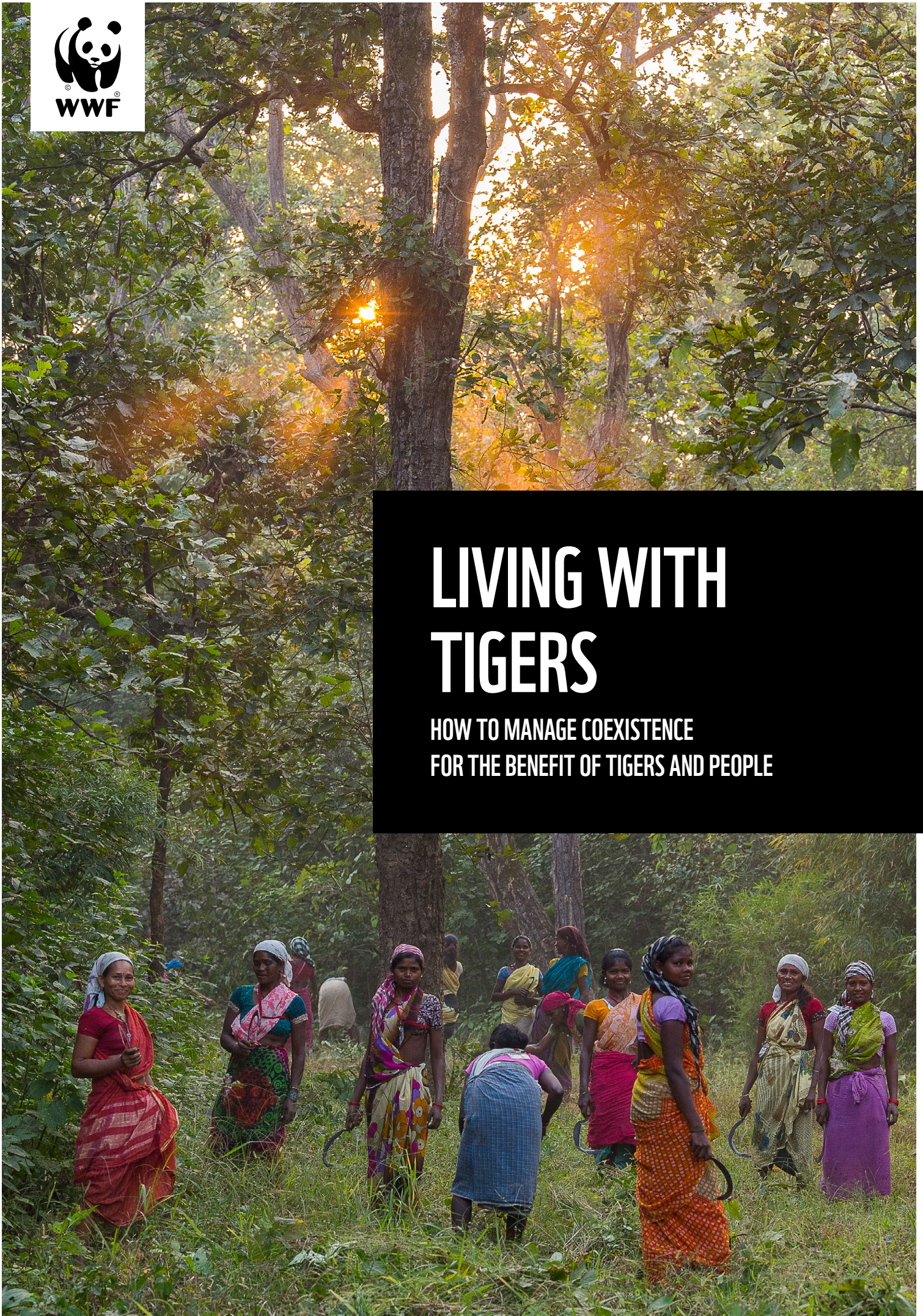




LIVING WITH TIGERS

HOW TO MANAGE COEXISTENCE
FOR THE BENEFIT OF TIGERS AND PEOPLE



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Editorial and Production Team

This report has been developed by Mike Belecky and Smriti Dahal of WWF's Tigers Alive Initiative. Sue Stolton and Nigel Dudley of Equilibrium Research have taken on the bulk of the writing and considerable research input has been provided by Chaitanya Hebert and Ming Fei Li.

Additional inputs from WWF were provided by Sanket Bhale (WWF-India), Ashley Brooks (WWF-TAI), Pranav Chanchani (WWF-India), Stuart Chapman (WWF-TAI), Leena Dahal (WWF International), Richard Diggle (WWF-Namibia), Pijush Kumar Dutta (WWF-India), Thomas Gray (WWF-TAI), Roa'a Hagir (WWF-Malaysia), Raffael Hickisch (WWF-Germany), Femke Hilderink-Koopmans (WWF-Netherlands), Pablo Izquierdo (WWF-Norway), Nilanga Jayasinghe (WWF-US), Yongchao Jin (WWF-China), Harry Jonas (WWF-US), Elina Kaartinen (WWF-UK), Ingelore Katjingsiua (WWF-Namibia), Sybille Klenzendorf (WWF-Germany), Aleksei Kostyria (WWF-Russia), Duo Liu (WWF-China), Peiqi Liu (WWF-China), Nagdrel Lhamo (WWF-Bhutan), Sabita Malla (WWF-Nepal), Rebecca May (WWF-UK), Vijay Moktan (WWF-Bhutan), Peter Osipov (WWF-Russia), David Patterson (WWF-UK), Tashi Phuntsho (WWF-Bhutan), Jenny Roberts (WWF-TAI), Harshad Sambamurthy (WWF-India), Shreya Sethi (WWF-India), Yash Shethia (WWF-India), Nay Myo Shwe (WWF-Myanmar), Lauren Simmonds (WWF-TAI), Rob Steinmetz (WWF-Thailand), Sither Tenzin (WWF-TAI), Kanchan Thapa (WWF-Nepal), Tjiiu C. Thomas (WWF-India), Vishaish Uppal (WWF-India), Kate Vannelli (WWF-Tanzania), Christopher Wong (WWF-Malaysia), Sejal Worah (WWF-India), and Kassia Wordley (WWF-Myanmar).

Input were also provided by Adam Barlow (WildTeam UK), Venetia S. Briggs-Gonzalez (IFAS-Port Lauderdale Research & Education Center), Rok Černe (Slovenia Forest Services), Amy Dickman (Lion Landscapes; University of Oxford), Susana Rostro Garcia (University of Oxford), Miguel Gómez (Northern Jaguar Project), Carmina Gutiérrez (Northern Jaguar Project), Laura Huggins (Bridger Ski Foundation), Špela Logar (Slovenia Forest Services), Frank J. Mazzotti (University of Florida), Rachel Rosenbaum (Go Global NC), Eric Sanderson (WCS), James Steven (IUCN SSC Human-wildlife Conflict Task Force) and Roberto A. Wolf (Northern Jaguar Project).

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WWF, 28 rue Mauverney, 1196 Gland, Switzerland.
Tel. +41 22 364 9111

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

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LIVING WITH TIGERS

**HOW TO MANAGE COEXISTENCE
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FOREWORD



The Kingdom of Bhutan, like many other countries, has been proud to be able to report an increase in our wild tiger population in recent years. This conservation success is great news both for our country and the larger tiger conservation region and the tiger conserving society. This achievement has stepped-up under the Global Tiger Initiative and its associated goal of

doubling wild tigers. One aspect that is often overlooked in these discussions around recovery, is that it would have been impossible if not for a large degree of acceptance and support from the millions of people – 46.7 million as estimated in this report – that live within the current boundaries of the tigers' range.

Living with one of the world's most captivating yet powerful carnivores is no easy matter for people living in tiger frequenting areas. Tigers have become a pest to the livestock resources and a threat to human life in some parts of Bhutan, for an example. Tigers are commonly encountered in human settlement areas in broad daylight. As such, it would be a major misstep to take any existing local support for granted. Particularly as we continue to discuss more tigers living with less equipped and low-income people in rural farming societies over the coming years.

It would seem to me we are at a crossroads of sorts, with two future scenarios that depend on how we respond to this moment. In one scenario we pour our energy into constructing new and long overdue policies for tiger conservation that fully integrate the needs, well-being, and development of local communities. This model would not only best protect those tiger gains recently made, but also unlock brand new ways of delivering tiger conservation built upon the many approaches that might be offered up by the wide variety of peoples that share their lands with tigers. The alternative is to go on as we have, considering communities and coexistence as simply one issue among dozens of issues that impact tigers. This would likely result in a significant decline in community support for the species given that the increased costs of living with more tigers would be felt, but without realizing any of the many possible benefits that might be linked to good stewardship of this species.

The report asks us to take the former path – and provides a wealth of ideas and approaches that can inform the development of new coexistence strategies and policies. In Bhutan we are already increasing our attention to this critical matter. For instance, guided by our Constitution and the Forest and Nature Conservation Act, 1995, which is being

deliberated as a revised bill in the parliament, environment conservation and wildlife protection is at the center of our five year as well as annual developmental plans. An independent National Tiger Center under the Department of Forest and Park Services has been established to plan and enhance Tiger conservation within the country and liaison with the Global Tiger Center, in the efforts to protect and enhance tiger population growth. I am also recently re-elected unanimously by the Executive Committee to Chair the Global Tiger Forum (GTF) for a second term, which I am told happened for the first time in the history of the GTF. Through the GTF, Bhutan has also begun a dialogue with the South Asian tiger countries to frame regional partnership cooperation strategies to facilitate coexistence of tigers with human beings in harmony.

Recognizing the value of the first 12-year Global Tiger Recovery Programme (2010-2022), I would like to invite all partners and governments involved in the negotiations of the next 12-year plan to reflect on how human-tiger coexistence can be made to stand out as a top priority, and one that is backed by a clear roadmap for concrete actions. I would note also that prerequisite to accomplishing any such goals is found in reference to a thread that runs throughout this report – namely, that we will need to open the door to new types of expertise. This includes local peoples and their representatives of course – who are the best experts in many ways – but also those who are preoccupied in relevant fields such as rural development, governance, and local-level institution building. Another very important opportunity to consider is introducing insurance schemes to the affected communities and supporting them to pay their premium charges.

In closing, I would note that tigers have always represented more than just a species; they hold incredible cultural value across the breadth of Asia. Existence of tigers is a proof of a healthy environment. I hope that this publication and the interest of the donors can help spur the type of actions and policies needed to ensure that people are not only champions for the tigers they live with, but that tigers can fairly be described as champions for those same people, the source of tangible benefits and advantages. If we can get this right, we will be in a very good place 12 years from now, and 'Living with Tigers' will not just be an aspiration but a way of life.

A handwritten signature in black ink, appearing to be 'Yeshey Penjor'.

His Excellency Yeshey Penjor
Minister, Ministry of Agriculture and Forest

EXECUTIVE SUMMARY

The *Living with Tigers* report is in many respects a direct response to a considerable conservation success story, which is that wild tiger populations are on the rise following a 2010 agreement by tiger range countries and their partners to double the global population of the species by 2022. This recovery has been highly uneven though, with South Asia accounting for the vast majority of this increase. This is especially impressive given that it is one of the most densely populated regions in the world.

Many of the trends associated with the fast pace of change in these Asian countries are also likely to increasingly bring tigers and humans into shared spaces. The communities living with tigers are not static either – their views and ambitions are also changing in many places. Taken together, there is a very real – and understandable – risk that local tolerance of tigers could decline in the coming years if action is not taken now.

If governments intend to secure their tiger recoveries over the long-term – or further expand these gains – they will need to drastically reimagine and expand their coexistence approaches. It will also require integrating tiger conservation into the human development agenda, with Indigenous peoples and local communities and social science experts playing leading roles in bringing this to fruition.

This will be no simple task, given the numerous and complex elements that fall under the banner of human-tiger coexistence. *Living with Tigers* groups these considerations under five sections and highlights many useful examples in each. Most come from tiger range countries, but not all. Applicable lessons can be learned from other parts of the world where people are finding new ways to live productively with large carnivores.

Section 1 begins by addressing the important question of how many people actually live with tigers. It is estimated that in 2020 nearly 47 million people were found within the boundaries of the tiger range, with an additional 85 million people living within 10km of those landscapes. These human populations are also shown to be on the rise; up 7.5 per cent in tiger landscapes since 2015 alone and projected to continue growing into the foreseeable future. Planning for how such demographic changes could impact tiger policy will require nuance however, particularly given that overall population increases are often accompanied by rural depopulation in these countries.

The remainder of the opening section illustrates the point that new coexistence policies are likely to become ineffective or obsolete if they do not account for the rapid pace of change occurring in Asia's tiger landscapes. Economic growth, climate change, agriculture and infrastructure expansion are among the many factors set to significantly alter both human and tiger behaviour in these places. Such changes – which are assessed in the report – will need to be

more rigorously modelled and considered for their effects on any coexistence policies designed to deliver results for people over the medium to long-term.

Section 2 tackles perhaps the biggest shortcoming at this time, which is that the voices of those peoples living with tigers are seldom incorporated within tiger conservation policy development and delivery. To better do so, a shift is needed – one that would see officials regularly engage communities as full and equal partners in such efforts. This will require flexibility from conservation authorities, given the diversity of attitudes and aspirations both within and between communities.

Indigenous and community conserved areas – in their various forms – are then assessed for their considerable tiger conservation potential. Governments might both accelerate the formal recognition of such areas where they are already delineated by communities, while at the same time building the enabling conditions for interested communities to establish new conservation areas. In addition to opening new pathways for locally realized benefits, these actions would likely bring governments closer to realizing key international commitments. For instance, such areas could qualify as so-called “other effective area- based conservation measures” or OECMs and contribute to the 30x30 goal that is expected to be endorsed under the Convention on Biological Diversity. Progress on this front could also lead to significant connectivity gains for tigers in important landscapes outside the traditional protected areas system.

Section 3 opens with consideration of how communities living with tigers might more directly benefit from the important role they already play in preserving this globally important species. Preferential employment opportunities for local peoples, direct investments in public goods, revenue sharing models, and incentives for private sector-community partnerships are just some ways this can be accomplished through governmental intervention.

