCS); Zoological Society of London (ZSL); Forum Kita Harimau; United Nations Development Programme (UNDP); Global Environment Facility (GEF)
Communities involved:	The Sumatran island-wide network of independent communities in handling HWC, in particular Margomulya Village
Contributors:	Muhammad Yayat Afianto (UNDP Indonesia); Hizbullah Arief and Noubbie Bahctiar (Sumatran Tiger Project)

In Sumatra, approximately 650 tigers [221] are found in highly fragmented and declining rain forest habitat, and they often disperse into village and farmland areas in search of territory and prey. Annually, on average, 15 people were injured or killed in interactions with tigers and 83 families lost their livestock to tiger predation between the years 2001 and 2016 [222]. Such conflicts contributed to the loss of the Bali and Javan tigers, which were hunted to extinction.

Recognising that the safety of communities and their assets is critical for saving the tiger, the UNDP-supported, GEF-financed Sumatran Tiger Project partners with local communities to prevent, mitigate, and manage HWC. First, spatio-temporal patterns of human-tiger conflict were analysed to identify the most conflict-prone districts within five tiger landscapes. In this project area, about 80 tiger encounters had been documented annually. To address these conflicts, HWC coordination teams prepared training plans and standard operating procedures to ensure human-tiger conflict management that would keep people and wildlife safe.

© Edi Susanto

At the heart of this project are village-level HWC management teams. Developing these teams empowered communities to independently handle tiger encounters. Legal frameworks support the trained teams of volunteers; they are empowered by a governor's decree to monitor and manage encounters with tigers by following an evidence-based protocol. Once the presence of a tiger close to a village is confirmed by the village HWC team, a specialised task force is called to install camera traps, closely monitor the tiger's movement, or implement measures to scare tigers away from the village. Close, coordinated communication is critical for ensuring responses are timely and adequate when addressing community concerns.

In addition to these HWC teams, the project installed tiger-proof livestock enclosures, providing increased security for not only the livestock, but entire communities, as tigers tend not to return if they cannot penetrate the enclosures. The integration of community-based prevention and response interventions, informed by research and monitoring and backed by local regulations, has reduced livestock predation and attacks on people to zero since the start of the programme and provided security for the communities and their livelihoods.

'We have lived with this problem for a long time without a viable solution, instead spending sleepless nights from guarding our livestock. A tiger-proof enclosure has kept away these wild animals and brought happiness to me and my neighbours in Margomulyo village.'

– Sairi, villager, Margomulyo Village, Sumatra Selatan

IMPROVING LIVESTOCK HUSBANDRY TO DECREASE JAGUAR PREDATION IN LATIN AMERICA

Message:	Management of conflict with jaguars has improved livestock husbandry and income while decreasing jaguar killing.
Location:	Colombia, Costa Rica, Bolivia, Brazil
Species:	Jaguar and puma
Organisations:	Panthera; Parques Nacionales Naturales de Colombia; United Nations Development Programme (UNDP); Corporaciones Autónomas Regionales (Departmental Environmental Authorities in Colombia); U.S. Fish and Wildlife Service; United States Agency for International Development (USAID) Natural Wealth Program; Fundación Jaguar; Fundación Cunaguaro; Cabildo Verde; Reserva Las Unamas; Reserva La Aurora; Reserva Hacienda San Jorge
Communities involved:	More than 16 indigenous and rural community associations and multiple community members
Contributors:	Valeria Boron, Esteban Payán, and Rafael Hoogesteijn (Panthera)

In Latin America, livestock ranches are widespread near forests and protected areas. These agricultural landscapes are also important habitat for large carnivores, as 50% of the jaguar's range is located outside protected areas [223]. Jaguars and pumas can kill prey much larger than they are, including cattle [224, 225], and poor livestock husbandry has led to high losses from jaguar and puma predation in all jaguar range countries. Livestock predation generally affects 50%-70% of the ranchers, reducing their income by 3%-12% [226] and making many farms unviable. This results in preventive retaliatory killings of jaguars and pumas – the second-greatest threat to their populations in Latin America (after habitat loss). Predictably, these threats have led to decreasing jaguar and puma populations [227, 228].

Since 2008, Panthera has been working with communities and with small-, medium-, and large-scale producers in key jaguar corridors to reduce jaguar and puma predation. The organisation has engaged ranchers to sign agreements that commit to zero wildcat killing, zero deforestation, and zero wild meat hunting. These commitments are important to reduce the pressure on jaguars and pumas and protect their natural prey base, and, thus, decrease their need to prey on livestock. In addition, various prevention, response, and mitigation measures were tested and their long-term effects monitored on 71 model ranches in Latin America covering more than 220,000 hectares.

Camera-trap monitoring revealed the continued presence of both jaguars and pumas on the model ranches [226] despite fewer attacks on livestock. Besides the reduction of livestock losses, ranching communities have experienced further positive effects of HWC management practices. Keeping livestock in night enclosures enhances animal nutrition and improves livestock husbandry, health, and growth [229, 230]. In addition, bio-digesters produce biogas from the faeces of the animals that are kept in enclosures; this biogas can serve as fuel for cooking, heating, and power generation, thereby eliminating the need for firewood and reducing harmful smoke exposure from wood stoves [226]. Improvement of productivity and reduction of losses provide more benefits to ranch owners than just offsetting cattle losses.

The various HWC measures implemented as part of this initiative, which include cattle breeding management, night enclosures, guard animals, and electric fences, as well as a decrease in prey hunting, have proved highly successful: Livestock predation on ranches has fallen by up to 90%, and in many cases, there have been zero losses due to jaguars and pumas [230].

© Valentina Rojas

CREATING BEAR-SAFE COMMUNITIES IN BRITISH COLUMBIA, CANADA

Message:	Managing human-bear conflict has increased the sense of human safety from grizzly and black bears and improved tolerance for bears in many locations.
Location:	British Columbia (BC), Canada
Species:	Black bear, grizzly bear
Organisations:	Bear Awareness Society; Ministry of Environment of BC
Communities involved:	Nine Bear-Smart Communities in BC
Contributors:	Lana Ciarniello (Aklak Wildlife Consulting); Bruce McLellan and Dave Garshelis (IUCN SSC Bear Specialist Group); Michael Proctor (Trans-border Grizzly Bear Project)

With more than 450,000 black bears [231] and 25,000 grizzly bears [232], there are far more bears in Canada than in all other countries in the world combined. Causes of human-bear conflicts are varied and complex. In some places, bears are increasing in number and distribution, leading to more human-bear conflict. In some areas, land use changes are causing habitat fragmentation [233] and a rise in human-bear conflict. Although many communities were dealing with human-bear conflicts, a major movement towards coexistence with bears began in the town of Revelstoke (8,000 inhabitants) in the 1990s. As in many towns in BC, conflicts with both black and grizzly bears were frequent, as bears were attracted to food in dump sites, garbage bins, and gardens, and by ripening fruit, and even pet food. Safety concerns resulting from close bear encounters led many people to lodge complaints with conservation officers who then responded by killing the black bears and relocating or killing the grizzly bears. Between 1986 and 1995, an average of 12 grizzly bears and 31 black bears were either killed or moved annually.

The frequent killing of bears upset many citizens of Revelstoke, and the Bear Awareness Society, steered by researchers, conservation experts, provincial and local government representatives, and the police force, was formed to reduce conflicts with bears. A 'Bear Awareness' coordinator was hired to lead an education programme to raise public awareness of bear behaviour and share information about how to prevent and respond to bear encounters. The town passed and enforced garbage and fruit tree management by-laws, and bear-resistant garbage containers gradually replaced the older models. Over the 25 years since the Bear Awareness Society was established, human safety has significantly improved and, on average, fewer than one grizzly bear every two years and seven black bears per year have been removed.

The success of the Bear Aware Programme in Revelstoke resulted in a provincial Bear Smart Community Program launched by the Ministry of Environment, a voluntary programme that is based on a series of criteria that communities must fulfil in order to be accredited as 'Bear Smart'. The programme includes a similar integrated approach that has not only significantly increased the feeling of community safety but also provided communities with ownership over the programme, which has led to their willingness to participate in non-lethal solutions to coexist with bears and has improved conservation stewardship [73, 234].

LIVING WITH WILDLIFE:

VOICES OF THE PEOPLE

© Ofelia de Pablo y Javier Zurita, WWF

Fernando Rodriguez Tábara is a young herder from Cerdillo in Zamora, Spain, who took over his parents' sheep and cattle farm. His mastiff dogs support him in keeping livestock safe from wolves.

'For new herder generations like me, who see that they have a wolf problem and solve it with dogs, that will be a clear example of coexistence.'

© WWF-Namibia

Pineas Kasaona lives in arid north-west Namibia, where people make their living from livestock farming. For the past 10 years, he has been a community game guard in a conservancy, protecting wildlife and managing HWC.

'Before becoming a game guard, I hated predators, especially lions, because they kill livestock. But since the formation of my conservancy, I understand the significant role predators play in the environment.'

© Prasiit Sthapit, WWF-Nepal

Sapika Magar is the first female coordinator of the Thori Rapid Response Team, helping communities live with tigers, rhinos, and elephants in the lowlands of Nepal.

'I am volunteering in HWC management because I believe that women play key roles in their communities and are well placed to foster coexistence strategies.'

© Jhon Mario Florez, Panthera

María Cristina Vargas owns El Palmar, a Panthera model cattle ranch in Colombia, and has reduced predation of her cattle by jaguars to zero.

'I find it super exciting to know that the jaguar is on our farm. As people understand that predation can be avoided with simple management measures, the need to kill jaguars will also decrease.'

© Rebekah Karimi, Enonkishu Conservancy

Benard Leshinka has been herding cows since he could walk and is now a professional herder working with Enonkishu Conservancy to graze livestock in coexistence with wildlife.

'Grass is everything. Without grass, there is no wildlife, no livestock, no benefit. Our livestock can help reduce drought and improve the grass, which helps both livestock and wildlife.'

© Hizbullah Arief, Sumatran Tiger Project

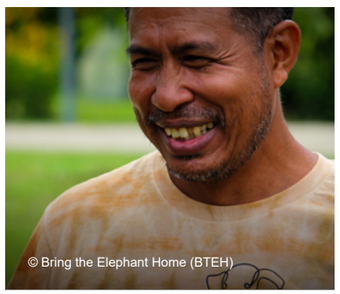
Ibu Sugiati and her family live in Margomulya Village, Sumatra, Indonesia. She keeps livestock for self-consumption and income. Tigers had threatened her and her livestock.

'The construction of a tiger-proof enclosure has brought peace of mind to me and my family. We feel safer now, as tigers and bears now stay away, and my family's livelihood is protected.'

© David Smith, WWF-India

Khogen Chandra Mahanta is a farmer in Assam, India, and mainly cultivates paddy. Elephants are frequently found feeding on farms and in villages, causing high damage.

With the help of the anti-depredation squads, we can drive away wild elephant herds from our crop fields safely. That's how we have been able to minimise damages in our paddy fields.'


© Bring the Elephant Home (BTEH)

Thanasit Phibunwattanakon farms near elephant habitat in Prachuap Khiri Khan Province, Thailand, and owns a homestay, a community-based guesthouse, that provides a means of income besides farming.

'Am I angry, or do I hate the elephants that cause so much damage to my crops? No, I am not angry, nor do I hate them. Because if we can live together in harmony, it will lead to sustainability, and benefit our environment. We have to think of a way to live with these wild elephants.'

© Isstatik Hunters and Trappers Organization

Simon Enuapik Jr is a young polar bear guard from Whale Cove, Nunavut, Canada. He searches for polar bears' presence close to villages early in the morning and keeps track of bears if they are close to people.

'I was hired to be the bear monitor. I feel honoured to keep my community safe when I can. I try not to feel too nervous while working in the presence of a polar bear, but it is exciting to see these things.'

Chapter 4.4

BENEFITS TO SOCIAL DYNAMICS

A key goal of integrated and holistic HWC management approaches is to build stakeholder consensus around management actions. Successful approaches foster consensus, transparency, and collective processes; they do not implement isolated interventions that address individual symptoms of HWC, and they do not take action without consensus, the lack of which could alienate stakeholders who feel their needs are not being met and set different groups of people against each other. Improved communication among interest groups with different values and attitudes is an important outcome of integrated and holistic HWC management. HWC management typically involves working with interest groups that have varying and sometimes opposing values. Therefore, conducting thorough stakeholder analyses is essential, as these analyses will provide insight into the social, cultural, and economic factors shaping these values, and pave the way for defining common ground.

Furthermore, reconciliation processes involved in HWC management have the potential to bring together various interest groups and transform hostility into partnerships. Such partnerships can be valuable in addressing other conservation and development concerns beyond HWC and can foster long-term collaboration. Importantly, integrated and holistic HWC management contributes to greater appreciation of others' contributions, reduction of prejudices, and relationships built on trust, which are key factors for creating and maintaining social stability.

TRANSFORMING DEEP-ROOTED, COMPLEX SOCIAL CONFLICT SO PEOPLE AND WILDLIFE THRIVE

Message:	Conservation conflict transformation (CCT) contributes to reconciliation between and within social groups that have been in conflict over wildlife by moving a system from seemingly intractable conflict towards long-term, shared progress and resilience.
Location:	Washington state, United States (US)
Species:	Wolf
Organisations:	Center for Conservation Peacebuilding (CPeace) (US); Conservation Northwest (US)
Communities involved:	Diverse communities, interest advocacy groups, and levels of government across Washington state
Contributors:	Francine Madden (Center for Conservation Peacebuilding, or CPeace) and Paula Swedeen (Conservation Northwest)

Conflict is often a complex, destructive, and overwhelming obstacle to progress. Through a conservation conflict transformation (CCT) approach [62, 166], the energy spent on destructive conflicts can be transformed into a constructive opportunity for collaboration and progress that can benefit people and wildlife. Drawing from disciplines ranging from neurology to complex systems theory, CCT puts multiple scientific disciplines into practice to address deep-rooted and identity-based conflict to achieve beneficial and long-lasting change.

In 2014, distrust over wolf management was exceedingly high in Washington state between urban and rural communities, between citizens and government, and within each group. Some communities and their elected leaders refused to speak or engage at all with government officials tasked with recovering and conserving wolves. The idea that killing wolves was the only solution to the conflict – livestock predation by wolves – was rampant in rural communities. Misperceptions about the wolves' origins and population size were widespread, and resistance to implementing non-lethal approaches to preventing predation was high. During multi-stakeholder meetings designed to engage members of the public to provide advice for policy decisions around wolves, citizens from conservative rural and liberal urban communities were mutually perceived to be hostile and antagonistic to one another. In fact, the multi-stakeholder process that was initially implemented in 2013 to solve conflict was widely perceived to be one of the greatest sources of conflict in the state. In early 2015, CPeace was invited in as a neutral third party to re-design and guide a CCT process among stakeholders and government.