The second half of this section addresses the importance of establishing legal authority for local peoples or their representatives to make decisions regarding the governance of their lands and biodiversity. There is ample evidence that this should increase sustainable management, given that local peoples are usually the best stewards of their lands. Legal recognition of community powers can also remove uncertainties over the status of land and resources that often inhibit investments in conservation or economic development.

Section 4 delves into human-tiger conflict, the aspect of coexistence that has been best studied in recent years. This section aims to provide practical advice for reducing conflict through a holistic and integrated approach to the topic. The first element of this is understanding the conflict, which includes the underlying drivers of that conflict, as well as the attitudes and expectations of communities in relation to tigers. This is important, as new government interventions can be counterproductive in communities that have already



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implemented their own strategies and solutions for reducing conflict. To better respond to these situations, policymakers should also be mindful of the psychological impacts of actual or potential incidents with tigers. The frequency with which different genders bear the costs of conflict must also be understood in a given landscape, given that available evidence shows that gaps are often significant here.

The section then turns to the other five elements that should inform the design of any holistic human-tiger conflict management programme. These are prevention, response, mitigation, monitoring and policy. A wide array of topics are covered therein; from risk mapping and prey maintenance to the impacts of community-led rapid incident response teams, and beyond.

Section 5 addresses the need for sustainable financing mechanisms to strengthen and improve coexistence outcomes over the long-term. Relatively new approaches such as conservation performance payments are considered here, with numerous case studies outlined. The potential to have tigers directly built in as an indicator in Payment for Ecosystem Service schemes – and how those schemes might better prioritize social outcomes – are considered. The noted overlap between tiger habitat and high carbon storage forests and other important ecosystem services provides ample justification to study these potentials more seriously.

By covering the many critical facets of human-tiger coexistence, the report aims to leave the reader with a sense of urgency, and the recognition that new holistic and wide-ranging approaches need to be put into action as soon as possible. It does not provide a prescriptive roadmap for designing these policies, as this needs to be done primarily in partnership with communities themselves. It does however share numerous insights and models that will be needed in doing so. In this way, *Living with Tigers* is simply a first step, and WWF is committed to expanding its contributions to this important area in the coming years.

As is discussed in the **epilogue** to the report, now is the perfect time to reimagine how Indigenous and local communities can contribute to tiger conservation – and how tigers can provide an important boost towards the realization of local ambitions and global sustainable development goals. With the tiger range countries entering negotiations for their next 12-year strategy and goals – which will run until 2034 – there is a unique opportunity for governments to lock-in coexistence and the wellbeing of those who live with tigers as a topmost priority going forward. Not doing so – or failing to back new commitments with strong national implementation – would be an incredibly risky gamble, particularly as this is an issue set to increasingly define success or failure over the coming years.

INTRODUCTION

Historians may come to view the slow but steady increase in wild tigers after the 2010 Tiger Summit as an early signal of the planet's environmental stabilization and recovery. The associated Global Tiger Initiative (GTI) is an unprecedented alliance of governments, international organizations and civil society, for the purpose of reversing the long and steep decline of tigers in the wild, from about 100,000 a century ago to as few as 3,200 in 2010.¹ Although the survival of wild tigers remains fragile, and they continue to decrease alarmingly in some places,² evidence of a recent upward global population trend is positive news. Population estimates are now (as of 2021) around 4,900,³ with increased monitoring and reporting meaning new data is being released at frequent intervals. Idealistic plans to double the wild population now seem justified.⁴

But enthusiasm about tiger survival is easy for people who live a long way from tiger habitat; for whom seeing tigers is at best a rare and exciting privilege. Those who live with tigers daily may not be so enthusiastic about their recovery. Tigers are the world's largest cat; given an opportunity they will take livestock and pose a threat to humans; people are killed by tigers every year. Plans to increase tiger populations in densely populated areas of Nepal and India,⁵ and proposals to reintroduce tigers in countries such as Kazakhstan⁶ and Cambodia⁷ where they have been extirpated, may not be welcomed locally. If we are to be successful in continuing to build tiger numbers, then we need legislation, policies, strategies and long-term partnerships that ensure impacted Indigenous peoples and local communities have a say in decisions that might affect them.

Human-wildlife coexistence refers to people and wildlife existing in proximity to each other, whether in contentious, neutral or beneficial coexistence. It 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 characterized by a level of tolerance on the human side.⁸ Achieving coexistence which provides mutual benefits for both people and tigers when sharing a landscape is a key step in securing a future for tigers.

This report provides a range of information including case studies and many short, boxed sections for people managing or living in areas with tigers. It is published in advance of consultations and negotiations that will define the second Global Tiger Recovery Program (GTRP) which will set the priorities for tiger conservation plans across the tiger range countries for the following 12 years (2023-2034).

Recent conservation gains in some tiger range countries make understanding of human-tiger coexistence more urgent. It comes when social and economic conditions in tiger range countries are in rapid flux, including more people, changing social aspirations, changing economies, a growing urban-rural divide, increasing conflict and tensions and rapid ecosystem deterioration. At the same time, human rights are justifiably getting more attention as a factor in conservation strategies, and new ways of approaching landscape scale conservation are being implemented. However, these new needs and approaches are potentially limited across parts of the tiger range, with human rights under attack in many places. One prominent measure of democratic freedoms found that collectively the tiger range countries had slightly regressed in this area between 2010 and 2021.⁹ This report draws on a range of sources. It is based on a comprehensive literature survey, commissioned especially for the study. Written material was augmented by inputs from specialists around the world, including many WWF staff, and several more in-depth case studies are presented. The research looked at how people have learned to live with other large cat species, such as lions, leopards and jaguars, and with other predators, to see if lessons can be applied in the tiger range. The report also reviews the importance of people's attitudes in shaping responses, for example the role of culture and faith. The wider benefits of tiger conservation are considered, such as the ecosystem services that come from tiger landscapes. A major focus is on the practical steps that can help to manage risk: from technical solutions to behavioural and management responses, and legal and policy options including grievance mechanisms, compensation schemes and the like. None of these are perfect on their own; their shortcomings are outlined as well as the opportunities they present for what should become a context-appropriate combination of strategies for coexistence. None of this will be possible without sustainable financing, so the report includes a section that looks at options, and barriers, for future tiger conservation funding.

The report starts and finishes with an attempt to see into the future. The opening section lays out a picture of the potential pressures, impacts and opportunities of a changing world. Such predictions and projections can, of course, never be certain, but they should help frame both the need for changing policies and the context for future conservation planning and policy-making.

The goal of this work is to help countries to continue to expand and secure tiger populations over the coming years, while respecting fairness and mutual benefit to neighbouring human communities. All those involved in the reports production hope we have achieved this.

ACRONYMS AND ABBREVIATIONS

30x30	Shorthand for plans to designate 30 per cent of the world's lands and oceans into protected and conserved areas by 2030
CA TS	Conservation Assured Tiger Standards
CBD	Convention on Biological Diversity
FPIC	Free, Prior and Informed Consent
GBF	Global Biodiversity Framework of the CBD
GDP	gross domestic product
GTI	Global Tiger Initiative
GTRP	Global Tiger Recovery Program
HTC	Human-tiger conflict
HWC	Human-wildlife conflict
NTFP	Non-Timber Forest Products
OECM	Other effective area-based conservation measure
PADDD	Protected Area Downgrading, Downsizing and Degazettement
PES	Payment for Ecosystem Services
REDD+	Reducing impacts from deforestation and forest degradation
RRT	Rapid Response Team
SDG	Sustainable Development Goal
SMART	Spatial Monitoring and Reporting Tool
UNFCCC	UN Framework Convention on Climate Change

GEOGRAPHIC AREAS:

Tiger landscape: used to describe an area (of any size) within the boundaries of the extant range of tigers. Where required for mapping purposes, the extant range of tigers is defined by reference to the most recent IUCN Red List assessment for the species.

Tiger range: this term is occasionally used when denoting all tiger landscapes (i.e., the entire range of the species).

Tiger range country: a political term, meaning the 13 countries participating in the Global Tiger Initiative. Only ten of the 13 countries are believed to have tiger populations (and thus tiger landscapes) at this time.

REFERENCES AND NOTES

- Global Tiger Initiative Secretariat. 2010. Global Tiger Recovery Program 2010-2020. The World Bank, Washington DC
- Conservation Assured. 2018. *Safe Havens for Wild Tigers: A rapid assessment of management effectiveness against the Conservation Assured Tiger Standards*. Conservation Assured, Singapore. Retrieved from: https://wwf.eu.awsassets.panda.org/downloads/safe_havens_for_wild_tigers_1.pdf
- 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* 3(2). DOI: 10.1002/pan3.10177
- Wikramanayake, E., Dinerstein, E., Seidensticker, J., Lumpkin, S., Pandav, B., Shrestha, M. et al. 2011. A landscape-based conservation strategy to double the wild tiger population: Landscape-based strategy for tiger recovery. *Conservation Letters* 4: 219-227. DOI: 10.1111/j.1755-263X.2010.00162.x
- Hails, C., O'Connor, S. and Soutter, R. 2022. *Securing a Viable Future for the Tiger*. Flora and Fauna International, IUCN, Panthera, TRAFFIC, WCS and WWF.
- WWF-Russia. Undated. *Tiger reintroduction programme in Kazakhstan*. <https://wwf.ru/en/regions/central-asia/vosstanovlenie-turanskogo-tigra/>
- Launay, F., Cox, N., Baltzer, M., Tepe, T., Seidensticker, J. et al. 2013. *Preliminary Study of the Feasibility of a Tiger Restoration Programme in Cambodia's Eastern Plains*. A report commissioned by WWF. Retrieved from: http://d2ouvy59podg6k.cloudfront.net/downloads/feasibility_study_reintroduction_jan_2013__1_.pdf
- 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.
- CIVICUS Monitor. 2019. *People Power under Attack*. Retrieved from: <https://civicus.contentfiles.net/media/assets/file/GlobalReport2019.pdf>



1. PEOPLE AND TIGERS IN THE FUTURE ASIA

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Why read this section?

Conservation science and management is adapting and improving in response to new techniques, research and, unfortunately, new threats. But conservation should not exist in a vacuum. The world is changing fast, and nowhere more so than in the tiger range countries. This section draws on research into projections, predictions and scenario-building on what tiger range countries may look like over the next 30 to 50 years, and how this may impact tigers. Understanding the context within which conservation needs to take place, both the threats and the opportunities, will make conservation strategies and policies stronger and more fit for purpose as the future unfolds.

INTRODUCTION

The GTRP process is running in parallel with several other global initiatives aiming to address environmental challenges and promote sustainable development, all with ambitious targets over the next decades. Over 100 world leaders pledged to halt and reverse forest loss and land degradation by 2030 at the 26th Conference of Parties (COP26) of the United Nations Framework Convention on Climate Change (UNFCCC).¹ A commitment to improve the effectiveness, and increase the global coverage of area-based conservation to 30 per cent of land and sea was made at COP 15 (part 1) of the Convention on Biological Diversity (CBD) in China in late 2021.² The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, agreed 17 Sustainable Development Goals (SDGs) for the future to end poverty, improve health and education, reduce inequality, and encourage economic growth while tackling climate change and conserving biodiversity.³ The UN Decade on Ecosystem Restoration, launched in 2021, aims to rebuild damaged ecosystems around the world.

Together these various pledges and commitments build a common vision of the integrated relationship between sustainable development and biodiversity, which is vital to the long-term viability of countries and their biodiversity worldwide. Several tiger range countries have led the way in showing that conservation success can be achieved while continuing ambitious development agendas. But this success will also bring many conservation challenges⁴ and has not generally to date focused on inclusive or rights-based approaches to conservation.

This initial section of the *Living with Tigers* report looks at the literature of forecasts, projections and predictions to set the scene for the opportunities and challenges which could impact the success of the second phase of the GTRP. Specifically, it looks at population growth and migration, land-use change linked to growing demand for commodities (regionally and globally), development of regional economies and the impacts of climate change. All these issues could have major negative impacts on increasing tiger numbers, or could, if done well, help develop a culture of coexistence.

As wild tiger populations expand, it is imperative to consider that the impact on Indigenous peoples and local communities increases. The strategies discussed in this report are thus focused on areas outside the boundaries of protected areas as well as on protected areas where communities and tigers coexist within the boundaries. Most of the report will focus on ways to achieve this coexistence; this first section thus acts as a reminder of the multiple challenges leaders across the tiger range countries face to find a balance between development and conservation. These challenges are amplified by global threats such as climate change, pandemics (see box 1) and more pervasive threats such as political conflict, which are harder to predict or mitigate, for example political instability is currently having a high impact on communities and conservation in Myanmar.⁵

Box 1: Lessons from the COVID-19 pandemic

The unprecedented global upset caused by the COVID-19 pandemic has put many protected and conserved areas under extreme pressure,⁶ and has undermined some community conservation efforts.⁷ It has also highlighted the importance of future-proof planning (e.g., plans that will continue to be useful or successful in the future even if the situation changes) as it becomes clear that warnings about the potential for a pandemic were ignored.⁸

Impacts on tiger conservation areas were surveyed early on in the pandemic in May-June 2020. These included rangers being re-deployed to pandemic response duties and temporary salary cuts. Community engagement activities by rangers essentially stopped, and more than one-third of respondents indicated that there was an increase in illegal access to the protected area (for grazing, use of non-timber forest products, etc.), presumably due to the negative economic impacts of the pandemic and associated restrictions.⁹

The pandemic also accelerated some necessary changes that were coming anyway. While not everyone has access to the Internet, particularly in remote protected areas, several important web-based ranger training exercises have been run with tiger reserves in the last two years and far more rangers have had access than would have been the case with in-person training courses. This has an impact on the professionalization of the ranger workforce, but cannot take the place of essential hands-on training related to physical fitness, equipment use and maintenance, etc. Online and hybrid training is hopefully here to stay. So too is greater use of remote monitoring equipment, which has been emerging rapidly over the last few years but was given further impetus during a period when human movement has been forcibly limited.

Another change has been a forced reliance on local tourism rather than (often higher paying) foreign visitors and community-based tourism enterprises have proved adaptable.¹⁰ This helps build support for conservation awareness and within-country tourism, rather than conservation being seen as the preserve of a rich-country elite.