The initial measures of listening, empathising, treating each individual with dignity and respect, and suspending judgement led to an immediate change in legislation hostile towards wolves and planned budgetary retaliation towards the government agency tasked with recovering wolves. It also led to improved willingness across the state to engage in a revised multi-stakeholder process integrating CCT to ensure policy decisions benefitted from the values, wisdom, and concerns of conservationists, hunters, livestock producers, government biologists, and policy officials.

© Francine Madden, CPeace

Within a year, the revised process for multi-stakeholder engagement led to unanimous development of, and agreement on, a complex policy decision on wolf management, which included increased quality and uptake of proactive non-lethal practices to reduce the need for lethal control of wolves. After the implementation of the new policy, all sides agreed that they needed to further adapt it, and they worked successfully together to achieve effective changes. Importantly, the intervention involved much more than a singular multi-stakeholder process to achieve widespread support for shared progress. Multiple processes internal to each community, interest group, and government agency occurred alongside the multi-stakeholder process that year to ensure broader empowerment and input to minimise unintended negative consequences, and to engage a broader subset of society in decisions that would impact them and their community.

In addition, members and leaders of all stakeholder and government groups engaged in CCT so that the capacity to understand and transform conflict was embedded in the system. The effort to transform conflict must be ongoing, by design and by human nature. Diverse stakeholders and the government continue their work together to develop and adapt policies around wolves and livestock. There are still challenges, conflicts, and difficult times. But the parties keep coming back together again and again, deepening their shared understanding and addressing their problems.

FACILITATING COMMUNICATION FOR HWC MANAGEMENT IN ASSAM, INDIA

Message:	HWC management opened and maintained communication between affected communities and governmental institutions and enhanced collaboration in HWC management.
Location:	Assam, India
Species:	Asian elephant
Organisations involved:	WWF-India; Assam Forest Department
Communities	70 communities in Sonitpur, Biswanath, and Nagaon Districts
Contributors:	Nitin Sekar and Hiten Baishya (WWF-India)

Well-planned stakeholder involvement is the first step towards fair, participatory approaches that build trust and create co-ownership of the ongoing process of achieving and maintaining human-wildlife coexistence. Getting to coexistence requires communication, engagement, and long-term commitment among the stakeholders [164]. In Assam, India, many communities experience losses caused by wildlife, particularly elephants. Some communities are located in remote areas, are marginalised, and have no one to help them when elephants feed on their crops or roam around their villages. Linking these communities with government departments that have the mandate and some ability to respond to human-elephant conflicts seems to be a logical step. However, doing so can be challenging because some remote communities have a historically difficult relationship with the government that has resulted in distrust.

Over two decades, WWF-India has worked to bring communities and the government together to address human-elephant conflict in parts of Assam. In Sonitpur, Biswanath, and Nagaon Districts, WWF-India has helped establish more than 70 voluntary anti-depredation squads (ADSs), which are community groups trained to protect crops and property and to respond to elephant presence in their areas. They are empowered to communicate with officials of the Forest Department and are instructed to contact them for assistance during conflict events. Furthermore, they help the Assam Forest Department safely drive away wild elephants from farms and villages. To launch this collaboration, WWF-India organised a series of meetings with local community representatives and explained the benefits of forming an ADS. These meetings helped ensure that the ADS was inclusive across the community and able to help the Forest Department manage HWC. By providing ADSs with materials, such as flashlights and firecrackers, as well as technical knowledge necessary to drive wild elephants, WWF-India helped build confidence in the ability of the ADSs to manage human-elephant conflict.

© David Smith/ WWF India

Preliminary results from a rigorous evaluation of communities with and without ADSs suggest that community members feel a sense of camaraderie from participating in ADSs, which has resulted in low attrition. Working with government officials can be a positive experience for villagers once barriers are broken down.

Overall, WWF-India's experiences with ADSs suggest that opening and maintaining communication between key stakeholders is a necessary step for ensuring adaptable, innovative, and effective responses to HWC.

'The officials of the Forest Department formed an anti-depredation squad in our village and provided us with torch-lights and firecrackers. We have trained how to safely manage conflict in our area. Through these measures we have been able to reduce conflict-related losses.'

– Ratul Keot, Mowamari Baruah Chuburi, primary school teacher and farmer

© WWF India

SYSTEMATIC NETWORKING AND STAKEHOLDER ENGAGEMENT FOR COEXISTENCE WITH LARGE CARNIVORES

Message:	HWC management involved professional networking and stakeholder engagement that allowed for systematic detection of common interests in solving problems, continuous improvement of relationships, and enhanced cooperation between stakeholders across national borders.
Location:	14 European countries
Species:	Bear, wolf, lynx, wolverine
Organisations:	EU LIFE Programme (L'Instrument Financier pour l'Environnement (environmental finance programme)); the Euro Large Carnivores project, led by WWF-Germany
Communities involved:	10 different stakeholder groups from various focus regions in 14 European countries
Contributors:	Carol M. Grossmann (Forest Research Institute Baden-Wuerttemberg, Germany); Eva-Maria Cattoen (formerly Elmauer Institute, Tyrol, now LechtAlps, Austria); Kai Elmauer (Elmauer Institute, Germany)

In Europe, wolves, bears, lynx, and wolverines are making a comeback. The return of these predators often causes conflicts among people. Perspectives on large carnivore management vary among interest groups, such as conservationists, hunters, and livestock owners. However, even within these groups, perspectives and attitudes vary considerably. As a result, there is also substantial overlap of opinions across groups. Finding common ground between groups is critical for assessing and crafting broadly supported large carnivore management approaches and policy options, as this common ground opens the possibility of collaborating across different interest groups.

Improving the coexistence of people and large carnivores requires the cooperation of all interest groups; research-informed decisions; and support for farmers, landowners, and citizens in places where large carnivores and people coexist. The EU LIFE-funded Euro Large Carnivores project, which connects stakeholders in 14 countries to improve HWC management, started with a participatory network mapping of interest groups and a comparative analysis of their relationships. Balanced numbers of people with diverging backgrounds, occupations, and views were included in the analysis, and 10 main stakeholder groups were identified [235]. Certain stakeholders who were widely acknowledged as experts were identified as potential trusted intermediaries between different parties with difficult relationships. The project also identified people who were members of more than one organisation or guild as key figures in managing conflict because they might be able to help reconcile contradictory viewpoints. Many farmers, for instance, are landowners, livestock raisers, nature conservationists, and hunters at the same time. They may, therefore, understand and effectively convey the different views and perspectives of these different groups.

© WWF Romania

As a next step, people were encouraged to work together to develop local solutions. Motivated stakeholders were professionally trained in communication, negotiation, and conflict resolution methods. They were also encouraged to participate in common local actions, forums, and meetings. The effects of such local exchanges and actions have the potential to last beyond the project's lifetime if stakeholders can identify common objectives and are open to building trusting relationships.

Working across borders and facilitating exchanges proved helpful in the Euro Large Carnivores project, as varying geographical, historical, legal, cultural, and political factors served as inspiration for change and cooperation. Professional networking and stakeholder engagement allowed for systematic detection of common interests in solving problems, continuous improvement of relationships, and enhanced cooperation between people of different backgrounds – and, thereby, contributed to reducing HWC. In Europe, some conditions are conducive to improving the coexistence of people and returning large carnivores, and some approaches are still evolving. Increased global research concerning novel stakeholder-oriented large carnivore management approaches, including their socio-economic impacts, and the exchange of results, especially with North America, are expected to enhance the effectiveness of this development and may also be interesting for other regions of the world.

'The wolf exists thanks to the people of the villages. The depopulation of the rural environment and the lack of incentives to live in the countryside are a danger for species, ecosystems, and forests. We must arbitrate on measures for coexistence, environmental education, and measures to promote life in the countryside.'

–Anonymous government official (Mayor) from Spain

© Tomas Hulik

Chapter 4.5

BENEFITS TO SUSTAINABLE DEVELOPMENT

Human-wildlife coexistence is as significant a concern for sustainable development as it is for conservation, so mainstreaming HWC management into landscape-level conservation and sustainable development endeavours creates benefits for both sides. Livelihood development projects that are built upon human-wildlife coexistence can increase the income of farmers and communities and, therefore, increase their resilience to wildlife-caused damage and losses. Reduced risk and new livelihood options lay the foundation for a growing local economy, creating connections to wider markets that increase the flow of revenues to the region. Well-planned sustainable development considers and manages drivers of HWC to realise several benefits: reducing environmental risk; improving household economies, education, health, and basic infrastructure; and providing conservation benefits such as increased knowledge about species and ecological processes, increased tolerance, and reduced killing of wildlife.

Integrated and holistic HWC management efforts can create opportunities for partnerships between conservation organisations and the development sector. Programmes designed and implemented in collaboration with these sectors ensure that actions are socially, ecologically, and economically sustainable and engage all relevant stakeholders. These partnerships between conservation and development organisations reinforce the objectives of both sectors and deliver conservation benefits, including maintaining an ecosystem and its wildlife, ensuring sustainable development, and furthering community stewardship of conservation initiatives, which builds trust in such initiatives.

Furthermore, the expertise of humanitarian partners in disaster and risk management can make programmes more effective, as such partners are experienced in ensuring the provision of emergency food supplies in case of food insecurity and improving health and emergency structures. Shared objectives, a well-grounded common theory of change, and a clear differentiation of roles and responsibilities support successful cross-sector partnerships critical to delivering sustainable development for people while conserving biodiversity in the long run [236].

HOLISTIC APPROACHES FOR HWC MANAGEMENT AND SUSTAINABLE DEVELOPMENT IN KAZA

Message:	The KAZA landscape has demonstrated that HWC management and sustainable development approaches can be combined in multiple ways to create synergies and benefits for both people and wildlife.
Location:	Kavango-Zambezi (KAZA) Transfrontier Conservation Area (TFCA) in Angola, Botswana, Namibia, Zambia, and Zimbabwe
Species:	African elephants
Organisations:	KAZA Secretariat; WWF-Namibia; Ecoexist Trust Ecoexist Trust is supported by Howard G. Buffett Foundation; United States Agency for International Development (USAID); and Good Planet Foundation.
Communities involved:	Various local groups and associations within KAZA, especially Elephant Aware farming communities of Gunotsoga, Eretsha, and Sekondomboro villages (Eastern Okavango Panhandle)
Contributors:	Nyambe Nyambe (KAZA Secretariat, Zambia); Anna Songhurst, Graham McCulloch, and Amanda Stronza (Ecoexist Trust, Botswana)

Achieving the socio-economic well-being of communities through sustainable development practices and conservation management is the objective of KAZA [237], the largest terrestrial TFCA in the world. An estimated 2.6 million people, mostly subsistence farmers, live in the area alongside a significant wildlife population, and HWC is ubiquitous. Management of HWC requires appropriate, evidence-based land use planning that takes the needs of both people and wildlife into consideration [238].

In KAZA, an integrated landscape development approach connects 20 national parks through savannahs, forests, agricultural fields, and other human-dominated areas. On a macro-landscape level, HWC is managed by land use planning and zoning based on wildlife abundance, movement patterns, and habitat availability. While corridors and dispersal areas enable free movement of wildlife, communally managed agricultural development zones enable sustainable economic progress for communities.

Within this dual land use vision, land use and HWC management are implemented at the micro level and support sustainable development in multiple ways. With the aim of reducing land use conflict and creating coexistence between people and elephants, the Ecoexist Trust, funded by the USAID Southern African Regional Environmental Programme (SAREP), facilitated a participatory micro-level land use planning process in the Okavango Panhandle in Botswana.

© Ecoexist

The project assisted Tawana Land Board in identifying paths frequently used by elephants requiring protection from future land conversion, as well as areas to be designated for safe settlement and farm expansion. Multiple stakeholders and village representatives were equally involved in the process of agreeing to avoid future development in 13 major pathways and development zones [238]. Through this land use planning work, 83,000 ha of land has been secured for elephant corridors, 65,000 ha of good agricultural land has been designated for arable farming, and 34,000 ha of land has been designated for settlement expansion away from elephant corridors [239].

In the agricultural zones, elephant-aware farming is supported. Farmers who are 'Elephant Aware' avoid cultivating in elephant corridors, protect their fields using effective elephant deterrents, and change their farming practices to include conservation agriculture principles, early maturing, and more resilient crop varieties. Conservation agriculture allows more permanent cultivation in one area and has increased yields of various crops up to 10 times the average yield per hectare. Elephant Aware farmers are registered to a farmer co-operative and connected to new markets and an Elephant Aware value chain.

This is part of Ecoexist's efforts to build an Elephant Economy, which aims to improve economic benefit among communities as a direct result of living with elephants by promoting sustainable, environmentally friendly elephant-themed enterprise development; improving community-based access to tourism and related value chains; and diversifying alternative rural livelihood opportunities as a direct result of living with elephants. Over the past three years, communities have seen an 80% increase in income from elephant-themed enterprises.

'Thinking 50 to 100 years from now, we would like to have good ways to control elephants. We will know where to put structures and gardens, and we can use chillies for protection. The fields will have no danger, and we will have measures to manage conflicts. Even if they have their own space, we will know where the elephants go. It won't be 100%, but we will know the way forward.'

– Resident in village of Eretsha, Okavango Panhandle, Botswana

HWC MANAGEMENT TRIGGERS SUSTAINABLE DEVELOPMENT IN PAKISTAN

Message:	Communities have effectively managed conflicts between herders and leopards and have fully participated in sustainable development activities.
Location:	Ayubia National Park, Pakistan
Species:	Common leopard
Organisations:	WWF-Pakistan; Provincial Khyber Pakhtunkhwa Wildlife Department; Garai Welfare Society; Galliat Development and Conservation Organization; supported by Peter Scott Award/IUCN and The Coca-Cola Foundation
Communities involved:	Various communities and village organisations, including Namlimera, Mohra, Arifabad, and Insaf welfare organisations; Bakot
Contributors:	Muhammad Waseem, Rab Nawaz, Iftikhar Hussain, and Ahmed Baqai (WWF-Pakistan)

In October 2008, WWF-Pakistan started a watershed management and sustainable development project in Pakistan's Ayubia National Park, a stronghold for biodiversity in the country and an important water catchment area of the Indus River. The objective of this project was to engage communities that heavily depend on forest resources in sustainable development actions, both to benefit local people and to halt deforestation in the mountainous forests, stop soil erosion, and prevent severe impacts to the water cycle. Various activities were planned, such as introducing alternate energy sources; setting up indigenous tree nurseries for replanting lost forest; developing farm forestry to reduce deforestation pressures; offering livelihood development trainings for women, such as handicraft trainings; and developing ecotourism as part of capacity building for sustainable income generation. However, before the project could proceed, a pressing issue that the communities were dealing with – HWC – had to be addressed.

The mountainous forest is home to the country's critically endangered common leopard. The leopard population has declined drastically over the years; between 1998 and 2015, more than 40 leopards were killed in the Abbottabad district alone, partly due to HWC caused by habitat degradation. Erosion and water cycle alterations had forced leopards to search for prey in community areas. HWC reached its peak in 2005, when six women were killed by leopards in the vicinity of Ayubia National Park, and many leopards were killed in retaliation.

WWF-Pakistan and partners realised that until people's immediate safety needs were addressed, the communities would not be willing to engage in any conservation or sustainable development activities. Therefore, they launched an integrated HWC management plan, which included the following components: training community members on safety measures to reduce leopard attacks, launching educational awareness activities on the value and behaviour of leopards, and piloting insurance programmes. Simultaneously, the initiative closely monitored the leopards' movements to determine how people could avoid them. These initiatives helped WWF-Pakistan and its partners gain the trust of local communities and paved the way for strong community engagement in various conservation initiatives.

The communities that once called for leopards to be shot now see leopards in a more positive light. Retaliatory killings have dropped by 50%, and human fatalities have dropped to zero. Communities also actively engage in tree planting, watershed protection, landslide treatment, and solid waste management. Furthermore, the partners worked with local communities to implement effective sustainable development activities, such as establishing mountain ecotourism ventures involving the local youth as guides and founding a vocational training centre for women. Holistic and participatory HWC management laid the foundation for strong community involvement, which made sustainable development possible.

BENEFITS THROUGH COMMUNITY-BASED ECOTOURISM IN BWINDI, UGANDA

Message:	HWC management and human-gorilla coexistence strategies paved the way for the sustainable development of a whole region, enhancing the local economy and improving health care and education.
Location:	Bwindi Impenetrable National Park, Uganda
Species:	Mountain gorilla
Organisations:	International Gorilla Conservation Programme (IGCP); Uganda Wildlife Authority (UWA); Bwindi Mgahinga Conservation Trust (BMCT); Institute of Tropical Forest Conservation (ITFC); Uganda Poverty and Conservation Learning Group (U-PCLG); International Institute for Environment and Development (IIED); Wildlife Friendly Enterprise Network
Communities involved:	21 local administration areas (parishes) of Bwindi
Contributors:	Anna Behm Masozera, Wellard Makambo, and Henry Mutabaazi (IGCP DR Congo, Rwanda, Uganda); Phil Franks (IIED UK)

To create sustainable development that benefits those most negatively affected by wildlife, community-based conservation projects must be designed carefully and with a holistic understanding of the social context and HWC situations [144]. Community-based ecotourism structures can play an important role in correcting the unequal distribution of benefits and costs of living with wildlife. Sustainable ecotourism can channel income generated from people visiting wildlife-rich areas to those people who bear the costs of living with wildlife.

By the time the International Gorilla Conservation Programme and its partners started their engagement with the communities at the boundary of Bwindi Impenetrable National Park, households faced high levels of crop damage caused by wildlife, especially gorillas, in the Nkuringo region. Therefore, a 150-metre-wide buffer zone was established by the Uganda Wildlife Authority (UWA), in collaboration with IGCP and the local community. They organised under what is now the Nkuringo Conservation Community and Development Foundation (NCCDF) to protect this buffer zone by planting tea, which is not consumed by gorillas [93].

In addition, 10 volunteer human-gorilla conflict management teams were set up to guard the national park boundary and drive gorillas back into the forest whenever they entered community land.

© Ramon Sanchez Orense

Another important component of park authorities' and conservation stakeholders' (including IGCP) work was the development of sustainable income for communities through tourism. Under national revenue-sharing guidelines, community development projects are supported with 20% of the income generated by the UWA through park entrance fees, including an additional US$10 for each gorilla viewing permit sold. To ensure that those who sustain the most losses from wild animals (and who, in return, pose the greatest threat to the animals) benefit from income generated through tourism, the initiative implemented a revenue-sharing scheme that was more equitable. The guidelines for disbursement of small grants through the UWA-administered revenue-sharing scheme were adjusted to serve communities suffering most from HWC, as well as those living close to the park boundary. These grants supported multiple projects run by individual community members, through micro-enterprises or school bursaries, and group projects that benefitted part or all of the community, such as school infrastructure, health care, and road repair projects [240]. Further, Uganda passed the Wildlife Act of 2019, which allows public compensation for individual losses due to wildlife [241]; once the regulations are in place to operationalise the new act, stakeholders will need to build communities' awareness of the law and ensure communities have equitable access to the funds it authorises.

For sustainable development programmes to succeed, those involved must have a thorough understanding of the socio-economy and culture of the target groups. The IIED-led pro-poor gorilla tourism project sought to create new ways for people living around Bwindi to benefit from park visitors [162]. As part of this project, standards for Certified Gorilla Friendly Park Edge Community Products were developed under the certification body Wildlife Friendly Enterprise Network, with a specific focus on standards regarding governance of community-based organisations that produce goods for sale to tourists. This initiative continues to date, with a re-launch of the voluntary, private certification scheme expected in 2021.

© Paul Robinson

Chapter 4.6

BENEFITS TO COMMODITY PRODUCTION, BUSINESSES, AND SUPPLY CHAINS

Well-designed HWC management schemes have the potential to increase revenues from forestry, agriculture, aquaculture, and free-ranging livestock production. These commodities are particularly prone to damage by wildlife species, as they may serve as alternative food sources or shelter for wildlife. However, the right production and management systems can make coexistence on farms and plantations possible. Effective and integrated management of HWC enables far-reaching positive impacts for businesses and regional economies, worker safety, and wildlife survival. And an environmentally and socially responsible economy can play a vital role in developing enterprises and businesses that not only are conflict free and beneficial for wildlife and people but also channel revenues back into coexistence systems and equitably distribute costs and benefits of living with wildlife.

Certification can be used along the supply chain to regulate production, processing, and distribution, and can also influence consumer choices. While some certification schemes promoting sustainable forestry, farming, or fishing practices mention HWC in guidelines or other documents, most have not included it in their actual standards. Two exceptions are the Rainforest Alliance and the Wildlife Friendly Enterprise Network. Both of these certification frameworks reflect the combined interests of companies, farmers, communities, and consumers in producing sustainable goods and services. Labels affirming that the final product contributes to the coexistence of wildlife and people must verify that the development of their product has resulted in the improved survival of individuals of key wildlife species or upward trends in threatened species' population indices and high social standards for the producers. Strong and trustworthy eco-labels embrace transparency, explicit standards, and third-party verification to convey the reliability and the accuracy of what they certify [242]. This process is costly and poses a particular challenge for small-scale producers. However, it may be precisely these small-scale producers who are willing to make the changes needed to coexist with wildlife. Therefore, in high-biodiversity areas where endangered species and communities coexist, small-scale eco-labels are often developed, though most have limited, local markets. Connecting them to growing markets would advance conservation and development.

Consumer choice is another area where certification can have an impact. A rising number of consumers value sustainability, conservation, and social responsibility when purchasing products. Frequently, those people do not share their neighbourhood with wildlife but live in urban areas that are rather disconnected from nature. However, they may have high motivation and sufficient resources not only to purchase certified conflict-free products but also to contribute to human-wildlife coexistence. Connecting these people – who have the resources and who value human-wildlife coexistence – to the opportunity to help rural communities bear the cost of living with wildlife can unlock the benefits of coexistence.

INCREASING WORKER SAFETY IN TEA AND COFFEE ESTATES, INDIA

Producing agricultural commodities in places where wildlife species are present can be very risky for workers. The Valparai plateau in southern India, a 220 km² landscape dominated by tea plantations and surrounded by protected areas, is home to 120 elephants and supports the livelihoods of 70,000 people who work for national and international tea companies. The area is a mosaic of tea plantations, riverine vegetation, and small rain forest fragments that cover less than 1% of the area and are the only refuges for elephants. Similarly, the Hassan region (620 km²), approximately 350 km north of Valparai, is primarily dominated by coffee plantations, paddy fields in the fallow areas among these plantations, and monoculture areas of acacia and eucalyptus. The area supports over 100,000 people and about 45 elephants. The major conflict concerns in these landscapes are fear, trauma, and helplessness among local communities resulting from the danger elephants pose to their lives and livelihoods.

Message:	HWC management has improved worker safety on tea and coffee estates.
Location:	Valparai and Hassan area in Southern India
Species:	Asian elephant
Organisations:	Nature Conservation Foundation (NCF); State Forest Departments of Tamil Nadu and Karnataka; Gupshup Enterprises; and Niagara Automations; supported by Elephant Family, UK; Whitley Fund for Nature, UK; Oracle India; Van Tienhoven Foundation, Netherlands; Arvind Datar; Mr Venky Harinarayan. Anamalai tea plantation companies; Parry Agro Industries Limited; TATA Coffee Limited; Bombay Burmah Trading corporation; Periya Karamalai Tea company; Wood Briar; Tea Estate India Limited; TANTEA; Hassan District Planters Association; and Coffee Federation Growers
Communities involved:	Women's self-help groups; paddy farmers; tea and coffee workers unions of Valparai and Hassan; village committees of Kodlipet, Mallapur, Yeslur, Sakleshpur, and Alur
Contributors:	M. Ananda Kumar, Ganesh Raghunathan, and Vinod Krishnan (NCF, India)

© Ananda Kumar, Nature Conservation Foundation

The NCF has investigated 47 and 40 human deaths in Valparai (2002-2020) and Hassan (2010-2020), respectively. In order to design effective safety measures, NCF focuses on understanding elephants' movements in habitat mosaics and their conflict with people. In both landscapes, most fatalities occurred on roads when people were travelling between home and workplace and accidentally encountered elephants. In most cases, people, as well as tea and coffee estate companies, were unaware of elephant presence and movements. The NCF identified risky times for human-elephant encounters, and research on the resulting human-elephant encounters indicated a need for a system to inform tea and coffee plantation workers and others about the presence of elephants when travelling. Therefore, NCF implemented early warning systems in both landscapes, including TV messages, alert tickers on buses, text and call alerts over mobile phones, and installation of mobile phone-operated alert beacons and digital display boards in strategic locations to convey daily elephant locations to people who live in the area.

As tea and coffee estate companies are responsible for the safety of their workers, they welcomed early warning systems, which help them improve the management of conflicts by implementing safety measures for people while allowing elephants to pass through plantations. The systems were implemented with the involvement of local communities and state forest departments, which empowered people to manage human-elephant conflict in a positive way. Plantation companies have also adopted a 'no drive policy' to allow elephants to pass through the tea and coffee estates. Improved communication among plantation companies about elephant movements has further increased the safety of staff and property. As a result of all these measures, conflict-related human fatalities declined from an annual average of three persons (1994-2002) to one person (2003-2020) in Valparai, and from an annual average of five (2010-2017) to one (2018-2020) in Hassan. Companies have recognised the importance of NCF's awareness programmes for workers on safety measures, elephant behaviour, and elephants' ecological requirements.

Today, the companies have adopted best field practices. They keep workers away from areas where elephants are present to minimise possible encounters; they shift storage of worker rations away from elephants; and they contribute to early warning system installation costs. A major learning to improve safety in these agriculture-dominated landscapes was to shift from a 'problem elephant approach' to a 'problem location approach'. With sustained participation by local communities and companies, this shift has led to a significant increase in worker safety.

'The early warning systems for elephant presence have ensured that the local communities, including coffee planters like myself, live and work in a safer environment. Personally, I see these systems as a good conflict prevention measure but not as a long-term solution for the human-elephant conflict issue in the Hassan region.'

– Rohith B.S., coffee planter of Kithlemane Estate, Sakleshpur Taluk

INCREASING REVENUES THROUGH ELEPHANT-SAFE AGRICULTURE, THAILAND

Message:	HWC management with a focus on agricultural adaptation has increased revenues, fostered business development, and reduced elephant encounters in farmlands adjacent to protected areas.
Location:	Kui Buri district, Thailand
Species:	Asian elephant
Organisations:	Bring The Elephant Home (BTEH); Phuluang Wildlife Research Station; The Forest Restoration Research Unit (FORRU); supported by WWF-NL INNO fund; Lush Charity Pot; Trunks & Leaves; Miami University
Communities involved:	Tom Yum project community group in Ruam Thai village; landowners and farmers in Ruam Thai village, Prachuap Khiri Khan province; Chang Pa Kui Buri Homestay; Soap Me – Hua Hin, Prachuap Khiri Khan province; Sahainan Permaculture and Organic Farm
Contributors:	Antoinette van de Water, David Owen, Jazz Kok, and Viviana Ceccarelli (BTEH, Thailand)

In elephant range states, farmers frequently suffer from crop damage by elephants. Because of the high nutrition content of many crops, scientists have found that elephants feeding regularly on farmland are growing faster, are more dominant, and have higher reproductive success [243]. Changing cropping patterns from crops attractive to elephants to spices or herbs containing essential oils and developing conflict-free income sources, such as honey production, in areas of high risk of elephant crop damage are strategies that can pave the way to coexistence [244, 245]. Such new cropping and income generation patterns need to suit the ecological conditions of an area and must be economically viable for local farmers.

© Bring The Elephant Home

In Thailand, human-elephant conflict is provoked by habitat loss and degradation exacerbated by mono-crop plantations of pineapple, sugar cane, and other crops that are highly palatable to elephants and grown near protected areas. This has led to massive crop destruction on farms located near the often fragmented patches of forests inhabited by elephants. To decrease crop damage and promote peaceful coexistence, BTEH and partners have implemented various projects that benefit elephants and people simultaneously. For example, through a community-run native tree nursery that annually attracts hundreds of volunteers who help restore elephant habitat, community members engage in conservation education, provide homestay accommodations, and organise community-based cultural activities. All actions are informed by scientific assessments of the impact of elephants and by monitoring their behaviour.

Local communities play an important role in these projects, as all activities are co-designed with villagers and farmers, agreed upon in community meetings, and implemented collectively. Sharing experiences and lessons learned in community meetings enhances ownership of the process of change. This strategy's success stems from its accessibility to all community members. While only some people in the region have adequate vehicles to lead safaris, accommodation to offer homestays, or language skills to guide tourists, everyone has agricultural land, garden space, and experience in planting commonly grown Thai plant species. Other factors that enable success are the material and nonmaterial benefits that flow to the community from these projects, such as community development, feelings of pride, skill development, and partnerships [246, 247].

The 'Tom Yum project' aims to promote coexistence with elephants by providing a viable alternative to the pineapple market. To achieve this, the project promotes the cultivation of crops that are unattractive to elephants, some of which are the ingredients of the traditional Thai Tom Yum soup, such as lemongrass, Kaffir lime leaves, chilli, and galangal, instead of pineapple, which elephants find highly palatable. Additionally, an elephant-coexistence brand, Elephant & Co., sells the products made from alternative crops, such as soaps, candles, and massage oils. Economic estimations project that involved communities will at least double their income through the farming of Tom Yum herbs and spices and the sale of community-based products like those listed above. Part of the profit goes towards reforestation of elephant habitat, consistent with a holistic approach that brings benefits to farmers, elephants, and the ecosystems on which they depend.

'Elephants are a unique species – they're intelligent and powerful, and they can solve problems. They brought job opportunities, tourism, and income to my community, and we cooperate and work together all because of elephants.'