HUMAN POPULATION AND URBANIZATION

Urbanization and population are inextricably linked. In 2020, some 55 per cent of the world's nearly 8 billion people lived in cities. By 2050, this could rise to 70 per cent of the global population being urban. With more than 80 per cent of global gross domestic product (GDP) currently generated in cities, urbanization can contribute to, or severely detract from, sustainable growth.¹¹ Urbanization is also linked with lower human mortality and fertility levels, better economic and education opportunities, enhanced realization of rights for women, rapid innovation and the capital and interconnectivity to realize change.¹² Below we review the potential for, and impacts of, urbanization in tiger range countries and consequences for tiger conservation.

Human population density impacts tiger

conservation. An analysis of over 3,000 historical records of tigers from AD 218 to 2015, revealed the existence of a threshold effect of human population density on likely tiger extinction. Specifically, when human population density exceeded 400 persons/km², tigers had a local extinction probability of over 60 per cent within a period of 50 years.¹³ More nuanced densities of 140 or less for the Indian subcontinent; 30 or less for Indochina; 20 or less for Southeast Asia; and 10 or less for the Russian Far East have also been suggested, although it is noted that tigers both persist and do not persist in areas above and below these thresholds.¹⁴ In 2020, the estimated population in tiger landscapes was about 47 million people, rising to over 130 million when adding the population living within 10km of these tiger landscapes (figure 1 and table 1). But these regional figures mask vast differences per individual area (table 2). Human population is increasing in the majority of tiger landscapes across South and Southeast Asia (figure 2 and table 3). Predictions for population growth across the tiger landscapes by 2050 vary depending on a wide range of factors. Scenarios used in climate change modeling, for example, predict growing urbanization and urban sprawl across the tiger landscape; with different policy and development scenarios leading to predictions of peaks that range from around 60 million people in 2050 followed by a rapid decline, to 85 million in 2050 and then reaching 106 million people in 2100. It is projected that urban coverage within tiger landscapes might expand; from 4 per cent in 2010, to either 4 per cent (minimal change), 7 per cent or 11 per cent under various scenarios for 2050.¹⁵ It is worth mentioning however that this analysis includes 'tiger conservation landscapes' a significantly larger geographic area than that used in the analysis of population (table 1) and urbanisation (table 5) in this report. Regardless of the area assessed, the implications of dramatic population growth and the human population density thresholds noted above could be catastrophic for tigers.

Table 1: Estimated human population within tiger landscapes, and when including areas within 10km of tiger landscape boundaries¹⁶

Country	Estimated 2020 human population in tiger landscapes	Estimated 2020 human population in tiger landscapes plus 10km
Bangladesh	636,136	1,537,423
Bhutan	681,634	2,109,774
India	32,152,406	95,363,762
Nepal	1,648,094	5,530,416
Indonesia	7,071,012	13,710,533
Malaysia	1,703,312	6,830,070
Myanmar	282,588	746,376
Thailand	875,017	2,146,701
China	600,942	2,293,125
Russia	1,009,623	1,884,433
Total	46,660,764	132,152,613

Table 2: Average estimated human population density (persons/km²) across tiger landscapes in 2020, by country¹⁷

Country	Tiger landscape density, people per km ²
Bangladesh	174.0
Bhutan	25.5
India	189.9
Nepal	209.8
Indonesia	81.7
Malaysia	46.2
Myanmar	13.4
Thailand	35.7
China	20.2
Russia	4.6
Total	74.3

Table 3: Estimated rate of human population change between 2015 and 2020, both within tiger landscapes and when including areas within 10km of tiger landscape boundaries¹⁸

Country	Human population change in tiger landscapes	Human population change in tiger landscapes plus 10km
Bangladesh	-0.06%	+0.99%
Bhutan	+9.50%	+6.95%
India	+7.08%	+8.27%
Nepal	+27.03%	+20.45%
Indonesia	+8.60%	+39.84%
Malaysia	+8.61%	+10.66%
Myanmar	+4.21%	+3.53%
Thailand	+2.85%	+2.32%
China	+1.41%	+1.38%
Russia	-3.71%	-3.69%
Range-wide	+7.46%	+8.33%

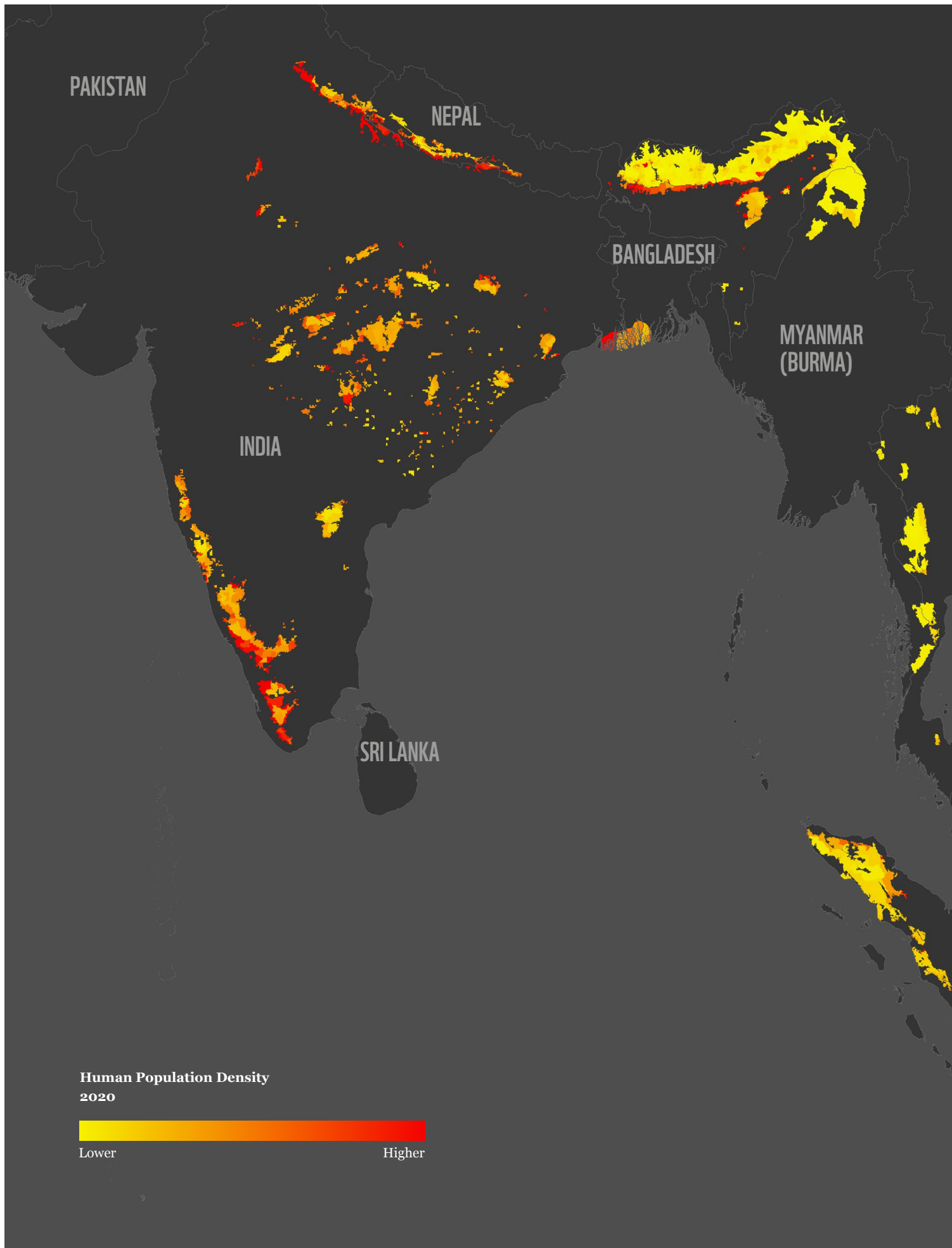
However, urbanization coupled with rural depopulation could create more tiger habitat.

Generally speaking, rapid urbanization without planning for future transportation and land use can lead to sprawling settlements. This in turn can lead to fragmenting tiger habitat, increasing human tiger conflict (HTC) and decreasing suitability for tigers and their prey. Furthermore, increasing dependence on fossil fuels can also drive an increase in roads (see below), leading to greater barriers to tiger movement.¹⁹ But this is not the case across the whole tiger range. Migration to urban areas of China has seen the country's urban population increase from just over 19 per cent of the total population in 1980 to almost 64 per cent in 2010.²⁰ From 1998 to 2015, big cat populations in general, their prey species and habitats increased in north-eastern China as regional human population density decreased by almost 60 per cent and forestry (specifically volume logged) reduced by over 60 per cent.²¹ Future growth scenarios focused on changing rural/urban populations (table 4) sustainable development, concentrated urbanization and less landscape fragmentation could provide tiger populations with more space to recover.^{22,23}

Table 4: Estimated year of maximum rural population (countrywide) in tiger countries²⁴

Country	Year of maximum rural population	Projected rural population change 2022-2034
Bangladesh	2014	- 5.8%
Bhutan	2018	- 3.5%
India	2026	- 1.3%
Nepal	2031	+ 1.6%
Indonesia	1992	- 9.4%
Malaysia	1992	- 13.0%
Myanmar	2028	- 0.3%
Thailand	2000	- 17.4%
China	1992	- 26.6%
Russia	1950 (first year of data set)	- 15.7%

Figure 1: Human population densities across the tiger range ²⁵



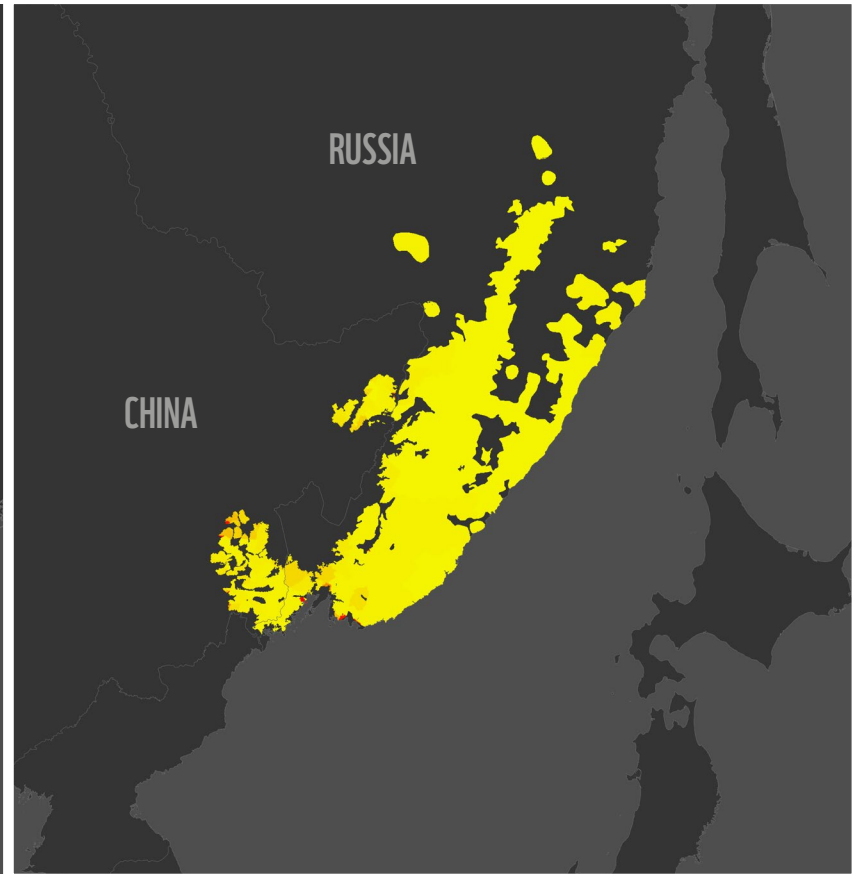
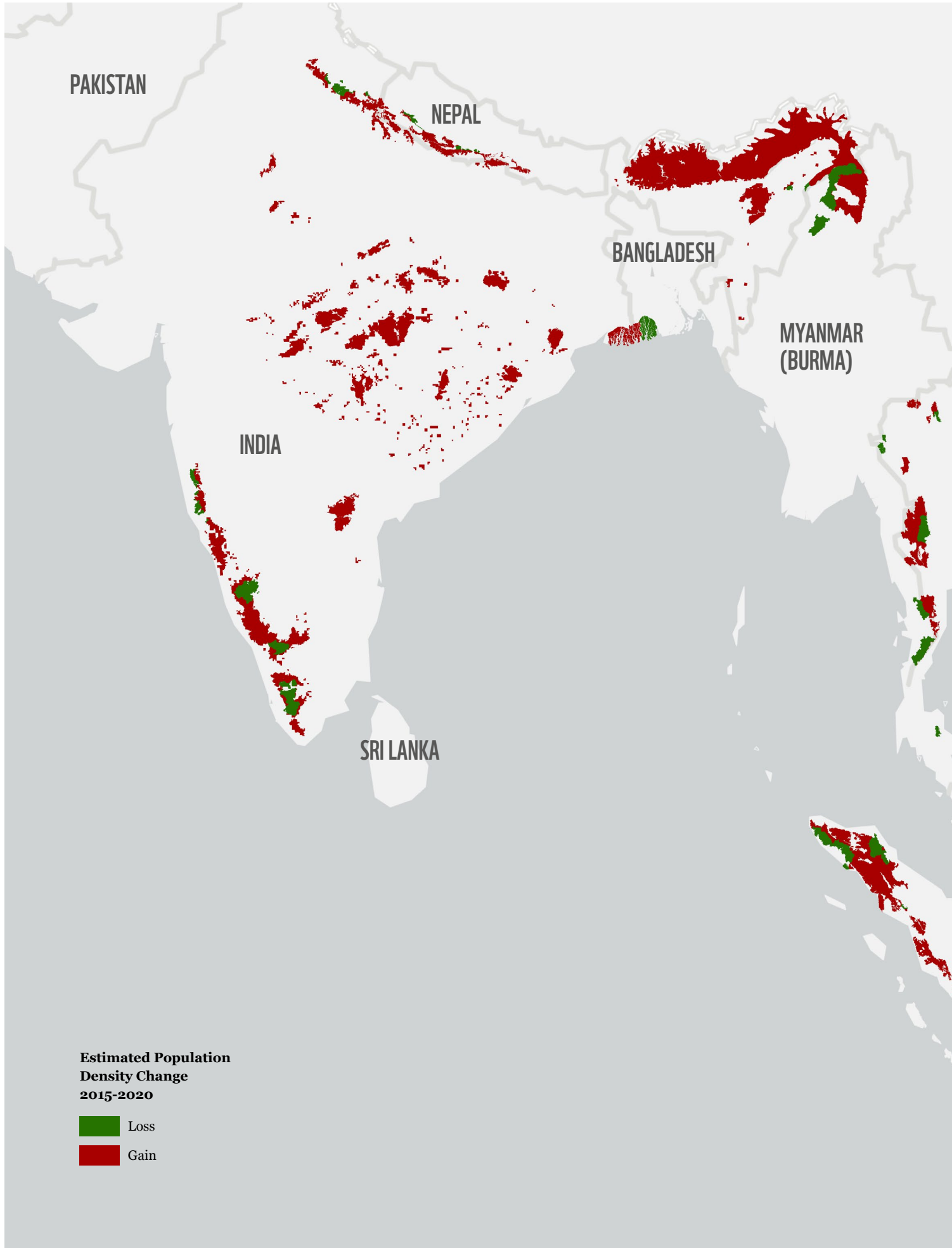