– Thanasit Phibunwattanakon, Regional Field Supervisor, BTEH

HARMONISING COMMERCIAL PLANTATION OPERATIONS AND ELEPHANT CONSERVATION, MALAYSIA

Message:	HWC management on industrial tree and oil palm plantations has decreased tree damage, enhanced wildlife connectivity, created ecotourism opportunities, and improved the image of the plantation company.
Location:	Sabah, Malaysia
Species:	Borneo elephant
Organisations:	WWF-Malaysia; Sabah Softwoods Berhad; Unilever; 1StopBorneo Wildlife; supported by the Malaysian Wildlife Conservation Foundation
Contributors:	Cheryl Cheah Phaik Imm (WWF-Malaysia) and Ram Nathan (Sabah Softwoods Berhad)

While monoculture plantations are widely believed to be less valuable for biodiversity, they may offer shelter and food to some species. Strategically designed and ecologically oriented plantations can play a particularly important role in connecting natural forests [180].

In Sabah, Malaysian oil palm plantations now cover approximately 23% of the land [248]. Elephants moving from one fragmented forest into another have to cross plantations and may feed on young oil palm seedlings, causing massive financial damage to the companies. Sabah Softwoods Berhad (SSB) is an industrial tree and oil palm plantation company that has been experiencing crop damage by elephants since 2004. To protect their crops, the company initially planned to install electric fences along plantation boundaries, which would be very costly and require labour-intensive maintenance. In 2012, WWF-Malaysia began engaging with the company to find long-term solutions, which included land use allocations such as setting aside 1,067 ha of the company's land as a wildlife corridor to facilitate the movement of elephants and other wildlife by connecting a fragmented forest to a larger forest block.

After working closely with WWF, SSB also decided to incorporate strategic electric fencing only around vulnerable areas that contained young palm trees and settlements. WWF provided technical assistance on the strategic placement of electric fences based on the movement of satellite-collared elephants. Elephants were allowed to access certain parts of SSB's plantations, such as those containing mature oil palm trees and tree plantations, where damage would be minimal.

SSB bore a majority of the costs involved in realigning the fences and restoring the corridor, with partial support from WWF and Unilever. This led to strategic land use planning and a significant reduction in crop damage, and benefitted SSB in the long run.

The NGO 1StopBorneo Wildlife later developed an ecotourism model together with SSB to provide tourists with opportunities to plant trees in the corridor and observe elephants, and some of the funds generated from these activities were channelled back to SSB to offset the costs of setting aside and restoring the corridor.

Furthermore, SSB fosters coexistence by providing continuous awareness programmes that educate plantation workers about safety precautions and elephant behaviour to increase their tolerance and understanding of elephants.

This form of coexistence delivered a win-win solution: SSB saved costs with the strategic placement of electric fences; losses caused by elephants were reduced; and elephants were able to use certain parts of the plantation and the wildlife corridor. Furthermore, the corridor is now used by multiple species, including orangutans, sun bears, and clouded leopards, and SSB has demonstrated that plantations can play a role in conservation. Finally, SSB has improved its image by respecting wildlife on its premises and considering wildlife movement when developing plantations.

WILDLIFE FRIENDLY CERTIFICATION

Message:	Human-wildlife coexistence strategies benefit the development of sustainable and legal enterprises, which are supported through certification and market access.
Location:	Worldwide
Species:	Cheetah, jaguar, wolf, elephant, and others
Organisations:	Wildlife Friendly Enterprise Network (WFEN) and associated certified enterprises
Communities involved:	Multiple community and interest groups in various projects
Contributors:	Julie Stein and Marissa Balfour (Wildlife Friendly Enterprise Network, US)

The Wildlife Friendly Enterprise Network (WFEN) and its Certified Wildlife Friendly, Certified Predator Friendly, and species-specific programmes represent farmers, ranchers, artisans, indigenous communities, and conservation practitioners in highly biodiverse landscapes around the world. To unite expertise, share lessons learned, and build brand power, WFEN is forging a new model whereby a certification scheme becomes a tool for advancing conservation and connecting regional and international conservation enterprise initiatives to a global market.

Certification criteria under WFEN's programmes require that production practices contribute directly to the conservation of key wildlife species through the abatement of threats that pose direct or indirect risks to their survival. Certified enterprises use formal agreements with farmers, herders, and local communities that address these threats, which may include lethal wildlife management, incidental mortality, and other impacts resulting from HWC. Criteria also include direct involvement of, and benefits to, local communities, long-term monitoring, and ongoing partnerships with on-the-ground conservation entities.

Most of the enterprises that receive WFEN's certification operate in coexistence landscapes, which are often in critical buffer zones where HWC is prevalent, just outside of protected areas. Certified Wildlife Friendly enterprises generate new sustainable, legal livelihoods for people living in wildlife areas. In Namibia, predator-friendly farming techniques are implemented to produce beef and goat cheese; these techniques have improved ranchers' attitudes towards cheetahs [249]. In Colombia, Jaguar Friendly Coffee is grown and harvested in shade-grown coffee plantations that implement HWC management measures and provide temporary habitat for jaguars in critical areas for the species [250].

In Tuscany, Italy, Certified Wildlife Friendly cashmere wool is produced by using predator-friendly strategies to coexist with wolves [251]. In India, Certified Elephant Friendly tea – a partnership with the University of Montana – is sourced from plantations that meet high standards for the protection of elephant habitat and water resources, reducing human-elephant conflict and mortality, and reducing barriers to elephant movement between elephant habitat areas [252].

Certified Wildlife Friendly products, including foods, cosmetics ingredients, handicrafts, and tourism, have added value with a message of coexistence. They target the 40% of global consumers who believe companies can and should play a critical role in addressing the world's environmental concerns and who are looking to join forces with brands they view as responsible stewards of the environment [253]. Products certified under WFEN's programmes are available at retailers worldwide and have received numerous awards in environmental leadership and product excellence [254].

Chapter 4.7

OPPORTUNITIES TO FINANCIAL INVESTMENT

Integrated HWC management addresses the needs of both wildlife and people, which makes it an interesting field of investment for international corporations and businesses. The advantages are obvious: Investing in HWC management programmes helps ensure the survival of wild species, maintains ecosystem functions, and enhances the safety of communities that share their neighbourhoods with wildlife. Holistic and integrated human-wildlife coexistence strategies even go a step further and lay the foundation for sustainable regional development by supporting economic growth, public health, and education through the establishment of mutually reinforcing economic development and wildlife/biodiversity conservation.

Investing in HWC management and coexistence programmes means not only doing good for people and wildlife but also investing in transformative change by unlocking synergies between wildlife conservation and local development.

WILDLIFE CREDITS REWARDS LIVING WITH WILDLIFE

Message:	Wildlife Credits was established as a conservation performance payment mechanism for wildlife custodians, specifically in communal conservancies.
Location:	Namibia
Species:	Multiple
Organisations:	Community Conservation Fund of Namibia (CCFN) and WWF-Namibia; supported by KfW Development Bank and Distell Namibia
Communities involved:	Wuparo, Sobbe, Tsiseb, ≠Khoadi//Hôas, and //Huab community conservancies
Contributors:	Richard Diggle, Ingelore Katjingisiua, and Greg Stuart-Hill (WWF-Namibia); Molly Crystal (WWF-Denmark)

Wildlife Credits is a performance payment model that channels payments to landholder communities, farmers, or other wildlife custodians in exchange for successful achievement of conservation goals. It enables community-driven conservation that has significant potential for converting HWC situations into human-wildlife coexistence. This new mechanism rewards communities for proven conservation outcomes based upon measurable and independently verifiable performance. This is different from the more conventional financing of conservation that is focused on supporting activities that may or may not result in tangible conservation results. To increase the efficiency of financing, payments for conservation outcomes to the landholders are designed to be as direct as possible.

Communities living with wildlife often incur direct and indirect costs. On the other hand, wildlife does have intrinsic economic value, but this is often unrealised or is not enjoyed by landholder communities. Unlocking these values and ensuring benefits accrue to the landholders are critically important mechanisms for incentivizing and building the capacity of local communities to coexist with wildlife. Devolved wildlife-based tourism and hunting rights have undoubtedly provided incentives for landholders to coexist with wildlife, but these mechanisms on their own are often not sufficient to offset HWC costs or to push back competing forms of land use.

Wildlife Credits was introduced as a value addition mechanism to drive human-wildlife coexistence. It rests on the understanding that wildlife is increasingly being viewed as a valuable global good, and that this value is increasing as wildlife declines globally. It relies on the 'willingness to pay' of parties who either profit in some way from the wildlife economy or simply view wildlife as a global public asset that needs 'saving'. It needs far-sighted governments that are willing to devolve conditional rights and benefits from a wildlife economy to landholder communities. Ultimately, it needs communities that can envisage a wildlife economy on their lands where, within reason, more wildlife means more reward.

This concept is being implemented in Namibia, Kenya, and Romania. Two examples of Wildlife Credits products currently being piloted in Namibia are 'wildlife sightings' and 'wildlife corridors'. With wildlife sightings, local lodges (serving as the independent verifiers) regularly record the presence of target wildlife species, such as lions, elephants, and rhinos. The more sightings they record, the more payments the landholder communities receive from the National Namibian Wildlife Credit Fund. The Wuparo Conservancy in northern Namibia has received payments for verifiable numbers of lion sightings on their farmlands and has used these revenues for the construction of lion-proof corrals for farmers affected by livestock predation. For wildlife corridors, conservancies receive annual payments upon proof that they have kept essential wildlife migration corridors open. The Namibian Sobbe Conservancy, which contains a critical elephant migration corridor, receives annual payments from Distell Namibia (Pty) Ltd. upon proof that this corridor remains free of settlement and cropping (shown using satellite imagery) and elephants continue to use it (shown with images from camera traps). Distell Namibia produces Amarula, a liquor that is synonymous with the African elephant, and the company wanted to do something for people who bear the costs of living with elephants and who make an effort to protect them.

Importantly, the landholder communities, having already delivered the agreed-upon conservation performance, are free to use the Wildlife Credits income as they see fit. Some do, however, reinvest a portion of revenues back into further conservation activities. Wildlife Credits links payers who wish to see conservation outcomes with landholder communities that are best placed to deliver these outcomes in the most cost-effective way. Through this, Wildlife Credits helps communities see wildlife conservation as a global business opportunity, and this, in turn, incentivizes human-wildlife coexistence. Wildlife Credits is now in the process of scaling up products to wildlife landscapes. These are vast tracts of community farmland that communities are offering to be set aside for conservation purposes in return for performance payments. Importantly, these Wildlife Credits schemes are undertaken with full and prior consent of the communities living on the lands, and it is the communities themselves that voluntarily enter into performance contracts with the payers, while community risk is confined to 'no performance, no payment'.

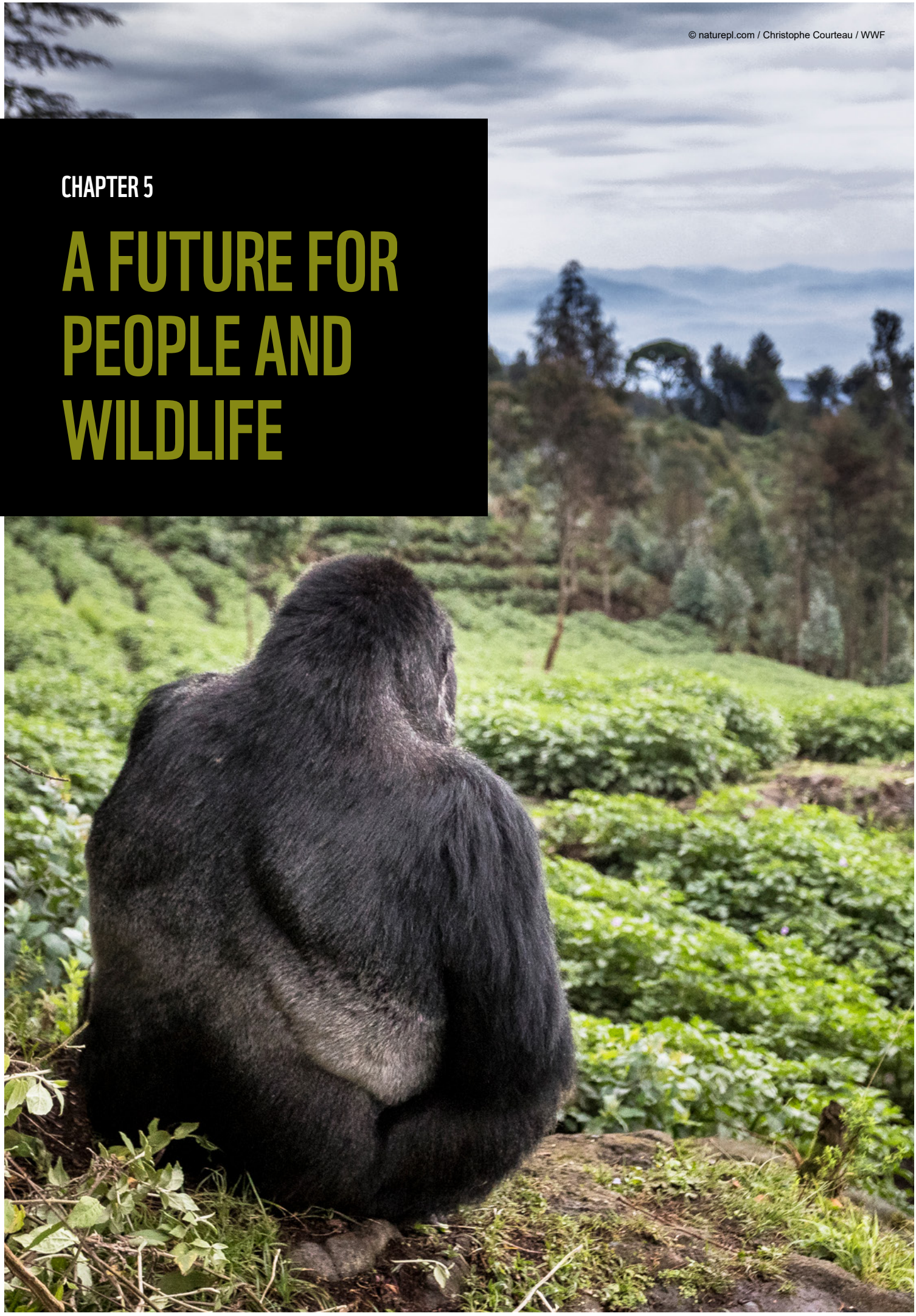
The game changer for achieving human-wildlife coexistence through Wildlife Credits will be for global funding agencies, the private sector, the general public, and national governments to make available a portion of their funds to be used to pay for conservation performance. The Namibian National Wildlife Credits Fund (NNWCF) was set up to receive such funding, to oversee the verification of conservation performance, and to make payments to registered Wildlife Credits schemes according to the contracts. The NNWCF is being administered by the newly created Community Conservation Fund of Namibia (CCFN), which is a legal non-profit entity with an independent board that meets modern governance standards. The Government of the Federal Republic of Germany, through the KfW Development Bank, took the lead in supporting CCFN with a significant grant to support human-wildlife coexistence. Further global financiers are sought to join the investment in Wildlife Credits to unlock benefits from wildlife to promote human-wildlife coexistence.