Figure 2: Areas of estimated human population growth and contraction in tiger landscapes between 2015 and 2020²⁶





1.2 LAND USE

By 2070, the impact of land-use change, and specifically habitat loss, is predicted to endanger some 1,700²⁷ species of amphibians, birds and mammals globally, including species of high conservation value and functional importance.²⁸ There are two major impacts on tigers of these developments. First, safe movement between habitats is critical for reducing extinction risk, maintaining genetic diversity and persistence of subdivisions of tiger populations.²⁹ Second, land-use change can impact all tiger prey species, with prey depletion being a major threat to tiger survival.³⁰ Given enough space, tigers generally avoid human settlements, agriculture and roads, but changes in agricultural production, linear infrastructure (such as roads, railways, high-tension electrical lines) and other development such as dams, plantations and urbanization can reduce dispersal and expansion and exacerbate genetic isolation of tigers and increased stress for the animal.³¹ Many tiger landscapes are already dominated by human use (see figure 3 and table 5). Continuing to delineate corridors between protected areas and coexistence strategies to reduce HTC will thus be critical for tiger dispersal as will ensuring landscape-scale conservation strategies that consider tigers' and prey species' needs outside protected areas. Unfortunately, taking the needs of tigers into development projects is far from common, even for organizations like the World Bank which, in theory, have policies and safeguards in place³²

Agricultural expansion for global commodities could mean vital tiger habitat is lost. Indonesia and Malaysia account for 80-90 per cent of global palm oil production. Indonesia's total area of harvested oil palm grew from 11.9 million ha in 2017 to around 13 million ha in 2020 and is projected to reach 17 million ha in 2025.³³ Tigers in the region are already severely under threat.³⁴ If the trends of natural forest conversion to oil palm plantation, acacia and rubber continue, as has occurred over the last 30-40 years in Sumatra, for example,³⁵ it is predicted that nearly 60 per cent of the remaining forest will be lost by 2050,³⁶ including tiger habitat. New areas are still being developed. Around 405,000 ha have been allocated by the government of Myanmar to 44 oil palm plantation companies in 2014, to develop plantations in the Tanintharyi region of the southern part of Myanmar, a tiger heartland in the Dawna Tenasserim Mountains of Myanmar and Thailand.³⁷

Increasing populations could also increase food production demands and increase HTC.

The combination of a rising population, changing diets and challenges to food security from climate change and political unrest mean that cropland area will increase in the future at the expense of forests and grasslands.³⁸ Given space constraints, increasing output in the Asia region will be driven largely by increases in efficiency.³⁹ However, existing forests are continuing to be cleared to create cropland in the region,⁴⁰ and intensification of agriculture also threatens biodiversity.⁴¹ In countries like India, where tiger populations are close to human communities, tigers' use of agricultural landscapes is already high (but also likely to be seasonal and to a certain extent predictable). A study in the Central Terai Landscape in northern India found tigers using more than 85 per cent of the landscape which has human settlements within it.⁴² This could also happen in other countries where the agricultural boundary is expanding, suggesting even minor increases in the extent of human settlement will impact human/tiger interaction.

Transport has severe impacts on wildlife. Road networks are developing across Asia. Asia is also a hotspot for the impact of roads on predators; with tigers being the second most impacted species by road development according to a recent study.⁴³ A study of the actual and potential impacts of road networks across the whole tiger range found about 43 per cent of the area where tiger breeding occurs and over half (57 per cent) of tiger landscapes fell within the road-effect zone (i.e., <5km from nearest road), including in tiger priority sites and protected areas. It has been estimated that some 24,000km of new roads will be built in tiger landscapes by 2050, stimulated through major investment projects such as China's Belt and Road Initiative. The Asian Infrastructure Investment Bank currently has 69 projects across 10 of the 13 tiger range countries, accounting for 49 per cent of their total project portfolio; at least 18 projects are linked to either "roads" or "infrastructure" in rural areas.⁴⁴ India is expected to increase roads in tiger landscapes by 32 per cent compared with current levels. The proximity to roads not only impacts tiger dispersal, but also decreases prey abundance and increases levels of human-wildlife conflict and poaching. The study concluded that roads in the tiger's current range may be decreasing abundance of tigers and their prey by more than 20 per cent.⁴⁵ Impacts are also felt from road widening and upgrading.⁴⁶ In Central India, modelling noted unplanned dense human settlements and roads with high traffic near protected areas led to a 56 per cent higher average extinction probability for tigers, but extinction risk, particularly in small protected areas, could be reduced by 23-70 per cent if a 5km buffer is added around existing boundaries. Scenarios where habitat connectivity was enhanced and maintained led to low overall extinction probability.⁴⁷ Research also suggests increased commercial river traffic and human activities impedes tiger dispersal across wide rivers, escalating the genetic isolation of tigers in areas such as the Sundarbans of India and Bangladesh.⁴⁸

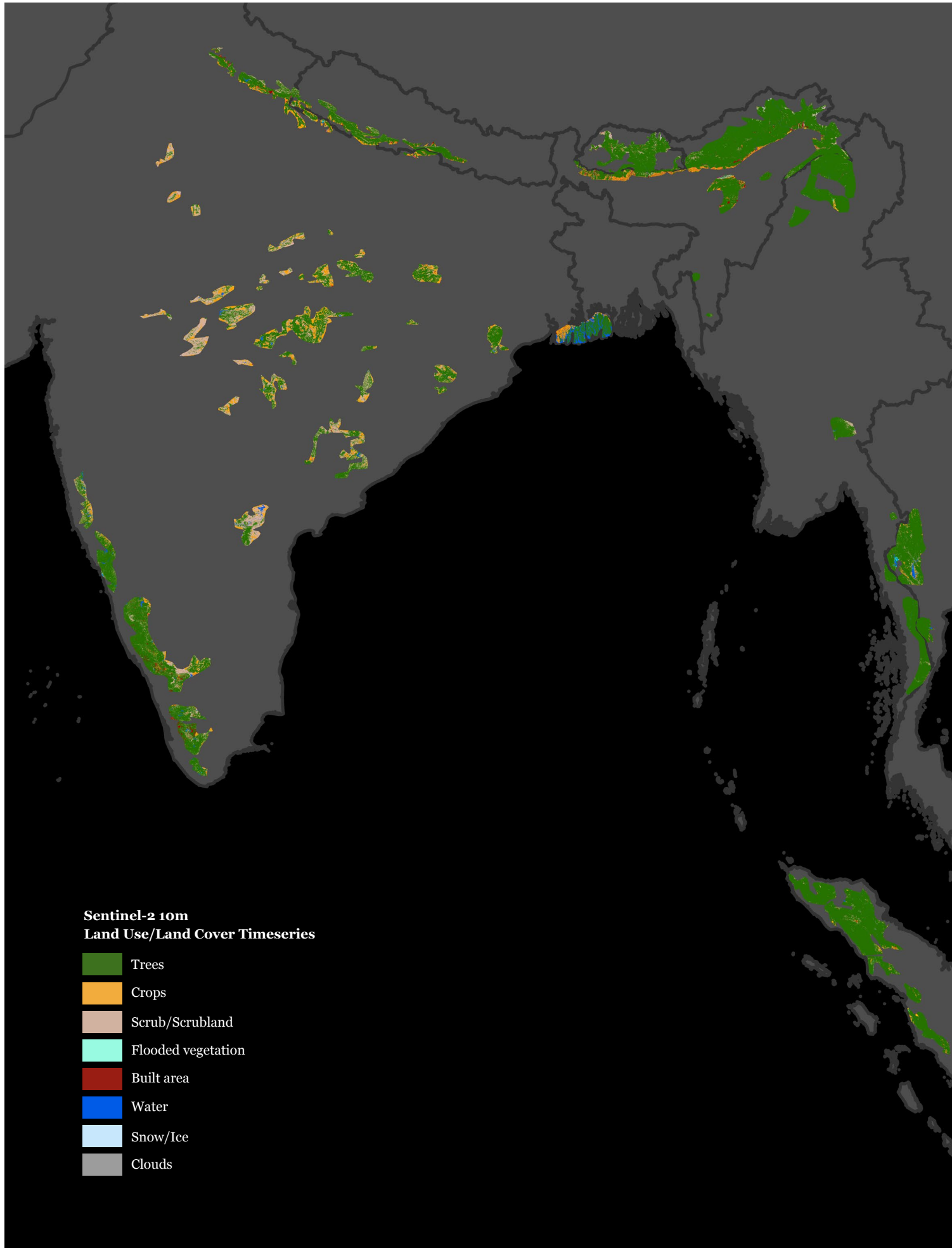
Linear development results in forest fragmentation and increases in built-up areas. Although the actual land area affected by linear infrastructure (e.g., roads, railways, powerlines) is often quite small, potential impacts can be high in areas which are ecologically fragile.⁴⁹ The tropical forests of Asia are increasingly impacted by infrastructure development (e.g., construction of the East Coast Rail Link in Malaysia that is cutting through tiger landscapes). Power-transmission lines and roads (see above) are the most common infrastructure features within forests. Impacts include the creation of forest patches, with scenarios indicating that over 80 per cent of forest habitats in India have been reduced by half or more of their original size due to linear infrastructure.⁵⁰ Fragmentation of forests increases “edge effects” and isolates species with lower mobility into smaller and less viable populations.⁵¹ Roads and other linear infrastructure also make it easier for poachers to gain access to previously remote areas.⁵² Research in Russia found that roads also increased disturbance of tigers, leading them to abandon prey more quickly and thus reduced their survival and reproductive success.⁵³ A study of possible land-use changes in the Western Ghats, a tiger stronghold, due to proposed railway networks predicted an increase in built-up areas of around 20 per cent, with subsequent decrease in agriculture and forested areas.⁵⁴

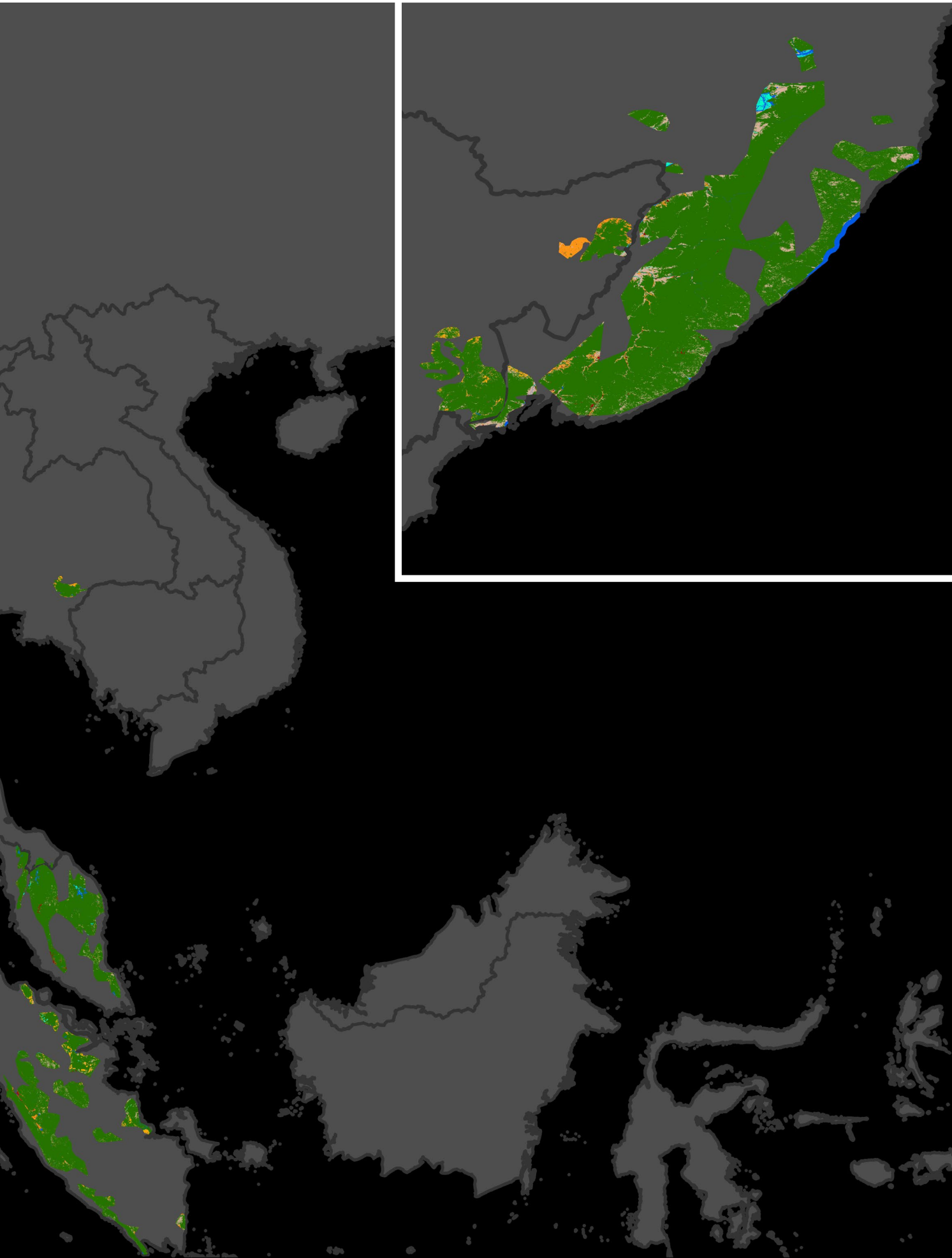
Further expansion of hydroelectric dams could lead to important losses of tiger landscapes. There are already 421 dams that intersect with tiger landscapes covering 13,750km² and impacting about 20 per cent of the total wild tiger population. At least another 41 are planned in tiger landscapes range-wide, most of which overlap priority tiger landscapes as well as protected areas or complexes (e.g., Nepal, Bhutan and North Sumatra). In India, the 3,097 megawatt Etalin Hydropower Project is proposed in the Dibang valley which would affect more than 1,000 ha of forest land and 4,500 ha of unclassified state forest and community lands, including those used by the Idu Mishmi community. According to the 2018 Indian tiger census the Dibang-Kamlang-Namdapha block of Arunachal Pradesh is a home to 29 tigers.⁵⁵ Across tiger landscapes in general, effects on terrestrial species include both direct habitat loss due to flooding and population declines due to habitat loss, fragmentation and degradation due to higher human accessibility.⁵⁶

Table 5: Land cover types in tiger landscapes across ten tiger countries, both by percentage and total coverage in km² ⁵⁷

Land cover	India	Nepal	Bhutan	Bangladesh	Russia	China	Indonesia	Malaysia	Thailand	Myanmar
Trees	67.9%	78.6%	90.0%	92.2%	91.5%	84.5%	93.6%	95.3%	91.3%	97.0%
	149,825km ²	9,640km ²	14,879km ²	3,510km ²	139,777km ²	19,672km ²	112,051km ²	46,638km ²	24,360km ²	36,467km ²
Crops	10.8%	9.2%	0.3%	5.8%	0.8%	11.5%	2.1%	0.4%	3.2%	0.5%
	23,926km ²	1,125km ²	54km ²	222km ²	1,210km ²	2,668km ²	2,550km ²	189km ²	863km ²	188km ²
Scrub/ shrub land	18.6%	8.7%	8.7%	0.3%	6.9%	3.4%	3.5%	2.7%	4.5%	2.3%
	41,132km ²	1,063km ²	1,431km ²	13km ²	10,495km ²	783km ²	4,214km ²	1,301km ²	1,202km ²	878km ²
Flooded vegetation	0.1%	0.0%	0.0%	0.2%	0.5%	0.0%	0.2%	0.5%	0.4%	0.0%
	159km ²	5km ²	0km ²	7km ²	758km ²	10km ²	185km ²	247km ²	100km ²	19km ²
Built area	2.5%	3.6%	1.0%	1.5%	0.3%	0.6%	0.6%	1.1%	0.6%	0.2%
	5,576km ²	438km ²	168km ²	56km ²	449km ²	137km ²	752km ²	546km ²	159km ²	84km ²

Figure 3: Map of land cover types across tiger landscapes⁵⁸





Tiger conservation areas are also under threat from land-use change. The amount of tiger habitat in protected areas across tiger landscapes varies (table 6); but even this area is not fully assured. Loss of protected areas, known as Protected Area Downgrading, Downsizing and Degazettement (PADDD) is prevalent in many countries, and threatens even some of the most iconic and valuable protected areas.⁵⁹ Protected areas in Indonesia are far from secure,⁶⁰ with predictions that nearly all the forest in Tesso Nilo National Park could be lost, primarily to oil palm plantations, by 2050 along with connectivity across the Sumatran landscape decreasing by 92 per cent.⁶¹ In addition, two dams are planned near the Leuser Ecosystem, home to an important source population of Sumatran tigers.⁶² One of the key corridors of the Terai Arc Landscape in northern India, the Kosi River corridor, links Jim Corbett Tiger Reserve and the Ramnagar Forest Division. Growing human disturbances, particularly those linked to tourism development, have led to fragmentation of existing wildlife habitats. If current disturbance scenarios continue, land-use change between 2020 and 2030 project a further decline in dense forest of 8.5km², due to the construction of resorts, buildings and residential houses, and, by 2030, a more than 4 per cent increase in area covered by plantations.⁶³ In Cambodia, Malaysia and Russia road densities are higher in protected areas than in the non-protected areas within tiger landscapes and in India densities are about the same but road building is expected to increase significantly (see above).⁶⁴ Linear infrastructure inside protected areas is of a similar density to that in non-protected forested areas across India, although it is important to recognise that there is often a significant difference in the nature of such infrastructure (e.g., narrower roads inside protected areas, etc.).⁶⁵ This emphasizes the need for careful mitigation of the impacts of infrastructure development in current and potential tiger landscapes.

Table 6: Percentage of tiger landscapes that fall within protected areas in each country with tigers⁶⁶

Country	Percentage of tiger landscape falling within protected areas
Bangladesh	87.6%
Bhutan	41.0%
India	24.6%
Nepal	41.8%
Indonesia	33.8%
Malaysia	22.9%
Myanmar	75.3%
Thailand	96.6%
China	31.8%*
Russia	15.1%
Range-wide	30.6%

* this figure takes into account the newly established Northeast China Tiger and Leopard National Park. Analysis for this value provided by WWF-China.

Box 2: Mitigating road impacts

There is concern that the rapid rate of road development will have a negative impact on biodiversity and environment.⁶⁷ But at the same time better road systems are urgently needed by many of those living in tiger landscapes, giving among other things better access to markets,⁶⁸ health care and education. The Wildlife Institute of India has developed detailed guidance on mitigation of impacts of linear infrastructure on wildlife (and examined the range of impacts, in particular the barriers to movement of animals, including noise, headlight glare along with the more obvious impacts of road death and injury), with the overall goal of mainstreaming biodiversity goals into landscape level infrastructure plans and strategies.⁶⁹ Such goals, even when achieved, are hard won. The mitigation of the impacts of a 37km stretch of major highway running through the Pench Tiger Reserve in India has shown that mitigation can work. But ensuring effective measures are taken involved, in this case, considerable expense and years of delay as wildlife experts had to resort to court cases to protect the wildlife of the reserve. Ideally roads should not penetrate protected areas, but if unavoidable Pench's five underpasses and four bridges show the way forward. Between March and December 2020, camera traps showed 5,450 images of wild animals using the underpasses; including 11 tigers that are frequent users.⁷⁰ Roads in tiger landscapes should therefore be prioritized for upstream planning, particularly as it pertains to routing, but also including assessment of where mitigation construction may be needed. This can both lessen impacts on tigers and avoid later delays and court battles if roads are badly planned and opposed.

1.3 ECONOMY AND ECONOMIC ACTIVITY

By 2050, Asia could contribute to more than half of the world's economic output.⁷¹ This realignment of the world's economies offers both great potential for tiger conservation but could also be a major threat if development overwhelms conservation efforts. Asia's growth is characterized by ongoing urbanization, rising demand and productivity growth, and an increasingly dynamic corporate sector.⁷² All these trends can impact tiger conservation.

By 2050, three of the top four economies in the world are likely to be countries with tigers.

Economists project that China will be the largest economy in the world by 2050 by a significant margin, while India could have edged past the US into second place and Indonesia risen to fourth place. Projections expect Viet Nam (a country that had tigers until recently), India and Bangladesh to be three of the world's fastest growing economies over this period.⁷³ Although projections of growth across the Asian tiger landscapes were downgraded slightly due to the pandemic in 2021, projections have increased for 2022 and current data shows Asian trade has continued to outperform global trade.⁷⁴ The impacts of this growth on tiger conservation is hard to predict; if conservation is sustainable and equitable there could be opportunities to expand habitat, funding to mitigate the impacts of infrastructure and other development that could greatly improve existing habitats and a focus on corridors to ensure viable wild tiger populations.

The consumer class in these countries is growing strongly. By 2030, three billion people, or 70 per cent of Asia's total population, may be part of the consuming class, with the number of households in the consuming class in Southeast Asia likely to double to 163 million households by 2030, with Indonesia, in particular, generating tens of millions of newly prosperous consumers.⁷⁵ The move from donor conservation funding toward an investor-driven approach is an increasing trend; globally it has been suggested that conservation investment needs could be met if investors (including rich individuals and retail and institutional investors) allocated 1 per cent of their new and reinvested capital to conservation.⁷⁶ Tiger conservation could benefit from increased education and the building of a philanthropic conservation constituency in Asia's growing towns and cities.⁷⁷ Amid rising concern in Asia about sustainability, eco-responsible consumption is on the rise. A 2019 poll found more than 80 per cent of respondents in China, India and emerging Asian economies made changes to the products and services they buy because they were concerned about climate change.⁷⁸ Increased environmental awareness will be particularly important given the rapid rise of the consumer class⁷⁹ across Asia.

Consumer purchasing power can be a threat to tigers. Despite the trends toward more eco-friendly purchases, Asian consumers have long had a strong preference for so-called luxury goods and brands.⁸⁰ One analysis found, for example, a clear association between GDP

growth in a group of consumer countries and the price of tiger skins paid to traders in illegal Indonesian wildlife markets.⁸¹ Analysis in Viet Nam found satisfaction among purchasers of tiger products as extremely high, indicating entrenched belief in medical efficacy,⁸² and thus these illegal markets for tiger products are likely to expand as income grows. A major consumer behavioural change campaign (along with education and law enforcement) is needed to help reduce and eventually eliminate trade in tiger parts.⁸³

Wealth is far from evenly distributed across the tiger range. Global wealth disparity has reached such a significant level that, as of 2019, 44 per cent of the world's wealth was held by less than 1 per cent of the population.⁸⁴ Projections suggest that if within-country inequality continues to increase as it has since 1980, then global income inequality will continue to rise steeply as we move toward 2050, even under fairly optimistic assumptions regarding growth in emerging economies.⁸⁵ This is a concern for many reasons, but is important within the context of this report as studies have found a clear connection between income inequality and biodiversity loss and linkages to illegal wildlife trade.^{86,87,88} As a counter to these inequalities, it should be noted that overall the percentage of people living in extreme poverty (table 7) has declined across the tiger range, and these trends are likely to continue in most countries.

Table 7: Percentage of national population living in extreme poverty in 2010 versus 2019 in countries with tigers ⁸⁹

Country	2010	2019
Bangladesh	19.2%	6.6%
Bhutan	2.8%	0.7%
India	29.7%	10.6%*
Nepal	15.4%	4.8%
Indonesia	13.3%	2.9%
Malaysia	0.2%	0.0%
Myanmar	13.3%	0.9%
Thailand	0.1%	0.1%
China	11.2%	0.2%
Russia	0.1%	0.0%

* Indian figure is from 2017, the most recent datum from that country.

Business is beginning to recognize the importance of the SDGs but companies are not focusing strategies on how to address them. A large scale survey of listed, private and public sector organizations found over 70 per cent reference the Sustainable Development Goals (SDGs) in their public reporting but only 1 per cent measures progress toward the targets. Integrated action, planning and targets are all critical for business action to progress national goals; SDGs related to water, land and energy have strategic opportunities and risks for almost every sector yet are not widely identified as considerations in future business strategies and investments.⁹⁰ Encouraging further recognition of sustainable development, and specifically tiger conservation, could be a major motivation for business to lessen habitat change and other impacts on conservation dependent species such as tigers.

1.4 CLIMATE CHANGE

One in six species globally could face extinction if climate change continues to accelerate global temperatures.⁹¹ Changes in tiger habitat viability are a major concern. It is vital not only to maintain tiger populations at key sites, such as protected areas and tiger reserves, but to also ensure habitat connectivity where survival and reproduction are complemented by opportunities for dispersal and colonization.⁹²

Climate change could seriously deplete tiger habitat.

Research suggests that the current network of protected and conserved areas may not adequately cover tiger habitats, even in countries like Bhutan⁹³ and Nepal⁹⁴ with high levels of protection and in areas with vast areas of forest like the boreal forest ecosystem in the Russian Far East and northeastern China.⁹⁵ One model has predicted a 23 per cent loss in suitable tiger habitat by 2050 using a climate scenario with a range of variables such as human population size, global energy consumption and change in land-use patterns and assuming global CO₂ emissions increase during the first half of 2000 and stabilize by 2100 with concentrations three times those of 2000⁹⁶ (between 2000 and 2021 global emissions have already risen from 23.1 Gt to 33 Gt).⁹⁷ Declines vary by region, with models suggesting a rapid decline in the tiger population and suitable habitats in the Sundarbans; resulting in no suitable tiger habitats remaining in the Bangladesh Sundarbans by 2070.⁹⁸ In the boreal forest ecosystem in the Russian Far East and northeastern China, potential habitat suitable for tigers is projected to expand northward under all climate change scenarios developed by the Intergovernmental Panel on Climate Change (IPCC). Tigers, however, will only survive into 2100 in this region if the size and quality of current habitat patches can be

matched as habitat suitability changes, and even then, under the most severe scenario of climate change it is likely that the Siberian tiger would go extinct due to low prey densities.⁹⁹ As climate-induced change impacts habitats and their suitability for tigers, it will become even more necessary to designate protected and conserved areas and promote connectivity between them to reduce isolated habitat patches and increase, and where necessary re-introduce, prey species into potentially suitable tiger habitat to enhance the tigers' viability.¹⁰⁰

Climate change is also increasing the likelihood and severity of fire.

Although fire is a natural phenomenon, the threat of fire is increasing in natural ecosystems in many parts of the world due to climate change,¹⁰¹ and tropical forests in Asia are identified as being particularly under threat.¹⁰² Iconic and successful tiger reserves, such as Bandipur Tiger Reserve in India, have undergone severe wildfires in the last few years.¹⁰³ Fires impact negatively on tigers,¹⁰⁴ hampering conservation efforts. Research on the population viability of the Siberian tiger found that fires threatened survival due to impacts on prey density.¹⁰⁵ Assessments of fire vulnerability for tiger landscapes include the Terai Arc Landscape, where fire is predicted to impact 10 per cent of the total area protected.¹⁰⁶

Climate change can exacerbate human-wildlife

conflict. Loss of tiger habitat as noted above could increase HTC as less land is available for wild tigers. Water scarcity can also force predators outside of their territories in search of water. There is evidence of drought forcing tigers in Nepal toward populated areas which is increasing cases of human-wildlife conflict, with precautionary measures such as artificial ponds to provide water also drying up.¹⁰⁷ These issues are likely to become even more urgent as impacts of climate change worsen.