'We want to do something for the people who bear the costs of living with elephants and who make an effort in protecting them.'

– Distell Namibia (Pty) Ltd.

'Wildlife Credits works to balance the inequity of costs and benefits of living with wildlife.'

– KfW Development Bank



CHAPTER 5

A FUTURE FOR PEOPLE AND WILDLIFE

The means to prevent and reduce HWC have changed relatively little over time, but the sociocultural, economic, and physical geographies of landscapes where conflict plays out have been radically transformed by ever-growing human enterprises. Demonstrated benefits from effective HWC management, discussed in the previous chapter, have illustrated significant possibilities for effecting change at scale. However, going beyond localised solutions to achieving a global level of change is still a distant possibility. Considering where we are in the wider landscape of moving towards human-wildlife coexistence, and in addition to approaches mentioned in previous chapters, what should the global community consider developing or improving as we look to the future of coexistence?

MAINTAINING CONNECTIVITY

Maintaining connectivity for wildlife through human-dominated spaces is of paramount importance. Many species have adapted to exploit and utilise these areas, bringing difficult deliberations and delicate negotiations about land-sharing and land-sparing to the forefront. The future of coexistence, thus, requires enabling wildlife persistence within human-dominated landscapes while substantially and sustainably reducing risks and costs for people and wildlife. Integrating HWC management with land use planning programmes and social and environmental safeguard systems, such as Social and Environmental Impact Assessments, can decrease negative impacts of development activities. In particular, new linear infrastructure projects should consider connectivity and the requirements of wildlife to decrease negative impacts.

INNOVATION

Human-wildlife coexistence is inspiring people all over the world and creating opportunities for innovation. Technology is part of a suite of measures that make up comprehensive solutions; however, many tech tools, such as early warning systems, are largely being developed to prevent HWC but don't address other elements of HWC management. However, considering the complexities and needs of the conflict landscape, tech solutions are inadequate in themselves and cannot ensure that humans will act responsibly in ways that will help manage conflict while still sustaining wildlife in the long term. Innovation must look beyond technology alone and include new ideas and approaches that foster human-wildlife coexistence. In order to produce systematic, sustainable, and successful innovations across the board, the mutual participation of communities; representatives from the social, biological, and engineering sciences; the private sector; and policymakers is required. This can only be achieved through a sound basis of trust, respect, and understanding by all stakeholders; with the total buy-in of local communities implementing such solutions; and by considering the needs of both people and wildlife. In the trialling of innovations, monitoring plays a key role in gauging their success and failure.

Concluding remarks

In addition to the opportunities highlighted, it is important to acknowledge that future global trends in resource use and land use change will bring increased challenges for coexistence. However, if the global community can come together and collaborate to implement and scale up integrated and holistic approaches to HWC management, and if new policies are able to strike an appropriate balance between mechanisms that deter negative human behaviour towards wildlife and those that promote and enable tolerance, then humans and wildlife may be able to share space more harmoniously for a long time to come.

COLLABORATION/ PARTNERSHIPS

Effective HWC management and coexistence strategies require collaborative and inclusive approaches among all stakeholders involved, with effective knowledge management and exchange and communication being crucial factors. Transforming social tensions and conflicts through strong governance mechanisms to further collaborative HWC management efforts is crucial for significantly and sustainably managing and reducing HWC at scale. Within these collaborations, exchange of best practices and the application of guidelines for HWC management should be fostered.

FUNDING

Current levels of funding are grossly inadequate to address HWC at scale. Unlocking resources at the global level through multilateral banks, development agencies, national budgets, and other donors and investors will be a significant next step in garnering the level of funding needed to address this growing issue.

RESEARCH

There is still a lot we don't know about HWC, especially in the absence of systematic monitoring. Gaining a deeper understanding of processes, drivers, and impacts of HWC and coexistence will enable development of new approaches to HWC management. Inter- and transdisciplinary approaches, involving social and natural science, psychology, and environmental law, can inform the understanding around HWC. Furthermore, research should contribute to the understanding of trends (climate change, urbanisation, industrialisation, changes in agriculture) that can be used as opportunities to manage HWC and develop new ways to coexist.

REFERENCES

1. König H.J., Kiffner C., Kramer-Schadt S., Furst C., Keuling O., Ford A.T. (2020). Human-wildlife coexistence in a changing world. *Conservation Biology* **34**(4):786-49.
2. IUCN (2020). *IUCN SSC Position Statement on the Management of Human-Wildlife Conflict*. (IUCN Species Survival Commission (SSC) Human-Wildlife Conflict Task Force).
3. Whitehouse-Tedd K., Abell J., Dunn A.K. (2020). Evaluation of the use of psychometric scales in human-wildlife interaction research to determine attitudes and tolerance toward wildlife. *Conservation Biology* **35**:533-547.
4. Frank B., Glikman J.A. (2019). Human-Wildlife conflicts and the need to include coexistence. In: *Human-Wildlife interactions: Turning conflict into coexistence* (eds. B. Frank, J.A. Glikman, S. Marchini), 1-19. (Cambridge University Press).
5. Brooks A. (2015). *Human Tiger Conflict: A SAFE Strategy for the tiger range 2016-2022*. (WWF Tigers Alive).
6. Barlow A, Brooks A. (2019). *Human Wildlife Conflict - Response Teams: Global lessons in design, operation, monitoring and sustainability*. (WWF Tigers Alive).
7. Decker D.J., Krueger C.C., Baer R.A., Knuth B.A., Richmond M.E. (1996). From clients to stakeholders: A philosophical shift for fish and wildlife management. *Human Dimensions of Wildlife* **1**(1):70-82.
8. Inskip C., Carter N., Riley S., Roberts T., MacMillan D. (2016). Toward Human-Carnivore Coexistence: Understanding Tolerance for Tigers in Bangladesh. *PLoS One* **11**(1):e0145913.
9. Treves A., Bruskotter J. (2014). Tolerance for predatory wildlife. *Science* **344**(6183):476-7.
10. Bruskotter J.T., Wilson R.S. (2014). Determining Where the Wild Things will be: Using Psychological Theory to Find Tolerance for Large Carnivores. *Conservation Letters* **7**(3):158-65.
11. JHU. (2012). *COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE)*. <https://coronavirus.jhu.edu/map.html> [28 June 2021]. (Johns Hopkins University, Coronavirus Resources Center, Baltimore, USA).
12. IPBES. (2020). *Workshop Report on Biodiversity and Pandemics of the Intergovernmental Platform on Biodiversity and Ecosystem Services*. (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services secretariat, Bonn, Germany).
13. Nyhus P.J. (2016). Human–Wildlife Conflict and Coexistence. *Annual Review of Environment and Resources* **41**(1):143-71.
14. Jones K.E., Patel N.G., Levy M.A., Storeygard A., Balk D., Gittleman J.L., et al. (2008). Global trends in emerging infectious diseases. *Nature* **451**(7181):990-3.
15. Locke H., Ellis E.C., Venter O., Schuster R., Ma K., Shen X., et al. (2019). Three global conditions for biodiversity conservation and sustainable use: an implementation framework. *National Science Review* **6**(6):1080-2.
16. Sachs J.D., Baillie J.E., Sutherland W.J., Armsworth P.R., Ash N., Beddington J., et al. (2009). Ecology. Biodiversity conservation and the Millennium Development Goals. *Science* **325**(5947):1502-3.
17. Prakash T.G.S.L., Wijeratne A.W., Prithiviraj F. (2020). Human-Elephant Conflict in Sri Lanka: Patterns and Extent. *Gajah Journal of the Asian Elephant Specialist Group* **51**:16-25.
18. Kushnir H., Packer C. (2019). Perceptions of Risk From Man-Eating Lions in Southeastern Tanzania. *Frontiers in Ecology and Evolution* **7**.
19. Ikanda D. (2021). *Status of the African Lion Panthera leo in Tanzania* [Presentation]. (WWF Mkomazi Lion Project Workshop, Tanzania Wildlife Research Institute, Moshi, Tanzania).
20. WHO. (2019). *Snakebite envenoming*. <https://www.who.int/news-room/fact-sheets/detail/snakebite-envenoming> [31 March 2021]. (World Health Organization, Geneva, Switzerland).
21. Bautista C., Revilla E., Naves J., Albrecht J., Fernández N., Olszańska A., et al. Large carnivore damage in Europe: Analysis of compensation and prevention programs. *Biological Conservation* **235**:308-16 (2019).
22. UNDP. (2014). *Nepal Human Development Report 2014*. (Government of Nepal, National Planning Commission, Kathmandu, Nepal).
23. Gross E.M. Lahkar B.P., Subedi N., Nyirenda V.R., Lichtenfeld L.L., Jakoby O. (2019). Does traditional and advanced guarding reduce crop losses due to wildlife? A comparative analysis from Africa and Asia. *Journal for Nature Conservation* **50**:125712.
24. Gross E.M., Lahkar B.P., Subedi N., Nyirenda V.R., Klebelsberg E., Jakoby O. (2020). Elephants in the village: Causes and consequences of property damage in Asia and Africa. *Conservation Science and Practice* **3**(2).
25. Hillman G., Hedges R., Moore A., Colledge S., Pettitt P. (2016). New evidence of Late Glacial cereal cultivation at Abu Hureyra on the Euphrates. *The Holocene* **11**(4):383-93.
26. Bruford M.W., Bradley D.G., Luikart G. (2003). DNA markers reveal the complexity of livestock domestication. *Nature Reviews Genetics* **4**(11):900-10.

27. Trouwborst A. (2010). Managing the Carnivore Comeback: International and EU Species Protection Law and the Return of Lynx, Wolf and Bear to Western Europe. *Journal of Environmental Law* **22**(3):347-72.

28. Wessing R. (1995). The Last Tiger in East Java: Symbolic Continuity in Ecological Change. *Asian Folklore Studies* **54**(2):191-218.

29. Paddle R. (2002). *The last Tasmanian tiger: the history and extinction of the thylacine*. (Cambridge University Press).

30. Torres D.F., Oliveira E.S., Alves R.R.N. (2018). Conflicts Between Humans and Terrestrial Vertebrates: A Global Review. *Tropical Conservation Science* **11**.

31. Draheim M.M., Madden F., McCarthy J.-B., Parsons E.C.M. (2015). *Human-wildlife conflict: Complexity in the Marine Environment* (Oxford University Press).

32. Guerra A.S. (2019). Wolves of the Sea: Managing human-wildlife conflict in an increasingly tense ocean. *Marine Policy* **99**:369-73.

33. UNEP-WCMC, IUCN. Protected Planet – *The World Database on Protected Areas (WDPA)*. <https://www.protectedplanet.net> [31 March 2021]. (Cambridge, UK, 2021).

34. Jhala Y., Gopal R., Mathur V., Ghosh P., Negi H.S., Narain S., et al. (2021). Recovery of tigers in India: Critical introspection and potential lessons. *People and Nature*.

35. Lindsey P.A., Petracca L.S., Funston P.J., Bauer H., Dickman A., Everatt K., et al. (2017). The performance of African protected areas for lions and their prey. *Biological Conservation* **209**:137-49.

36. Riggio J., Jacobson A., Dollar L., Bauer H., Becker M., Dickman A., et al. (2013) The size of savannah Africa: a lion's (Panthera leo) view. *Biodiversity and Conservation* **22**(1):17-35.

37. Hedges S., Fisher K., Rose R. (2008). Range-wide Mapping Workshop for Asian Elephants *(Elephas maximus)*, Cambodia, October 2008. *Report to the U.S. Fish & Wildlife Service*.

38. Thouless C., Dublin H.T., Blanc J., Skinner D.P., Daniel T.E., Taylor R.D., et al. (2016). *African Elephant Status Report 2016: an update from the African Elephant Database*. (IUCN Gland, Switzerland).

39. Harris L.R., Nel R., Oosthuizen H., Meyer M., Kotze D., Anders D., et al. (2018). Managing conflicts between economic activities and threatened migratory marine species toward creating a multiobjective blue economy. Conservation Biology 32(2):411-23.

40. Dickman A.J. (2010). Complexities of conflict: the importance of considering social factors for effectively resolving human-wildlife conflict. *Animal Conservation* **13**(5):458-66.

41. Lamarque F., Anderson J., Fergusson R., Lagrange M., Osei-Owusu Y., Bakker L. (2009). Human-wildlife conflict in Africa. Causes, consequences and management strategies. *FAO Report* **157** (Rome, Italy).

42. Schell C.J., Stanton L.A., Young J.K., Angeloni L.M., Lambert J.E., Breck S.W., et al. (2021). The evolutionary consequences of human-wildlife conflict in cities. *Evolutionary Applications* **14**(1):178-97.

43. Goswami V.R., Medhi K., Nichols J.D., Oli M.K. (2015). Mechanistic understanding of human-wildlife conflict through a novel application of dynamic occupancy models. *Conservation Biology* **29**(4):1100-10.

44. Hemson G., MacLennan S., Mills G., Johnson P., Macdonald D. (2009). Community, lions, livestock and money: A spatial and social analysis of attitudes to wildlife and the conservation value of tourism in a human–carnivore conflict in Botswana. *Biological Conservation* **142**(11):2718-25.

45. Haddad N.M., Brudvig L.A., Clobert J., Davies K.F., Gonzalez A., Holt R.D., et al. (2015). Habitat fragmentation and its lasting impact on Earth ecosystems. *Science Advances* **1**(2):e1500052.

46. Margulies J.D., Karanth K.K. (2018). The production of human-wildlife conflict: A political animal geography of encounter. *Geoforum* **95**:153-64.

47. 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):1512-20.

48. Ranagalage M., Gunarathna M.H.J.P., Surasinghe T.D., Dissanayake D., Simwanda M., Murayama Y., et al. (2020). Multi-Decadal Forest-Cover Dynamics in the Tropical Realm: Past Trends and Policy Insights for Forest Conservation in Dry Zone of Sri Lanka. *Forests* **11**(8):836.

49. Atwood T.C. (2017). Implications of Rapid Environmental Change for Polar Bear Behavior and Sociality. *In: Marine Mammal Welfare: Human Induced Change in the Marine Environment and its Impacts on Marine Mammal Welfare* (ed. A. Butterworth), 445-62. (Springer International Publishing).

50. AMAP. (2019). *AMAP Climate Change Update 2019: An Update to Key Findings of Snow, Water, Ice and Permafrost in the Arctic*. (Arctic Monitoring and Assessment Programme, Oslo, Norway).

51. Meredith M., Sommerkorn M., Cassotta S., Derksen C., Ekaykin A., Hollowed A., et al. (2019). Polar Regions. In: *Special Report on the Ocean and Cryosphere in a Changing Climate* (eds. H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, et al.), 203-320. (IPCC, Geneva, Switzerland).

52. Atwood T.C., Peacock E., McKinney M.A., Lillie K., Wilson R., Douglas D.C., et al. (2016). Rapid Environmental Change Drives Increased Land Use by an Arctic Marine Predator. *PLoS One*. **11**(6):e0155932.