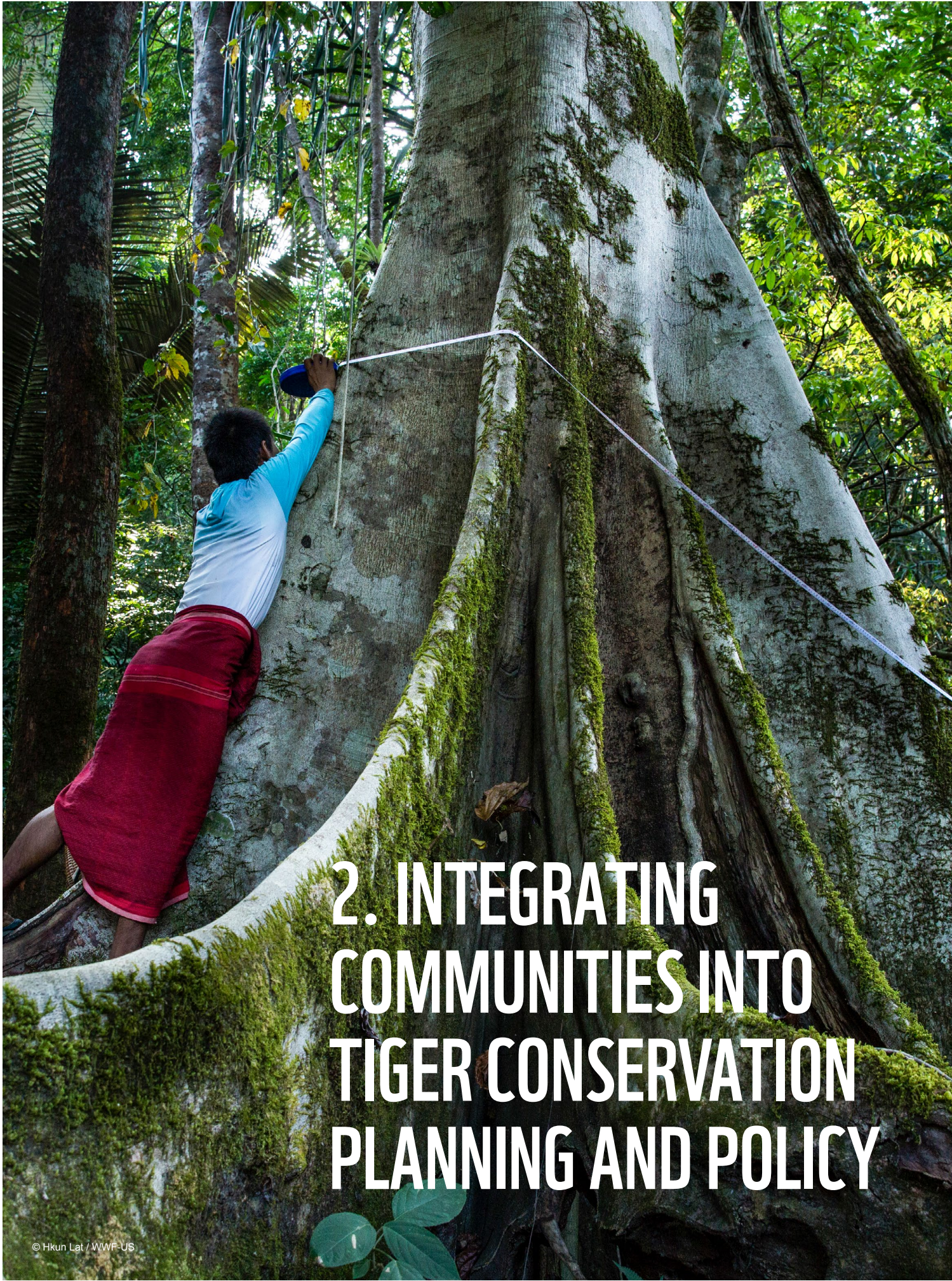
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REFERENCES AND NOTES

- 1 Prime Minister's Office. 2021. Press Release: Over 100 leaders make landmark pledge to end deforestation at COP26. 2 November 2021. <https://www.gov.uk/government/news/over-100-leaders-make-landmark-pledge-to-end-deforestation-at-cop26>
- 2 Convention on Biological Diversity. 2021. *Kunming Declaration "Ecological Civilization: Building a Shared Future for All Life on Earth."* COP15 (Part I). Retrieved from: <https://www.cbd.int/doc/c/c2db/972a/fb32e0a277bf1ccff742be5/cop-15-05-add1-en.pdf>
- 3 United Nations. 2015. *Transforming Our World: The 2030 Agenda for Sustainable Development*. A/RES/70/1. Retrieved from: <https://sdgs.un.org/sites/default/files/publications/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>
- 4 Torres, D.F., Oliveira, E.S. and Alves, R.R.N. 2018. Conflicts between Humans and Terrestrial Vertebrates: A Global Review. *Tropical Conservation Science* 11: 1-15. DOI: 10.1177/1940082918794084
- 5 <https://news.mongabay.com/2021/09/following-coup-myanmars-indigenous-vow-to-protect-forests-until-the-end-of-the-world-commentary/>; <https://news.mongabay.com/2021/08/deforestation-surge-continues-amid-deepening-uncertainty-in-myanmar/> (accessed 16 April 2022)
- 6 Waithaka, J., Dudley, N., Álvarez, M., Arguedas Mora, S., Chapman, S., Figgis, P. et al. 2021. Impacts of COVID-19 on protected and conserved areas: a global overview and regional perspectives. *PARKS* 27: 41-56. DOI: 10.2305/IUCN.CH.2021.PARKS-27-SLJW.en
- 7 Lendelvo, S.M., Pinto, M. and Sullivan, S. 2020. A perfect storm? The impact of COVID-19 on community-based conservation in Namibia. *Namibian Journal of Environment* 4: 1-15. Retrieved from: <http://www.nje.org.na/index.php/nje/article/view/volume4-lendelvo>
- 8 Mackenzie, D. 2020. The covid-19 pandemic was predicted – here's how to stop the next one. *New Scientist* 16 September 2020. Retrieved from: <https://www.newscientist.com/article/mg24733001-000-the-covid-19-pandemic-was-predicted-heres-how-to-stop-the-next-one/>
- 9 Gray, T., Chapman, S., Singh, R. and Pasha, M.K.S. 2020. COVID-19 Impact on Protected Area Management in Tiger Range Countries, PARKS, special issue. Retrieved from: <https://parksjournal.com/wp-content/uploads/2021/03/COVID-survey-results-TRC.pdf>
- 10 Noorashid, N. and Chin, W.L. 2021. Coping with COVID-19: The Resilience and Transformation of Community-Based Tourism in Brunei Darussalam. *Sustainability* 13: 8618. DOI: 10.3390/su13158618
- 11 World Bank. 2021. Urban Development. www.worldbank.org/en/topic/urbandevelopment/overview#1 (accessed 14 December 2021)
- 12 Sanderson, E.W., Moy, J., Rose, C., Fisher, K., Jones, B., Balk, D., et al. 2019. Implications of the shared socioeconomic pathways for tiger (*Panthera tigris*) conservation. *Biological Conservation* 231: 13-23. DOI: 10.1016/j.biocon.2018.12.017
- 13 Qi, J., Holyoak, M., Ning, Y. and Jiang, G. 2020. Ecological thresholds and large carnivores conservation: Implications for the Amur tiger and leopard in China. *Global Ecology and Conservation* 21. DOI: 10.1016/j.gecco.2019.e00837
- 14 Sanderson, E.W., Moy, J., Rose, C., Fisher, K., Jones, B., Balk, D., et al. 2019. *Op cit*
- 15 *Ibid*
- 16 Data sources: Center for International Earth Science Information Network (CIESIN), Columbia University, Gridded Population of the World, Version 4. Species: The IUCN Red List of Threatened Species. Version 2021-4. <http://www.iucnredlist.org>. Downloaded on Jan. 2022. Map: © WWF, 2022. Map produced with WWF-SIGHT.org.
- 17 *Ibid*
- 18 *Ibid*
- 19 Sanderson, E.W., Moy, J., Rose, C., Fisher, K., Jones, B., Balk, D., et al. 2019. *Op cit*
- 20 Data source: <https://www.statista.com/statistics/270162/urbanization-in-china/> (accessed 14 December 2021).
- 21 Jiang, G., Wang, G., Holyoak, M., Yu, Q., Jia, X., Guan, Y. et al. 2017. Land sharing and land sparing reveal social and ecological synergy in big cat conservation. *Biological Conservation* 211: 142-149. DOI: 10.1016/j.biocon.2017.05.018
- 22 Sanderson, E.W., Moy, J., Rose, C., Fisher, K., Jones, B., Balk, D., et al. 2019. *Op cit*
- 23 Baral, K., Sharma, H.P., Kunwar, R., Morley, C., Aryal, A., Rimal, B. et al. 2021. Human Wildlife Conflict and Impacts on Livelihood: A Study in Community Forestry System in Mid-Hills of Nepal. *Sustainability* 13: 13170. DOI: 10.3390/su132313170
- 24 United Nations, Department of Economic and Social Affairs, Population Division. 2019. *World Urbanization Prospects: The 2018 Revision (ST/ESA/SER.A/420)*. United Nations, New York. Retrieved from: <https://population.un.org/wup/publications/Files/WUP2018-Report.pdf>
- 25 Data sources: Center for International Earth Science Information Network (CIESIN), Columbia University, Gridded Population of the World, Version 4. Species: The IUCN Red List of Threatened Species. Version 2021-4. <http://www.iucnredlist.org>. Downloaded on Jan. 2022. Map: © WWF, 2022. Map produced with WWF-SIGHT.org
- 26 *Ibid*
- 27 Powers, R.P. and Jetz, W. 2019. Global habitat loss and extinction risk of terrestrial vertebrates under future land-use-change scenarios. *Nature Climate Change* 9: 323-329. DOI: 10.1038/s41558-019-0406-z
- 28 Penjor, U., Wangdi, S., Tandin, T. and Macdonald, D.W. 2021. Vulnerability of mammal communities to the combined impacts of anthropic land-use and climate change in the Himalayan conservation landscape of Bhutan. *Ecological Indicators* 121: 107085. DOI: 10.1016/j.ecolind.2020.107085
- 29 Thatte, P., Chandramouli, A., Tyagi, A., Patel, K., Baro, P., Chhattani, H. and Ramakrishnan, U. 2020. Human footprint differentially impacts genetic connectivity of four wide-ranging mammals in a fragmented landscape. *Diversity and Distribution* 26: 299-314. DOI: 10.1111/ddi.13022
- 30 Carter, N.H., Levin, S.A. and Grimm, V. 2019. Effects of human-induced prey depletion on large carnivores in protected areas: Lessons from modeling tiger populations in stylized spatial scenarios. *Ecology and Evolution* 9: 11298-11313. DOI: 10.1002/ece3.5632
- 31 Bhattacharjee, S., Kumar, V., Chandrasekhar, M., Malviya, M., Ganswindt, A., Ramesh, K., Sankar, K. and Umapathy, G. 2015. Glucocorticoid stress responses of reintroduced tigers in relation to anthropogenic disturbance in Sariska Tiger Reserve in India. *PLoS One* 10(6): e0127626. DOI: 10.1371/journal.pone.0127626
- 32 Worden, R.C. and Rees, C. 2011. *IEG Review of 20 World Bank-Funded Projects in Tiger Landscapes*. Evaluation Brief 12. Washington, USA. Retrieved from: <https://www.oecd.org/derec/worldbankgroup/49024768.pdf>
- 33 Dadi. 2021. Oil Palm Plantation Expansion: An Overview of Social and Ecological Impacts in Indonesia. *BIRCI-Journal* 4: 6550-6562. DOI: 10.33258/birci.v4i3.2469
- 34 Ten, D.C.Y., Jani, R., Hashim, N.H., Saaban, S., Abu Hashim, A.K. and Abdullah, M.T. 2021. *Panthera tigris jacksoni* Population Crash and Impending Extinction due to Environmental Perturbation and Human-Wildlife Conflict. *Animals* 11: 1032. DOI: 10.3390/ani11041032.
- 35 Smith, O., Wang, J. and Carbone, C. 2018. Evaluating the effect of forest loss and agricultural expansion on Sumatran tigers from scat surveys. *Biological Conservation* 221: 270-278. DOI: 10.1016/j.biocon.2018.03.014
- 36 Poor, E.E., Shao, Y. and Kelly, M.J. 2019. Mapping and predicting forest loss in a Sumatran tiger landscape from 2002 to 2050. *Journal of Environmental Management* 231: 397-404. DOI: 10.1016/j.jenvman.2018.10.065
- 37 Baskett, J.P.C. 2015. *Myanmar oil palm plantations: A productivity and sustainability review*. Report no. 28 of the Tanintharyi Conservation Programme, a joint initiative of Fauna & Flora International and the Myanmar Forest Department. Retrieved from: http://www.supplychainge.org/fileadmin/reporters/all_files/Myanmar-Oil-Palm-Plantations-productivity-and-sustainability-review-en.pdf
- 38 Bahar, N.H.A., Lo, M., Sanjaya, M., Vianen, J. van, Alexander, P., Ickowitz, A. et al. 2020. Meeting the food security challenge for nine billion people in 2050: What impact on forests? *Global Environmental Change* 62: 102056. DOI: 10.1016/j.gloenvcha.2020.102056
- 39 OECD and Food and Agriculture Organization of the United Nations. 2015. *OECD-FAO Agricultural Outlook 2015*. OECD Publishing, Paris. DOI: 10.1787/agr_outlook-2015-en
- 40 Zeng, Z., Estes, L., Ziegler, A.D., Chen, A., Searchinger, T., Hua, F. et al. 2018. Highland cropland expansion and forest loss in Southeast Asia in the twenty-first century. *Nature Geoscience* 11: 556-562. DOI: 10.1038/s41561-018-0166-9
- 41 Zabel, F., Delzeit, R., Schneider, J.M., Seppelt, R., Mauser, W. and Václavík, T. 2019. Global impacts of future cropland expansion and intensification on agricultural markets and biodiversity. *Nature Communications* 10: 2844. DOI: 10.1038/s41467-019-10775-z
- 42 Warrior, R., Noon, B.R. and Bailey, L. 2020. Agricultural lands offer seasonal habitats to tigers in a human-dominated and fragmented landscape in India. *Ecosphere* 11: e03080. DOI: 10.1002/ec2.3080
- 43 Quintana, I., Cifuentes, E.F., Dunnink, J.A., Ariza, M., Martínez-Medina, D., Fantacini, F.M. et al. 2022. Severe conservation risks of roads on apex predators. *Scientific Reports* 12: 2902. DOI: 10.1038/s41598-022-05294-9
- 44 <https://rightsindexdevelopment.org/project/the-asian-infrastructure-investment-bank/> (accessed 17 March 2022).
- 45 Carter, N., Killion, A., Easter, T., Brandt, J. and Ford, A. 2020. Road development in Asia: Assessing the range-wide risks to tigers. *Science Advances* 6 (18). DOI: 10.1126/sciadv.aaz9619
- 46 Nayak, R., Karanth, K.K., Dutta, T., Defries, R., Karanth, K.U. and Vaidyanathan, S. 2020. Bits and pieces: Forest fragmentation by linear intrusions in India. *Land Use Policy* 99. DOI: 10.1016/j.landusepol.2020.104619
- 47 Thatte, P., Joshi, A., Vaidyanathan, S., Landguth, E. and Ramakrishnan, U. 2018. Maintaining tiger connectivity and minimizing extinction into the next century: Insights from landscape genetics and spatially-explicit simulations. *Biological Conservation* 218: 181-191. DOI: 10.1016/j.biocon.2017.12.022

- 48 Aziz, M.A., Smith, O., Barlow, A., Tollington, S., Islam, M.A. and Groombridge, J.J. 2018. Do rivers influence fine-scale population genetic structure of tigers in the Sundarbans? *Conservation Genetics* 19: 1137-1151. DOI: 10.1007/s10592-018-1084-5
- 49 Nyumba, T.O., Sang, C.C., Olago, D.O., Marchant, R., Waruingi, L., Githiora, Y. et al. 2021. Assessing the ecological impacts of transportation infrastructure development: A reconnaissance study of the Standard Gauge Railway in Kenya. *PLOS ONE* 16: e0246248. DOI: 10.1371/journal.pone.0246248
- 50 Nayak, R., Karanth, K.K., Dutta, T., Defries, R., Karanth, K.U. and Vaidyanathan, S. 2020. Bits and pieces: Forest fragmentation by linear intrusions in India. *Land Use Policy* 99: 104619. DOI: 10.1016/j.landusepol.2020.104619
- 51 Liu, J., Coomes, D.A., Gibson, L., Hu, G., Liu, J., Luo, Y. et al. 2019. Forest fragmentation in China and its effect on biodiversity. *Biological Reviews* 94: 1636-1657. DOI: 10.1111/brv.12519
- 52 Clements, G.R., Lynam, A.J., Gaveau, D., Yap, W.L., Lhota, S., Goosman, M. et al. 2014. Where and How Are Roads Endangering Mammals in Southeast Asia's Forests? *PLOS ONE* 9: e115376. DOI: 10.1371/journal.pone.0115376
- 53 Kerley, L.L., Goodrich, J.M., Miquelle, D.G., Smirnov, E.N., Quigley, H.B. and Hornocker, M.G. 2002. Effects of Roads and Human Disturbance on Amur Tigers. *Conservation Biology* 16: 97-108. DOI: 10.1046/j.1523-1739.2002.99290.x
- 54 Ramachandra, T.V., Vinay, S. and Bharath, S. 2021. Visualisation of landscape alterations with the proposed linear projects and their impacts on the ecology. *Modeling Earth Systems and Environment*. DOI: 10.1007/s40808-021-01135-2
- 55 Nandi, Jayashree. 2020. 29 tigers present in Dibang block: Report. *Hindustan Times*, 31 July 2020. Retrieved from: <https://www.hindustantimes.com/india-news/29-tigers-present-in-dibang-block-report/story-18XhzzZnEhzzf15UxydlwL.html> (accessed 6 June 2022).
- 56 Palmeirim, A.F. and Gibson, L. 2021. Impacts of hydropower on the habitat of jaguars and tigers. *Communications Biology* 4: 1-7. DOI: 10.1038/s42003-021-02878-5
- 57 Sentinel-2 10m resolution land cover for 2021. Produced by Impact Observatory, Microsoft and Esri (updated 10 Feb. 2022). Note that percentage total calculations in the table exclude values for water, clouds and snow/ice.
- 58 *Ibid.*
- 59 Qin, S., Golden Kroner, R.E., Cook, C., Tesfaw, A.T., Braybrook, R., Rodriguez, C.M. et al. 2019. Protected area downgrading, downsizing, and degazettement as a threat to iconic protected areas. *Conservation Biology* 33: 1275-1285. DOI: 10.1111/cobi.13365
- 60 Poor, E.E., Frimpong, E., Imron, M.A. and Kelly, M.J. 2019. Protected area effectiveness in a sea of palm oil: A Sumatran case study. *Biological Conservation* 234: 123-130. DOI: 10.1016/j.biocon.2019.03.018
- 61 Poor, E.E., Shao, Y. and Kelly, M.J. 2019. Mapping and predicting forest loss in a Sumatran tiger landscape from 2002 to 2050. *Journal of Environmental Management* 231: 397-404. DOI: 10.1016/j.jenvman.2018.10.065
- 62 Palmeirim, A.F. and Gibson, L. 2021. Impacts of hydropower on the habitat of jaguars and tigers. *Communications Biology* 4: 1-7. DOI: 10.1038/s42003-021-02878-5
- 63 Areendran, G. Raj, K. Mazumdar, S. and Sharma, A. 2017. Land use and land cover change analysis for Kosi River wildlife corridor in Terai Arc Landscape of Northern India: Implications for future management. *Tropical Ecology* 58(1): 139-149. Retrieved from: http://216.10.241.130/pdf/open/PDF_58_1/13.%20Areendran%20et%20al..pdf
- 64 Carter, N., Killion, A., Easter, T., Brandt, J. and Ford, A. 2020. *Op cit*
- 65 Nayak, R., Karanth, K.K., Dutta, T., Defries, R., Karanth, K.U. and Vaidyanathan, S. 2020. *Op cit*
- 66 IUCN, UNEP-WCMC. 2020. The World Database on Protected Areas (WDPA). October 2020. Cambridge (UK): UNEP World Conservation Monitoring Centre. (Available at: www.protectedplanet.net): The IUCN Red List of Threatened Species. Version 2021-4. <http://www.iucnredlist.org>.
- 67 Laurance, W.F. and Arrea, I.B. 2017. Roads to riches or ruin? *Science* 358: 442-444. DOI: 10.1126/science.aao0312
- 68 Jacoby, H.G. 2000. Access to Markets and the Benefits of Rural Roads. *The Economic Journal* 110: 713-737. DOI: 10.1111/1468-0297.00562
- 69 WII. 2016. *Eco-friendly Measures to Mitigate Impacts of Linear Infrastructure on Wildlife*. Wildlife Institute of India, Dehradun, India. Retrieved from: https://moef.gov.in/wp-content/uploads/2019/07/eco_friendly_measures_mitigate_impacts_linear_infra_wildlife_compressed.pdf
- 70 https://economictimes.indiatimes.com/industry/transportation/roadways/how-an-elevated-stretch-of-nh-44-through-pench-tiger-reserve-earned-a-distinction/articleshow/74260122.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst (accessed 19 March 2022).
- 71 Orlik, T. and Van Roye, B. 2020. An Economist's Guide to the World in 2050. Bloomberg Businessweek. Retrieved from: www.bloomberg.com/graphics/2020-global-economic-forecast-2050/
- 72 Tonby, O., Woetzel, J., Choi, W., Seong, J. and Wang, P. 2019. *Asia's future is now*. McKinsey Global Institute, London. Retrieved from: <https://www.mckinsey.com/~media/mckinsey/featured-percentage20insights/asia-percentage20pacific/asias-percentage20ofuture-percentage20is-percentage20now/asias-future-is-now-final.pdf>
- 73 PwC. 2017. *The Long View. How will the global economic order change by 2050?* PricewaterhouseCoopers LLP. Retrieved from: www.pwc.com/gx/en/world-2050/assets/pwc-the-world-in-2050-full-report-feb-2017.pdf
- 74 ADB. 2021. Asian Development Outlook July 2021. Asian Development Bank, Philippines. Retrieved from: www.adb.org/sites/default/files/publication/715491/ado-supplement-july-2021.pdf
- 75 Tonby, O., Woetzel, J., Choi, W., Seong, J. and Wang, P. 2019. *Asia's future is now*. McKinsey Global Institute, London. Retrieved from: www.mckinsey.com/~media/mckinsey/featured-percentage20insights/asia-percentage20pacific/asias-percentage20ofuture-percentage20is-percentage20now/asias-future-is-now-final.pdf
- 76 Credit Suisse AG. 2014. *Conservation finance moving beyond donor funding toward an investor-driven approach*. Credit Suisse AG, WWF and McKinsey & Company, Switzerland. Retrieved from: <https://www.cbd.int/financial/privatesector/g-private-wwf.pdf>
- 77 Sanderson, E.W., Moy, J., Rose, C., Fisher, K., Jones, B., Balk, D. et al. 2019. Implications of the shared socioeconomic pathways for tiger (*Panthera tigris*) conservation. *Biological Conservation* 231: 13-23. DOI: 10.1016/j.biocon.2018.12.017
- 78 Tonby, O., Woetzel, J., Choi, W., Seong, J. and Wang, P. 2019. *Op cit*
- 79 Defined as spending more than US\$11 a day in 2011 purchasing power parity terms.
- 80 Tonby, O., Woetzel, J., Choi, W., Seong, J. and Wang, P. 2019. *Op cit*
- 81 Linkie, M., Martyr, D., Harihar, A., Mardiah, S., Hodgetts, T., Risdianto, D., et al. 2018. Asia's economic growth and its impact on Indonesia's tigers. *Biological Conservation* 219: 105-109. DOI: 10.1016/j.biocon.2018.01.011
- 82 Davis, E.O., Willemsen, M., Dang, V., O'Connor, D. and Glikman, J.A. 2020. An updated analysis of the consumption of tiger products in urban Vietnam. *Global Ecology and Conservation* 22: e00960. DOI: 10.1016/j.gecco.2020.e00960
- 83 Sanderson, E.W., Moy, J., Rose, C., Fisher, K., Jones, B., Balk, D., et al. 2019. Implications of the shared socioeconomic pathways for tiger (*Panthera tigris*) conservation. *Biological Conservation* 231: 13-23. DOI: 10.1016/j.biocon.2018.12.017
- 84 PwC. 2020. *ADAPT: Five urgent global issues and implications*. PwC, UK. Retrieved from: www.pwc.com/gx/en/issues/assets/pdf/pwc-adapt-five-urgent-global-issues-and-implications-may.pdf
- 85 Alvaredo, F., Chancel, L., Piketty, T., Saez, E. and Zucman, G. 2018. *What is the Future of Global Income Inequality?* World Inequality Report 2018. Harvard University Press, Cambridge, MA and London, England. DOI: 10.4159/9780674984769
- 86 Mikkelsen, G.M., Gonzalez, A. and Peterson, G.D. 2007. Economic Inequality Predicts Biodiversity Loss. *PLOS ONE* 2: e444. DOI: 10.1371/journal.pone.0000444
- 87 Islam, S.N. 2015. *Inequality and Environmental Sustainability*. DESA Working Paper No. 145, ST/ESA/2015/DWP/145. Department of Economic & Social Affairs, USA. Retrieved from: https://www.un.org/esa/desa/papers/2015/wp145_2015.pdf
- 88 Duffy, R., St John, F.A., Btischer, B. and Brockington, D. 2016. Toward a new understanding of the links between poverty and illegal wildlife hunting. *Conservation Biology*, 30(1): 14-22. DOI: 10.1111/cobi.12622
- 89 <https://ourworldindata.org/extreme-poverty> (accessed 7 April 2022). Figures relate to household income or consumption per person, measured in international-\$ (in 2011 PPP prices) to account for price differences across countries and inflation over time.
- 90 PwC. 2021. *Only 10 years to achieve Sustainable Development Goals but businesses remain on starting blocks for integration and progress*. Press Release 17/12/19. PwC, UK. Retrieved from: <https://www.pwc.com/gx/en/news-room/press-releases/2019/sdg-challenge-2019.html>
- 91 Urban, M.C. 2015. Accelerating extinction risk from climate change. *Science* 348: 571-573. DOI: 10.1126/science.aaa4984
- 92 Thinley, P., Rajaratnam, R., Morreale, S.J. and Lassoie, J.P. 2021. Assessing the adequacy of a protected area network in conserving a wide-ranging apex predator: The case for tiger (*Panthera tigris*) conservation in Bhutan. *Conservation Science and Practice* 3: e318. DOI: 10.1111/csp.2.318
- 93 *Ibid*
- 94 Thapa, K. and Tuladhar, S. (eds) 2021. *Connecting Corridors*. WWF-Nepal, Kathmandu, Nepal.
- 95 Tian, Y., Wu, J., Wang, T. and Ge, J. 2014. Climate change and landscape fragmentation jeopardize the population viability of the Siberian tiger (*Panthera tigris altaica*). *Landscape Ecology* 29: 621-637. DOI: 10.1007/s10980-014-0009-z