53. Wilder J.M., Vongraven D., Atwood T., Hansen B., Jessen A., Kochnev A., et al. (2017). Polar bear attacks on humans: Implications of a changing climate. *Wildlife Society Bulletin* **41**(3):537-47.

54. Prop J., Aars J., Bardsen B.-J., Hanssen S.A., Bech C., Bourgeon S., et al. (2015). Climate change and the increasing impact of polar bears on bird populations. *Frontiers in Ecology and Evolution* **3**.

55. Government of Nunavut. (2020). *Nunavut Polar Bear Co-management Plan*. (Iqaluit, Nunavut, Canada).

56. 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):247-57.

57. Madden F. (2004). Preventing and Mitigating Human–Wildlife Conflicts: World Parks Congress Recommendation. *Human Dimensions of Wildlife* **9**(4):259-60.

58. Hoare R. (2012). Lessons from 15 years of human elephant conflict mitigation: Management considerations involving biological, physical and governance issues in Africa. *Pachyderm* **51**(1):60-74.

59. Woodroffe R., Thirgood S., Rabinowitz A. (2005). The impact of human-wildlife conflict on natural systems. In: *People and Wildlife: Conflict or Coexistence?* 1st edition (eds. R. Woodroffe, S. Thirgood, A. Rabinowitz), 1-12. (Conservation Biology. Cambridge University Press, UK,).

60. YMCA of the Rockies. (2008). *Pathways to Success: Integrating Human Dimensions into Fish and Wildlife Management – September 28-October 2*. (Estes Park, Colorado, USA).

61. Redpath S.M., Bhatia S., Young J. (2014). Tilting at wildlife: reconsidering human–wildlife conflict. *Oryx* **49**(2):222-5.

62. Madden F., McQuinn B. (2015). Conservation conflict transformation: the missing link in conservation. In: *Conflicts in Conservation: Navigating Towards Solutions. Ecological Reviews* (eds. J.C. Young, K.A. Wood, R.J. Gutiérrez, S.M. Redpath), 257-70. (Cambridge University Press, UK).

63. Zimmermann A., McQuinn B., Macdonald D.W. (2020). Levels of conflict over wildlife: Understanding and addressing the right problem. *Conservation Science and Practice*.

64. Hodgson I.D., Redpath S.M., Sandström C, Biggs D. (2020). *The State of Knowledge and Practice on Human-Wildlife Conflicts*. (Luc Hoffmann Institute, Gland, Switzerland).

65. Büscher B., Fletcher R. (2020). *The Conservation Revolution: Radical Ideas for Saving Nature beyond the Anthropocene*. (Verso, London, UK).

66. Ripple W.J., Beschta R.L. (2003). Wolf reintroduction, predation risk, and cottonwood recovery in Yellowstone National Park. *Forest Ecology and Management* **184**(1-3):299-313.

67. Taylor R.A., Ryan S.J., Brashares J.S., Johnson L.R. (2016). Hunting, food subsidies, and mesopredator release: the dynamics of crop-raiding baboons in a managed landscape. *Ecology* **97**(4):951-60.

68. Shehzad W., Nawaz M.A., Pompanon F., Coissac E., Riaz T., Shah S.A., et al. (2014). Forest without prey: livestock sustain a leopard Panthera pardus population in Pakistan. *Oryx* **49**(2):248-53.

69. Woodroffe R., Ginsberg J.R. (1998). Edge effects and the extinction of populations inside protected areas. *Science* **280**(5372):2126-8.

70. Romero-Muñoz A., Torres R., Noss A.J., Giordano A.J., Quiroga V., Thompson J.J., et al. (2019). Habitat loss and overhunting synergistically drive the extirpation of jaguars from the Gran Chaco. *Diversity and Distributions* **25**(2):176-90.

71. Cullen Junior L., Sana D.A., Lima F., de Abreu K.C., Uezu A. (2013). Selection of habitat by the jaguar, *Panthera onca* (Carnivora: Felidae), in the upper Paraná River, Brazil. *Zoologia (Curitiba)* **30**(4):379-87.

72. Frank L.G., Woodroffe R., Ogada M.O. (2005). People and predators in Laikipia District, Kenya. In: People and Wildlife: Conflict or Coexistence? 1st edition (eds. R. Woodroffe, S. Thirgood, A. Rabinowitz), 286-304. (Conservation Biology. Cambridge University Press, UK).

73. Proctor M.F., Kasworm W.F., Annis K.M., MacHutchon A.G., Teisberg J.E., Radandt T.G., et al. (2018). Conservation of threatened Canada-USA trans-border grizzly bears linked to comprehensive conflict reduction. Human–Wildlife Interactions 3(12):348-72.

74. Athreya V., Odden M., Linnell J.D.C., Karanth K.U. (2011). Translocation as a Tool for Mitigating Conflict with Leopards in Human-Dominated Landscapes of India. *Conservation Biology* **25**(1):133-41.

75. Inskip C., Zimmermann A. (2009). Human-felid conflict: a review of patterns and priorities worldwide. *Oryx* **43**(1):18.

76. Schley L., Dufrêne M., Krier A., Frantz A.C. (2008). Patterns of crop damage by wild boar (Sus scrofa) in Luxembourg over a 10-year period. *European Journal of Wildlife Research* **54**(4):589-99.

77. Naughton-Treves L., Treves A. (2005). Socio-ecological factors shaping local support for wildlife: crop-raiding by elephants and other wildlife in Africa. In: *People and Wildlife: Conflict or Coexistence?* 1st edition (eds. R. Woodroffe, S. Thirgood, A. Rabinowitz), 252-77. (Conservation Biology. Cambridge University Press, UK).

78. Bobek B., Furtek J., Bobek J., Merta D., Wojciuch-Ploskonka M. (2017). Spatio-temporal characteristics of crop damage caused by wild boar in north-eastern Poland. *Crop Protection* **93**:106-12.

79. Pandey P., Shaner P.J., Sharma H.P. (2016). The wild boar as a driver of human-wildlife conflict in the protected park lands of Nepal. *European Journal of Wildlife Research* **62**(1):103-8.

80. Magle S.B., Simoni L.S., Lehrer E.W., Brown J.S. (2014). Urban predator–prey association: coyote and deer distributions in the Chicago metropolitan area. *Urban Ecosystems* **17**(4):875-91.

81. Chauhan N.P.S. (2011). Human casualties and agricultural crop raiding by wild pigs and mitigation strategies in India. *Mitteilungen des Julius-Kühn Instituts* **432**:192-3.

82. Gross E.M., Lahkar B.P., Subedi N., Nyirenda V.R., Lichtenfeld L.L., Jakoby O. (2018). Seasonality, crop type and crop phenology influence crop damage by wildlife herbivores in Africa and Asia. *Biodiversity and Conservation*.

83. Sitompul A.F., Tyson M.J., Caroll J.P., O'Brien T. (2010). Crop Raiding by Elephants Adjacent to Two National Parks in Lampung Province, Sumatra, Indonesia. *Gajah* **33**:26-34.

84. Lamb C.T., Ford A.T., McLellan B.N., Proctor M.F., Mowat G., Ciarniello L., et al. (2020). The ecology of human-carnivore coexistence. *PNAS* **117**(30):17876-83.

85. Gaynor K.M., Hojnowski C.E., Carter N.H., Brashares J.S. (2018). The influence of human disturbance on wildlife nocturnality. *Science* **360**(6394):1232-5.

86. Tucker M.A., Böhning-Gaese K., Fagan W.F., Fryxell J.M., Van Moorter B., Alberts S.C., et al. (2018). Moving in the Anthropocene: Global reductions in terrestrial mammalian movements. *Science* **359**(6374):466-9.

87. Karamanlidis A., Adamantopoulou S., Kallianiotis A.A., Tounta E., Dendrinos P. (2020). An interview-based approach assessing interactions between seals and small-scale fisheries informs the conservation strategy of the endangered Mediterranean monk seal. *Aquatic Conservation: Marine and Freshwater Ecosystems* **30**(5):928-36.

88. Johnson W.M., Lavigne D. (1999). Monk Seals in Antiquity: *The Mediterranean Monk Seal (Monachus monachus) in Ancient History and Literature*. (Netherlands Commission for International Nature Protection, Leiden, The Netherlands).

89. Dendrinos P., Adamantopoulou S., Tounta E., Karamanlidis A. (2017). The Uncertain Fate of the Endangered Mediterranean Monk Seal Monachus monachus in the 21st Century. In: *Tropical Pinnipeds: Bio-Ecology, Threats and Conservation* (ed. J.J. Alava), 219-233. (CRC Press).

90. Woodroffe R., Frank L.G. (2005). Lethal control of African lions (Panthera leo): local and regional population impacts. *Animal Conservation* **8**(1):91-8.

91. Marker L.L., Dickman A.J., Mills M.G.L., Macdonald D.W. (2003). Aspects of the management of cheetahs, Acinonyx jubatus jubatus, trapped on Namibian farmlands. *Biological Conservation* **114**(3):401-12.

92. Nyirenda V.R., Lindsey P.A., Phiri E., Stevenson I., Chomba C., Namukonde N., et al. (2015). Trends in Illegal Killing of African Elephants (Loxodonta africana) in the Luangwa and Zambezi Ecosystems of Zambia. *Environment and Natural Resources Research* **5**(2):24-36.

93. Seiler N., Robbins M.M. (2015). Ranging on Community Land and Crop-Raiding by Bwindi Gorillas. *Gorilla Journal* **50**:11-3.

94. IUCN. (2018). *IUCN SSC Position Statement on the Culling of the Mauritius Fruit Bat Pteropus niger*. (IUCN Gland, Switzerland).

95. Thirgood S., Woodroffe R., Rabinowitz A. (2005). The impact of human-wildlife conflict on human lives and livelihoods. In: *People and Wildlife: Conflict or Coexistence?* 1st edition (eds. R. Woodroffe, S. Thirgood, A. Rabinowitz), 13-26. (Conservation Biology. Cambridge University Press, UK).

96. Miquelle D., Nikolaev I., Goodrich J., Litvinov B., Smirnov E., Suvorov E., et al. (2005). Searching for the coexistence recipe: a case study of conflicts between people and tigers in the Russian Far East. In: *People and Wildlife: Conflict or Coexistence?* 1st edition (eds. R. Woodroffe, S. Thirgood, A. Rabinowitz), 305-22. (Conservation Biology. Cambridge University Press, UK).

97. Corvera M.D., Manalo R.I., Aquino M.T.R. (2017). People and Crocodiles Sharing One Environment: An Analysis of Local Human-Crocodile Conflict Management Strategies in the Philippines. *Journal of Animal Science and Research* **1**.

98. Bharadwaj A.R., Prasad A.D. Human-King Cobra Conflict in Western Ghats Region of Sringeri, Karnataka, India. *Journal of Biodiversity Management & Forestry* **8**(2) (2019).

99. Nowell K, Li J, Paltsyn M, Sharma RK. (2016). *An Ounce of Prevention: Snow Leopard Crime Revisited*. (TRAFFIC, Cambridge, UK).

100. Le Busque B., Dorrian J., Litchfield C. (2021). The impact of news media portrayals of sharks on public perception of risk and support for shark conservation. *Marine Policy* **124**:104341.

101. Zimmermann A., Walpole M.J., Leader-Williams N. (2005). Cattle ranchers' attitudes to conflicts with jaguar Panthera onca in the Pantanal of Brazil. *Oryx* **39**(4):406.

102. Campbell E., Mangel J.C., Alfaro-Shigueto J., Mena J.L., Thurstan R.H., Godley B.J. (2020). Coexisting in the Peruvian Amazon: Interactions between fisheries and river dolphins. *Journal for Nature Conservation* **56**:125859.

103. Liberg O., Chapron G., Wabakken P., Pedersen H.C., Hobbs N.T., Sand H. (2012). Shoot, shovel and shut up: cryptic poaching slows restoration of a large carnivore in Europe. *Proceedings of the Royal Society B* **279**(1730):910-5.

104. Hoffmann W.R.E., Neumann P., Schmolz E. (2000). Technique for rearing the European hornet (Vespa crabro) through an entire colony life cycle in captivity. *Insectes sociaux* **47**(4):351-3.

105. Langowska A., Ekner A., Skorka P., Tobolka M., Tryjanowski P. (2010). Nest-Site Tenacity and Dispersal Patterns of Vespa crabro Colonies Located in Bird Nest-Boxes. *Sociobiology* **56**(2):375-82.

106. Robin K. (2001). Die Wiederansiedlung des Bartgeiers in den Alpen: ein Positivbeispiel. *Forest Snow and Landscape Research* **76**(1-2):41-52.

107. Roe D., Mulliken T., Milledge S., Mremi J., Mosha S., Grieg-Gran M. (2002). Making a Killing or Making a Living? Wildlife Trade, Trade Controls and Rural Livelihoods. (IIED, London, UK.)

108. Rosen G.E., Smith K.F. (2010). Summarizing the evidence on the international trade in illegal wildlife. *Ecohealth* **7**(1):24-32.

109. Challender D.W.S., MacMillan D.C. (2014). Poaching is more than an Enforcement Problem. *Conservation Letters* **7**(5):484-94.

110. Sellar J.M. (2018). 'A Blunt Instrument': Addressing Criminal Networks with Military Responses, and the Impact on Law Enforcement and Intelligence. In: *Militarised Responses to Transnational Organised Crime:* The War on Crime (eds. T. Reitano, S. Jesperson, L. Bird Ruiz-Benitez de Lugo), 91-105. (Springer International Publishing, Cham, Switzerland).

111. WWF/Dalberg. (2012). *Fighting illicit wildlife trafficking: A consultation with governments*. (WWF International, Gland, Switzerland).

112. Moreto W.D. (2019). Provoked poachers? Applying a situational precipitator framework to examine the nexus between human-wildlife conflict, retaliatory killings, and poaching. *Criminal Justice Studies* **32**(2):63-80.

113. Stoldt M., Gottert T., Mann C., Zeller U. (2020). Transfrontier Conservation Areas and Human-Wildlife Conflict: The Case of the Namibian Component of the Kavango-Zambezi (KAZA) TFCA. *Scientific Reports* **10**(1):7964.

114. Moreto W.D., Lemieux A.M. (2015). Poaching in Uganda: Perspectives of Law Enforcement Rangers. *Deviant Behavior* **36**(11):853-73.

115. Songer M., Aung M., Allendorf T.D., Calabrese J.M., Leimgruber P. (2016). Drivers of Change in Myanmar's Wild Elephant Distribution. *Tropical Conservation Science* **9**(4).

116. O'Connell-Rodwell C., Parry-Jones R. (2002). *An Assessment of China's Management of Trade in Elephants and Elephant Products*. (TRAFFIC International).

117. Sampson C., McEvoy J., Oo Z.M., Chit A.M., Chan A.N., Tonkyn D., et al. (2018). New elephant crisis in Asia-Early warning signs from Myanmar. *PLoS One* **13**(3):e0194113.

118. Nyein M.N.M. (2020). Pers. communication. WWF-Myanmar.

119. Boitani L., Powell R.A. (2012). *Carnivore Ecology and Conservation: A Handbook of Techniques*. (Oxford University Press, New York, USA).

120. Poledníková K., Kranz A., Poledník L., Myšiak J. (2013). Otters Causing Conflicts. In: *Human-Wildlife Conflicts in Europe: Fisheries and Fish-eating Vertebrates as a Model Case* (eds. R.A. Klenke, I. Ring, A. Kranz, N. Jepsen, F. Rauschmayer, K. Henle), 81-106. (Springer Berlin, Heidelberg, Germany).

121. Jepsen N., Olesen T. (2013). Cormorants in Denmark: Re-enforced management and scientific evidence. In: *Human-Wildlife Conflicts in Europe: Fisheries and Fish-eating Vertebrates as a Model Case* (eds. R.A. Klenke, I. Ring, A. Kranz, N. Jepsen, F. Rauschmayer, K. Henle), 165-182. (Springer Berlin, Heidelberg, Germany).

122. Schakner Z.A., Blumstein D.T. (2013). Behavioral biology of marine mammal deterrents: A review and prospectus. *Biological Conservation* **167**:380-9.

123. Wiafe E.D. (2019). Primates crop raiding situation on farmlands adjacent to South-West of Mole National Park, Ghana. *Ghana Journal of Agricultural Science* **54**(2):58-67.

124. Ramey E.M., Ramey R.R., Brown L.M., Kelley S.T. (2013). Desert-dwelling African elephants (Loxodonta africana) in Namibia dig wells to purify drinking water. *Pachyderm* **53**:66-72.

125. Can Ö.E., D'Cruze N. Garshelis D.L., Beecham J., Macdonald D.W. (2014). Resolving Human-Bear Conflict: A Global Survey of Countries, Experts, and Key Factors. *Conservation Letters* **7**(6):501-13.

126. Nash C.E., Iwamoto R.N., Mahnken C.V.W. (2000). Aquaculture risk management and marine mammal interactions in the Pacific Northwest. *Aquaculture* **183**(3):307-23.

127. Williams D.J, Faiz M.A., Abela-Ridder B., Ainsworth S., Bulfone T.C., Nickerson A.D., et al. (2019). Strategy for a globally coordinated response to a priority neglected tropical disease: Snakebite envenoming. *PLoS Neglected Tropical Diseases* **13**(2):e0007059.

128. Dunham K.M., Ghiurghi A., Cumbi R., Urbano F. (2010). Human–wildlife conflict in Mozambique: a national perspective, with emphasis on wildlife attacks on humans. *Oryx* **44**(02):185.

129. Chomba C., Senzota R., Chabwela H., Mwitwa J., Nyirenda V. (2012). Patterns of human-wildlife conflicts in Zambia, causes, consequences and management responses. *Journal of Ecology and the Natural Environment* **4**(12):303-13.

130. Acharya K.P., Paudel P.K., Neupane P.R., Kohl M. (2016). Human-Wildlife Conflicts in Nepal: Patterns of Human Fatalities and Injuries Caused by Large Mammals. *PLoS One* **11**(9):e0161717.

131. Sullivan J.M. (2011). Trends and characteristics of animal-vehicle collisions in the United States. *Journal of Safety Research* **42**(1):9-16.

132. Bond J., Mkutu K. (2018). Exploring the Hidden Costs of Human–Wildlife Conflict in Northern Kenya. *African Studies Review* **61**(1):33-54.

133. Pozo R.A., LeFlore E.G., Duthie A.B., Bunnefeld N., Jones I.L., Minderman J., et al. (2020). A multispecies assessment of wildlife impacts on local community livelihoods. *Conservation Biology*.

134. 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 of the USA* **108**(34): 13937-44.

135. Barua M., Bhagwat S.A., Jadhav S. (2013). The hidden dimensions of human-wildlife conflict: Health impacts, opportunity and transaction costs. *Biological Conservation* **157**:309-16.

136. Ogra M.V. (2008). Human-wildlife conflict and gender in protected area borderlands: A case study of costs, perceptions, and vulnerabilities from Uttarakhand (Uttaranchal), India. *Geoforum* **39**(3):1408-22.

137. Doubleday K.F., Adams P.C. (2020). Women's risk and well-being at the intersection of dowry, patriarchy, and conservation: The gendering of human–wildlife conflict. Environment and Planning E: *Nature and Space* **3**(4):976-98.

138. Mayberry A., Hovorka A., Evans K. (2017). Well-Being Impacts of Human-Elephant Conflict in Khumaga, Botswana: Exploring Visible and Hidden Dimensions. *Conservation and Society* **15**(3):280-91.

139. Ogra M., Badola R. (2008). Compensating Human-Wildlife Conflict in Protected Area Communities: Ground-Level Perspectives from Uttarakhand, India. *Human Ecology* **36**(5):717-29.

140. Khumalo K., Yung L. (2015). Women, Human-Wildlife Conflict, and CBNRM: Hidden Impacts and Vulnerabilities in Kwandu Conservancy, Namibia. *Conservation and Society* **13**(3):232.

141. Jadhav S., Barua M. (2012). The Elephant Vanishes: impact of human-elephant conflict on people's wellbeing. *Health Place* **18**(6):1356-65.

142. Chowdhury A.N., Mondal R., Brahma A., Biswas M.K. (2008). Eco-psychiatry and Environmental Conservation: Study from Sundarban Delta, India. *Environmental Health Insights* **2**(1).

143. Chowdhury A.N., Brahma A., Mondal R., Biswas M.K. (2016). Stigma of tiger attack: Study of tiger-widows from Sundarban Delta, India. *Indian Journal of Psychiatry* **58**(1):12-9.

144. Jordan N.R., Smith B.P., Appleby R.G., van Eeden L.M., Webster H.S. (2020). Addressing inequality and intolerance in human-wildlife coexistence. *Conservation Biology* **34**(4):803-10.

145. Mech L.D. (2017). Where can wolves live and how can we live with them? *Biological Conservation* **210**:310-7.

146. Triguero-Mas M., Olomi-Sola M., Jha N., Zorondo-Rodriguez F., Reyes-Garcia V. (2010). Urban and rural perceptions of protected areas: a case study in Dandeli Wildlife Sanctuary, Western Ghats, India. *Environmental Conservation* **36**(3): 208-17.

147. Booth A.L., Ryan D.A.J. (2019). A tale of two cities, with bears: understanding attitudes towards urban bears in British Columbia, Canada. *Urban Ecosystems* **22**(5):961-73.

148. Patterson M.E., Montag J.M., Williams D.R. (2003). The urbanization of wildlife management: Social science, conflict, and decision making. *Urban Forestry & Urban Greening* **1**(3):171-83.

149. Sjoegren A., Matsuda H. (2016). Seeing the Wolf through Sami Eyes - Understanding Human Dimensions of Wildlife Conflict in Northern Sweden. *International Journal of Sustainable Future for Human Security* **4**(1):35-49.

150. Goldman M.J., Roque De Pinho J. Perry J. (2010). Maintaining Complex Relations with Large Cats: Maasai and Lions in Kenya and Tanzania. *Human Dimensions of Wildlife* **15**(5):332-46.

151. Kansky R., Knight A.T. (2014). Key factors driving attitudes towards large mammals in conflict with humans. *Biological Conservation* **179**:93-105.

152. Kansky R., Kidd M., Fischer J. (2020). Does money "buy" tolerance toward damage-causing wildlife? *Conservation Science and Practice.*

153. Ghosal S., Skogen K., Krishnan S. (2015). Locating Human-Wildlife Interactions: Landscape Constructions and Responses to Large Carnivore Conservation in India and Norway. *Conservation and Society* **13**(3):265.

154. Liu F., McShea W.J., Garshelis D.L., Zhu X., Wang D., Shao L. (2011). Human-wildlife conflicts influence attitudes but not necessarily behaviors: Factors driving the poaching of bears in China. *Biological Conservation* **144**(1):538-47.

155. Siex K.S., Struhsaker T.T. (1999). Ecology of the Zanzibar Red Colobus Monkey: Demographic Variability and Habitat Stability. *International Journal of Primatology* **20**(2):163-92.

156. Chase Grey J.N., Bell S., Hill R.A. (2017). Leopard diets and landowner perceptions of human wildlife conflict in the Soutpansberg Mountains, South Africa. *Journal for Nature Conservation* **37**:56-65.

157. Fritts S.H., Stephenson R.O., Hayes R.D., Boitani L. (2003). Wolves and Humans. In: Wolves: Behavior, Ecology, and Conservation (eds. L. Boitani, L.D. Mech). (University of Chicago Press, USA).

158. Madden F.M. (2008). The Growing Conflict Between Humans and Wildlife: Law and Policy as Contributing and Mitigating Factors. Journal of International Wildlife Law & Policy 11(2-3):189-206.

159. Karanth K.K., DeFries R. (2011). Nature-based tourism in Indian protected areas: New challenges for park management. *Conservation Letters* **4**(2):137-49.

160. Gross E.M. (2019). Tackling routes to coexistence. *Human-elephant conflict in sub-Saharan Africa.* (GIZ Partnership against Poaching and Illegal Wildlife Trade, Eschborn, Germany).

161. Blomley T. (2003). Natural resource conflict management: the case of Bwindi Impenetrable and Mgahinga Gorilla National Parks, southwestern Uganda. In: *Natural resource conflict management case studies: an analysis of power, participation and protected areas* (eds. A.P. Castro, E. Nielsen), 231-250. (FAO, Rome, Italy).

162. Twinamatsiko M., Nizette P., Baker J., Mutabaazi H., Behm Masozera A., Roe D. (2019). *Beyond gorillas. Local economic development through tourism at Bwindi Impenetrable National Park.* (IIED, London, UK).

163. Ahebwa W.M., van der Duim R., Sandbrook C. (2012). Tourism revenue sharing policy at Bwindi Impenetrable National Park, Uganda: a policy arrangements approach. *Journal of Sustainable Tourism* **20**(3):377-94.

164. Marchini S., Ferraz K.M.P.M.B., Zimmermann A., Guimarães-Luiz T., Morato R., Correa P.L.P., et al. (2019). Planning for Coexistence in a Complex Human-Dominated World. In: *Human-Wildlife interactions: Turning conflict into coexistence* (eds. B. Frank, J.A. Glikman, S. Marchini), 414-38. (Cambridge University Press).

165. Hodgson I.D., Redpath S.M., Fischer A., Young J. (2018). Fighting talk: Organisational discourses of the conflict over raptors and grouse moor management in Scotland. *Land Use Policy* **77**:332-43.

166. Madden F., McQuinn B. (2014). Conservation's blind spot: The case for conflict transformation in wildlife conservation. *Biological Conservation* **178**:97-106.

167. HDR. (2020). Human Development Reports. <http://hdr.undp.org/> [31 March 2021]. (UNDP).

168. Jacobsen K.S., Linnell J.D.C. (2016). Perceptions of environmental justice and the conflict surrounding large carnivore management in Norway: Implications for conflict management. *Biological Conservation* **203**:197-206.

169. Skogen K. (2015). The Persistence of an Economic Paradigm: Unintended Consequences in Norwegian Wolf Management. *Human Dimensions of Wildlife* **20**(4):317-22.

170. Anyango-van Zwieten N., van der Duim R., Visseren-Hamakers I.J. (2015). Compensating for livestock killed by lions: payment for environmental services as a policy arrangement. *Environmental Conservation* **42**(4):363-72.

171. Oerke E.C. (2006). Crop losses to pests. *The Journal of Agricultural Science* **144**(1):31-43.

172. Massé F. (2016). The political ecology of human-wildlife conflict: Producing wilderness, insecurity, and displacement in the Limpopo National Park. *Conservation and Society* **14**(2):100.

173. Szteren D., Páez E. (2002). Predation by southern sea lions (Otaria flavescens) on artisanal fishing catches in Uruguay. *Marine and Freshwater Research* **53**(8):1161.

174. Graham M.D., Notter B., Adams W.M., Lee P.C., Ochieng T.N. (2010). Patterns of crop-raiding by elephants, Loxodonta africana, in Laikipia, Kenya, and the management of human-elephant conflict. *Systematics and Biodiversity* **8**(4):435-45.

175. Madhusudan M.D. (2003). Living amidst large wildlife: livestock and crop depredation by large mammals in the interior villages of Bhadra Tiger Reserve, South India. *Environmental Management* **31**(4):466-75.

176. Akinwotu E. (2020). Hunger fears in north-east Nigeria as roaming elephants trample crops. *The Guardian* [09 November 2020] (Guardian News & Media Ltd., London, UK).

177. Parakkasi K. (2013). *Understanding the characteristic and mitigation strategies of human-tiger conflict in an Oil Palm Plantation*, Riau Province, Indonesia (University of Kent, UK).

178. Kumar M.A., Raghhunathan G. (2014). Fostering human-elephant coexistence in the Valparai landscape, Anamlai Tiger Reserve, Tamil Nadu. In: *Human-Wildlife Conflict in the Mountains of SAARC Region Compilation of Successful Management Strategies and Practices* (ed. SAARC Forestry Centre Office), 14-26. (South Asian Association for Regional Cooperation, Thimphu, Bhutan).

179. Othman N., Goossens B., Cheah C.P.I., Nathan S., Bumpus R., Ancrenaz M. (2019). Shift of paradigm needed towards improving human-elephant coexistence in monoculture landscapes in Sabah. *International Zoo Yearbook* **53**(1):161-73.

180. Cheah C.P.I., Koh P.H., Nathan R. (in press). Can the oil palm industry and elephant conservation be reconciled? A case study in Kalabakan, Sabah. *Gajah*.

181. Würsig B, Gailey G.A. (2002). Marine mammals and aquaculture: conflicts and potential resolutions. In: *Responsible marine aquaculture* (eds. R. Stickney, J.P. McVey), 45-59. (CABI Publishing, Maryland, USA).

182. Sitati N.W., Walpole M., Leader-Williams N., Stephenson P.J. (2012). Human-elephant conflict: Do elephants contribute to low mean grades in schools within elephant ranges? *International Journal of Biodiversity and Conservation* **4**(15):614-20.

183. Mackenzie C.A., Sengupta R.R., Kaoser R. (2015). Chasing baboons or attending class: protected areas and childhood education in Uganda. *Environmental Conservation* **42**(4):373-83.

184. Jones B.T.B., Elliot W.J. (2007). Human Wildlife Conflict in Namibia: Experiences from a Portfolio of Practical Solutions. In: Human-wildlife conflicts Vol. 21 (eds. M. Laverdière, L. Bakker, A. Ndeso-Atanga). (FAO Regional Office for Africa, Accra, Ghana).

185. Roe D., Fancourt M., Sandbrook C. (2015). *Biodiversity conservation and poverty reduction: what's the connection? A systematic mapping of the evidence*. (International Institute for Environment and Development (IIED), London, UK).

186. WWF Tigers Alive (2020). *Landscape Connectivity, Science and Practice: Ways forward for large ranging species and their landscapes*. (WWF International).

187. Bhatia S., Athreya V., Grenyer R., Macdonald D.W. (2013). Understanding the role of representations of human-leopard conflict in Mumbai through media-content analysis. *Conservation Biology* **27**(3):588-94.

188. White P.C.L, Ward A.I. (2010). Interdisciplinary approaches for the management of existing and emerging human–wildlife conflicts. *Wildlife Research* **37**(8):623-9.

189. Manral U., Sengupta S., Hussain S.A., Rana S., Badola R. (2016). Human Wildlife Conflict in India: A review of economic implication of loss and preventive measures. *The Indian Forester* **142**(10):928-40.

190. Stuart-Hill G., Diggle R., Munali B., Tagg J., Ward D. (2005). The Event Book System: A Community-based Natural Resource Monitoring System from Namibia. *Biodiversity and Conservation* **14**(11):2611-31.

191. Western D., Waithaka J. (2005). Policies for reducing human-wildlife conflict: a Kenya case study. In: *People and Wildlife: Conflict or Coexistence?* 1st edition (eds. R. Woodroffe, S. Thirgood, A. Rabinowitz), 357-72. (Conservation Biology. Cambridge University Press, UK).

192. Karanth K.K., Gupta S., Vanamamalai A. (2018). Compensation payments, procedures and policies towards human-wildlife conflict management: Insights from India. *Biological Conservation* **227**:383-9.

193. Snively S.W. (2012). Environmental Laws of Namibia: Constitutions, Conservation, and Cheetahs. *Probate & Property*.

194. Republic of Namibia (2015). *Namibian constitution*. (Juta Law, Cape Town, South Africa).

195. MET (2018). *Revised National Policy on Human Wildlife Conflict Management*. (Ministry of Environment and Tourism, Republic of Namibia, Windhoek).

196. MET (2013). *National Policy on Community Based Natural Resources Management*. (Ministry of Environment and Tourism, Republic of Namibia, Windhoek).

197. NACSO (2019). *Conservation & Conservancies Namibia*. (Namibian Association of CBNRM Support Organisations (NACSO)).

198. MET/NACSO (2018). *The State of Community Conservation in Namibia, Annual Report 2018*. (MET/NACSO, Windhoek, Namibia).

199. MET/NACSO (2019). T*he state of community conservation in Namibia, Annual Report 2019.* (MET/NACSO, Windhoek, Namibia).

200. Jones B.T.B., Diggle R.W., Thouless C. (2015). From Exploitation to Ownership: Wildlife-Based Tourism and Communal Area Conservancies in Namibia. In: *Institutional Arrangements for Conservation, Development and Tourism in Eastern and Southern Africa: A Dynamic Perspective* (eds. R. van der Duim, M. Lamers, J. van Wijk), 17-37. (Springer Netherlands, Dordrecht).

201. Shilongo S.M., Sam M., Simuela A. (2018). Using Incentives as Mitigation Measure for Human Wildlife Conflict Management in Namibia. *International Journal of Scientific and Research Publications* **8**(11):677-82.

202. Rai R.P., Ghose P.S., Shresta P. (2014). Shifting perspectives in Human Wildlife Conflict: Unheard voices from the Sikkim and Darjeeling Himalaya. In: *Human-Wildlife Conflict in the Mountains of SAARC Region: Compilation of Successful Management Strategies and Practices* (ed. SAARC-Forestry Centre), 72-82. (SAARC Forestry Centre Office, Thimphu, Bhutan).

203. Government of India (2008). *The Wild Life (Protection) Act, 1972: (53 of 1972) as amended by the Wild Life (Protection) Amendment Act, 2006 (39 of 2006)*. (Universal Law Publishing Co., Delhi, India.

204. MoEF (2017). *India's National Wildlife Action Plan 2017-2031*. (Ministry of Environment, Forests and Climate Change (MoEF), New Delhi, India).

205. Oliveira I., Batinge B., Herrera H., Saleh M.M., Saysel A., Videira N., Blanc J., Davidsen, P. (2021). *Integrated Model for Human-Wildlife Coexistence in the Hwange Kazuma Chobe Landscape* <https://exchange.iseesystems.com/public/unepecosystems/acl-hkc>. Version 12.2. [31 March 2021]. United Nations Environment Programme, Nairobi, Kenya.

206. Redfern J.V., McKenna M.F., Moore T.J., Calambokidis J., Deangelis M.L., Becker E.A., et al. (2013). Assessing the risk of ships striking large whales in marine spatial planning. *Conservation Biology* **27**(2):292-302.

207. Government of Greece (1981). *Hellenic Republic Gazette*.

208. Government of Greece (2011). *Hellenic Republic Gazette*.

209. Kotomatas S. (2020). Pers. communication. WWF-Greece.

210. Lamichhane B.R., Persoon G.A., Leirs H., Poudel S., Subedi N., Pokheral C.P., et al. (2019). Contribution of Buffer Zone Programs to Reduce Human-Wildlife Impacts: the Case of the Chitwan National Park, Nepal. *Human Ecology*.

211. KMTNC/NCRTC (2001). *Tiger monitoring in and around RCNP. Final report submitted to WWF-Nepal*. (King Mahendra Trust for Nature Conservation/Nepal Conservation and Research Training Centre, Kathmandu, Nepal).

212. DNPWC, DFSC (2018). *Status of Tigers and Prey in Nepal*. (Department of National Parks and Wildlife Conservation & Department of Forests and Soil Conservation, Ministry of Forests and Environment, Kathmandu, Nepal).

213. MoFSC (1998). *Buffer Zone Management Guidelines*. (Ministry of Forests and Soil Conservation, Kathmandu, Nepal).

214. MoFE (2017). *Guidelines for compensation payments on damages from wildlife, 3d amendment*. (Ministry of Forests and Environment, Kathmandu, Nepal).

215. Painter L.E., Beschta R.L., Larsen E.J., Ripple W.J. (2015). Recovering aspen follow changing elk dynamics in Yellowstone: evidence of a trophic cascade? *Ecology* **96**(1):252-63.

216. Fritz H. (2017). Long-term field studies of elephants: understanding the ecology and conservation of a long-lived ecosystem engineer. *Journal of Mammalogy* **98**(3):603-11.

217. Petracca L.S., Funston P.J., Henschel P., Cohen J.B., MacLennan S., Frair J.L. (2019). Modeling community occupancy from line transect data: a case study with large mammals in post-war Angola. *Animal Conservation* **23**(4):420-33.

218. Davidson Z., Valeix M., Loveridge A.J., Madzikanda H., Macdonald D.W. (2011). Socio-spatial behaviour of an African lion population following perturbation by sport hunting. *Biological Conservation* **144**(1):114-21.

219. Hanssen L., Fwelimbi M.H., Siyanga O., Funston P. (2020). *Human-Lion Conflict Mitigation in the Zambezi Region, Namibia*. (Kwando Carnivore Project, Kongola, Namibia).

220. Hanssen L., Fwelimbi M.H., Siyanga O., Funston P. (2017). *Human-Lion Conflict in the Mudumu Complexes, Report March 2017.* (Kwando Carnivore Project, Kongola, Namibia).

221. Goodrich J., Lynam A., Miquelle D., Wibisono H., Kawanishi K., Pattanavibool A., *et al. (2015). Panthera tigris: The IUCN Red List of Threatened Species 2015* <https://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T15955A50659951.en>. [02 January 2021].

222. UNDP (2020). *From Conflict to Coexistence*. <https://undp-biodiversity.exposure.co/from-conflict-to-coexistence> [20 January 2021]. (UNDP Ecosystems & Biodiversity, Lampung, Indonesia,).

223. Jedrzejewski W., Robinson H.S., Abarca M., Zeller K.A., Velasquez G., Paemelaere E.A.D., et al. (2018). Estimating large carnivore populations at global scale based on spatial predictions of density and distribution - Application to the jaguar (Panthera onca). *PLoS One* **13**(3):e0194719.

224. Quigley H.B., Crawshaw P.G. (1992). A conservation plan for the jaguar Panthera onca in the Pantanal region of Brazil. *Biological Conservation 61*(3):149-57.

225. Polisar J., Maxit I., Scognamillo D., Farrell L., Sunquist M.E., Eisenberg J.F. (2003). Jaguars, pumas, their prey base, and cattle ranching: ecological interpretations of a management problem. *Biological Conservation* **109**(2):297-310.

226. Panthera. (2020). Unpublished data.

227. Quigley H., Foster R., Petracca L., Payán E., Salom R., Harmsen B. (2017). *Panthera onca* (errata version published in 2018): *The IUCN Red List of Threatened Species 2017.* <http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T15953A50658693.en> [23 January 2021]. (IUCN).

228. Nielsen C., Thompson D., Kelly M., Lopez-Gonzalez C.A. (2015). *Puma concolor* (errata version published in 2016): *The IUCN Red List of Threatened Species 2015*. <https://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T18868A50663436.en> [23 January 2021]. (IUCN).

229. Castaño-Uribe C., Lasso C.A., Hoogesteijn R., Diaz-Pulido A., Payán E. (2016). *Conflictos entre felinos y humanos en América Latina*. (Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH) Bogotá, D. C., Colombia).

230. Quigley H., Hoogesteijn R., Hoogesteijn A., Foster R., Payan E., Corrales D., et al. (2015). Observations and Preliminary Testing of Jaguar Depredation Reduction Techniques in and Between Core Jaguar Populations. *Parks* **21**(1):63-73.

231. Garshelis D.L., Scheick B.K., Doan-Crider D.L., Beecham J.J., Obbard M.E. (2016). *Ursus americanus* (errata version published in 2017): *The IUCN Red List of Threatened Species 2016*. <https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T41687A45034604.en> [02 January 2021]. (IUCN).

232. McLellan B.N., Proctor M.F., Huber D., Michel S. (2017). *Ursus arctos* (amended version of 2017 assessment): *The IUCN Red List of Threatened Species 2017.* <https://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T41688A121229971.en> [02 January 2021]. (IUCN).

233. Proctor M.F., Dutta T., McLellan B.N., Garica-Rangel S., Paetkau D., Swaisgood R.R., et al. (2021). Managing for interpopulation connectivity of the World's Bear Species. In: *Bears of the World, Ecology, Conservation and Management* (eds. V. Penteriani, M. Melletti), 317-37. (Cambridge University Press, UK).

234. Morehouse A.T., Hughes C., Manners N., Bectell J., Bruder T. (2020). Carnivores and Communities: A Case Study of Human-Carnivore Conflict Mitigation in Southwestern Alberta. *Frontiers in Ecology and Evolution* **8**(2).

235. Grossmann C.M., Patkó L., Ortseifen D., Kimmig E., Cattoen E.-M., Schraml U. (2020). Human-Large Carnivores Co-existence in Europe – A Comparative Stakeholder Network Analysis. Frontiers in Ecology and Evolution 8(266).

236. WWF-CARE Alliance (2020). Building a Successful Partnership between Conservation and Development Organizations: Experiences and Lessons from the CARE-WWF Alliance. (Washington, DC, USA).

237. KAZA-TFCA (2015). Master Integrated Development Plan 2015-2020. (Kavango-Zambezi Transfrontier Conservation Area Secretariat, Kasane, Botswana).

238. Songhurst A., McCulloch G., Coulson T. (2015). Finding pathways to human–elephant coexistence: a risky business. Oryx 50(4):713-20.

239. Songhurst A., McCulloch G., Stronza A. (2018). Ecoexist Annual Report 2018. (Ecoexist, Maun, Botswana).

240. Franks P., Twinamatsiko M. (2017). *Lessons learnt from 20 years of revenue sharing at Bwindi Impenetrable National Park, Uganda*. (International Institute for Environment and Development (IIED), London, UK).

241. Republic of Uganda (2019). The Uganda Wildlife Act, 2019. (Republic of Uganda, Kampala, Uganda, 2019).

242. van Amstel M., de Neve W., de Kraker J., Glasbergen P. (2007). Assessment of the potential of ecolabels to promote agrobiodiversity. *Ambio* **36**(7):551-8.

243. Chiyo P.I., Lee P.C., Moss C.J., Archie E.A., Hollister-Smith J.A., Alberts S.C. (2011). No risk, no gain: effects of crop raiding and genetic diversity on body size in male elephants. *Behavioral Ecology* **22**(3):552-8.

244. Gross E.M., McRobb R., Gross J. (2016). Cultivating alternative crops reduces crop losses due to African elephants. *Journal of Pest Science* **89**:497-506.

245. Gross E.M., Drouet-Hoguet N., Subedi N., Gross J. (2017). The potential of medicinal and aromatic plants (MAPs) to reduce crop damages by Asian Elephants (Elephas maximus). *Crop Protection* **100**:29-37.

246. van de Water A., King L.E., Arkajak R., Arkajak J., Doormaal N., Ceccarelli V., et al. (2020). Beehive fences as a sustainable local solution to human□elephant conflict in Thailand. *Conservation Science and Practice* **2**(10).

247. van de Water A., Matteson K. (2017). Human-elephant conflict in western Thailand: Socio-economic drivers and potential mitigation strategies. *PLoS One* **13**(6):e0194736 (2018).

248. Department of Agriculture Sabah. *Annual Report 2017*. (Department of Agriculture Sabah Kota Kinabalu, Sabah, Malyasia).

249. Marker L. (2019). Cheetahs Race for Survival: *Ecology and Conservation*. *IntechOpen*.

250. ProCAT (2017). *World's first Jaguar Friendly™ Coffee launched by Phoenix Zoo, Press Coffee Roasters, ProCAT & WFEN*. <https://procat-conservation.org/publicaciones/worlds-first-jaguar-friendly-coffee/> [31 March 2021]. (ProCAT, Bogota, Colombia).

251. Chianti Cashmere (2021). *International Projects and Work Goats*. <http://www.chianticashmere.com> [31 March 2021]. (Chianti Cashmere, Radda, Italy, 2021).

252. Certified Elephant Friendly Tea (2021). *Certified Elephant Friendly™ Tea is sourced from tea plantations that meet high standards for the protection of elephants and their habitat*. <https://elephantfriendlytea.com/> [31 March 2021]. (Wildlife Friendly Enterprise Network, USA).

253. GlobeScan, SustainAbility, BBMG (2013). *2.5 Billion Aspirational Consumers Mark Shift in Sustainable Consumption*. <https://globescan.com/two-and-a-half-billion-aspirational-consumers-mark-shift-in-sustainable-consumption/> [10 January 2021]. (GlobeScan, 2013).

254. Wildlife Friendly Enterprise Network (2021). *Latest News*. <https://wildlifefriendly.org/> [31.03.2021]. (WFEN).

WWF

Working to sustain the natural world for the benefit of people and wildlife.

together possible™

panda.org

© 2021

© 1986 Panda symbol WWF – World Wide Fund for Nature (Formerly World Wildlife Fund) ® "WWF" is a WWF Registered Trademark. WWF, Avenue du Mont-Blanc, 1196 Gland, Switzerland. Tel. +41 22 364 9111. Fax. +41 22 364 0332.

For contact details and further information, please visit our international website at www.panda.org