- 96 Rather, T.A., Kumar, S. and Khan, J.A. 2020. Multi-scale habitat modelling and predicting change in the distribution of tiger and leopard using random forest algorithm. *Scientific Reports* 10: 11473. DOI: 10.1038/s41598-020-68167-z
- 97 Data from: www.iea.org/data-and-statistics/charts/global-energy-related-co2-emissions-1990-2021 (accessed 14 December 2021).
- 98 Mukul, S.A., Alamgir, M., Sohel, M.S.I., Pert, P.L. Herbohn, J., Turton, S.M., et al. 2019. Combined effects of climate change and sea-level rise project dramatic habitat loss of the globally endangered Bengal tiger in the Bangladesh Sundarbans. *Science of the Total Environment* 663: 830-840. DOI: 10.1016/j.scitotenv.2019.01.383
- 99 Tian, Y., Wu, J., Wang, T. and Ge, J. 2014. Climate change and landscape fragmentation jeopardize the population viability of the Siberian tiger (*Panthera tigris altaica*). *Landscape Ecology* 29: 621-637. DOI: 10.1007/s10980-014-0009-z
- 100 *Ibid*
- 101 Abatzoglou, J.T., Williams, A.P. and Barbero, R. 2019. Global Emergence of Anthropogenic Climate Change in Fire Weather Indices. *Geophysical Research Letters* 46: 326-336. DOI: 10.1029/2018GL080959
- 102 Deb, J.C., Phinn, S., Butt, N. and McAlpine, C.A. 2018. Climate change impacts on tropical forests: identifying risks for tropical Asia. *Journal of Tropical Forest Science* 30: 182-194. DOI: 10.26525/jtfs2018.30.2.182194
- 103 Ashwatha, K.N., Tejaswini, J.S. and Rayamane, A.S. 2021. Identifying the decadal forest fire effects on conversion of forest cover to grassland in Bandipur Tiger Reserve through geospatial technology. *International Journal of Scientific and Research Publications* 11: 1-9. DOI: 10.29322/IJSRP.11.09.2021.p11702
- 104 Murthy, K., Sinha, S., Kaul, R. and Vaidyanathan, S. 2019. A fine-scale state-space model to understand drivers of forest fires in the Himalayan foothills. *Forest Ecology and Management* 432: 902-911. DOI: 10.1016/j.foreco.2018.10.009
- 105 Tian, Y., Wu, J., Smith, A.T., Wang, T., Kou, X. and Ge, J. 2011. Population viability of the Siberian Tiger in a changing landscape: Going, going and gone? *Ecological Modelling* 222: 3166-3180. DOI: 10.1016/j.ecolmodel.2011.06.003
- 106 Verma, A.K., Kaliyathan, N.N., Bisht, N.S., Sharma, S.D. and Nautiyal, R. 2020. Forest fire prediction modeling in the Terai Arc Landscape of the lesser Himalayas using the maximum entropy method. In: S.M. Hood, S. Drury, T. Steelman and R. Steffens (eds), *Proceedings of the Fire Continuum-Preparing for the future of wildland fire. 2018 May 21-24; Missoula, MT*, pp 219-230. Proceedings RMRS-P-78. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, USA. Retrieved from: https://www.fs.fed.us/rm/pubs_series/rmrs/proc/rmrs_p078.pdf
- 107 <https://myrepublica.nagariknetwork.com/news/scarcity-of-water-increasing-risk-of-human-wildlife-conflict-1/>; <https://www.thethirdpole.net/en/nature/why-have-tiger-attacks-spiked-in-nepals-bardia-national-park/> and <https://www.indiablooms.com/health-details/W/8971/water-scarcity-in-national-parks-increasing-human-wildlife-conflict.html> (accessed 7 April 2022).



2. INTEGRATING COMMUNITIES INTO TIGER CONSERVATION PLANNING AND POLICY

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Why read this section?

Attitudes to conservation are changing, with new approaches and tools emerging in response. Support from Indigenous people and local communities for conservation is essential to success and there is now wider recognition of the importance of respecting and promoting human rights in conservation. Understanding community attitudes and priorities toward tigers is therefore critical, particularly knowledge of what will influence these attitudes over time. This section summarizes the likely influences, along with good practices for community engagement in policy-making and outcomes. It describes some newer tools that governments can use in collaboration with others to deliver conservation, including the designation of “other effective area-based conservation measures” (OECMs) and the opportunities for bringing other actors into tiger conservation.

INTRODUCTION

Attitudes toward, and options for, area-based conservation are changing fast. Many see the 2003 World Parks Congress in Durban, South Africa, as the tipping point when protected areas stopped being viewed predominantly as government-led, top-down initiatives and the conservation landscape opened up to new approaches from local communities, private individuals and, above all, Indigenous peoples.¹ While all these groups had managed areas for conservation long before that date,² the 2003 World Parks Congress saw a wider acceptance of these options and rapid acceleration of their adoption.³ At the same time, management in many government controlled protected areas was opened to greater local uses, for instance to collect medicinal plants, visit sacred sites or undertake sustainable grazing. Many of the resulting changes are still in process (and it would be naïve to assume that the conflicts about protected areas have disappeared). These changing attitudes have been reflected in tiger landscapes, but perhaps somewhat slower than in other areas, with a major survey of management effectiveness of protected areas across the tiger range in 2018 finding that management related to community issues was weak across the whole range. Only 58 per cent of the sites surveyed had put in place benefit-sharing/alternative livelihood mechanisms and only 30 per cent had involved stakeholders in management planning.⁴ Although management effectiveness and standard setting systems like Conservation Assured | Tiger Standards (CA|TS) (see box 24) are working across many tiger landscapes to help implement better, more equitable and inclusive management and governance, this is clearly an area which needs far more attention and one which is fundamental to improving coexistence particularly in and around protected areas.

Trust and legitimacy emerge as key elements in building support and overcoming local opposition to area-based conservation.⁵ Furthermore, there is abundant evidence that any form of conservation management, including protected and conserved areas, stands far more chance of long-term success if it comes from,⁶ or is at least developed in cooperation with,⁷ the people living in or near to the area, along with others reliant on the area for aspects of their livelihoods and well-being.⁸

Living with tigers poses particularly important challenges and reconciling human and tiger needs at a landscape level will never be easy. Tigers are sensitive to human disturbance and ideally need large areas protected for their conservation.⁹ Coexistence relies on a complicated series of trade-offs,¹⁰ and continues to carry risks for both people and tigers. Human casualties are the most significant cost of coexistence with tigers,¹¹ although livestock predation is more common and an important and understandable source of tension.¹²

Although tigers are one of over 250 vertebrates identified as being in “conflict” with humans,¹³ they are one of the largest and have a long history of attacks on humans and livestock. While some level of conflict is inevitable, and it must be admitted that human-tiger conflict (HTC) is increasing in areas that have succeeded in recovering tiger populations,¹⁴ a narrow focus on the negative misses the positive aspects of tiger presence for local peoples. Indeed, the growing recognition of the concept of coexistence offers the potential to stimulate a step-change in thinking on human-wildlife interactions.¹⁵

Figure 4 reproduces an assessment of the ecological potential for tiger recovery. However, many of these areas will not have the social conditions appropriate for tiger re-establishment. Governments can make use of existing analyses such as these to prioritize where subsequent mapping of social variables is most needed. At the same time there is a strong obligation on governments to discuss ways to reduce costs, increase benefits and put a greater emphasis on *coexistence*.¹⁶ Indeed, the fact that research in this area focuses predominantly on conflict may be distorting management actions away from coexistence options,¹⁷ which are increasingly recognized as the only viable options in the long term.¹⁸

2.1 COMMUNITY VALUES AND BELIEFS INFLUENCE ATTITUDES AND BEHAVIOURS

Most communities sharing space with tigers have deep-seated cultural and spiritual beliefs relating to tigers and these are as important – frequently more important – than day-to-day practical decisions in determining how tigers are viewed and how coexistence can be fostered.

Links between faith and tigers can sometimes provide additional support for conservation. No-one doubts the historical significance of tigers to many of the region’s faith groups (see box 3). Nor that these faiths are all flourishing in the region, with one or the other followed by most of the population. But does this translate into willingness to conserve?¹⁹ The evidence is mixed. Buddhist traditions have close links with conservation²⁰ and in Bhutan the tiger is considered sacred²¹ and conservation success is in part attributed to people’s religious beliefs.²² The spiritual value associated with the tiger for the Soligas people living in the Biligiri Rangaswamy Temple (BRT) Tiger Reserve in India’s Western Ghats has proved important in developing conservation policies.²³ Beliefs about tigers are identified as

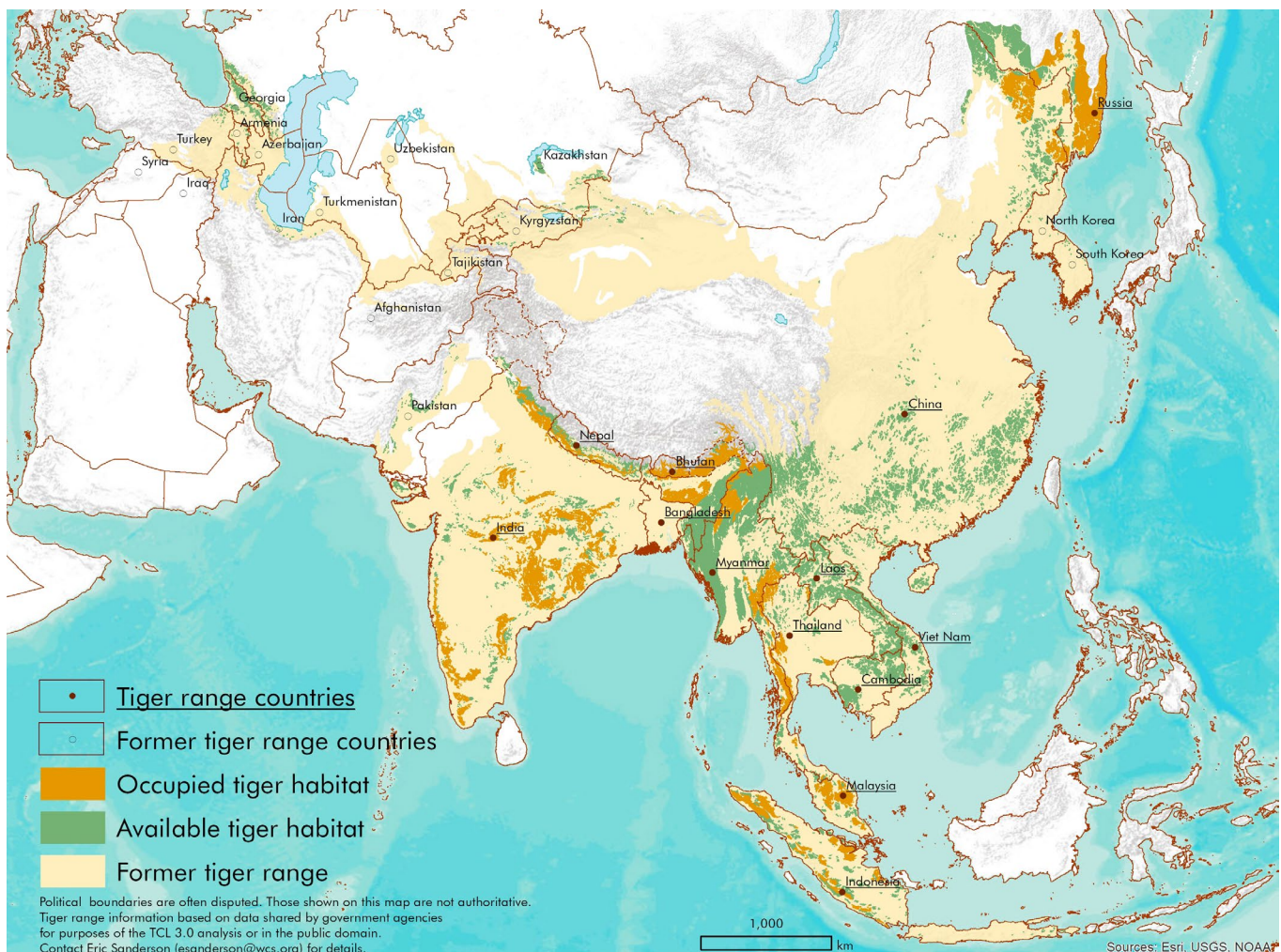


Figure 4: Current and former tiger range countries – the ecological potential for tiger recovery³⁶

major factors in determining tolerance levels among local populations in the Indian Sundarbans.²⁴ Research with three ethnic groups, all Muslims, in Sumatra, Indonesia, found differing attitudes to tigers. Although no-one saw close links with Islam, belief in the spiritual significance of tigers, and of spirit tigers, remained high. While there was an opinion that tigers killing people by entering villages should be destroyed, this was not so often the case if tigers killed people while out hunting in the forest, and there was also a belief that if tigers killed someone who had committed adultery this was their role as an enforcer of a moral code.²⁵ Countries with ambitions to increase or restore tigers in the wild, such as China, hope to build on the role of tigers in national cultures to elicit public support for conservation.²⁶ Similarly in Cambodia, in the Cardamom Mountains, local people believed that spirits associated with tigers bite those who violate taboos on forest use. As tiger populations were extirpated by poaching these belief systems became ineffective and a new belief arose that violators were punished by crop damage caused by wild pigs and other animals. Nevertheless, the association between tiger, spirits and their role in forest use remains strong²⁷ and could be important for coexistence if tigers return to Cambodia.

But support for tiger conservation due to spiritual beliefs is by no means universal or a given. The tiger is still the national animal of South Korea but has been driven to extinction in the country and interest in the tiger is more symbolic than physical.²⁸ While growing numbers of educated, middle-class Indians are prepared to spend time and money to see a wild tiger,²⁹ with the species' rarity being one of the attractions, it is not clear how closely this aligns to either Hindu or Muslim traditions. Research on attitudes to snow leopards and wolves in northern India among Muslim and Buddhist communities found that religious belief was statistically insignificant in shaping opinions, although active Buddhists were more likely to be tolerant of carnivores.³⁰ Conversely, socio-economic and cultural factors were found to be more important than previous encounters (e.g., livestock predation) among communities living around Chitwan National Park in Nepal.³¹

The rights of nature are increasingly being reflected in legal systems. The emergence of legal recognition for ecosystems such as rivers,³² and recognition of "personhood" for species like the tiger,³³ are also changing both social attitudes and the practices of governments. It brings long-standing debates about the rights of other animals,³⁴ and of plants,³⁵ into national legal frameworks. This is a highly significant development although it is still too early to see how important this will be in the future.

Box 3: The tiger is significant to faith groups and cultures across its entire historic range

For the Chinese (and many others) the tiger is one of the 12 zodiac signs and king of all the animals.³⁷ Tigers are closely linked with Taoism, with many traditions of people shapeshifting into tigers.³⁸ They are also important in Buddhism. In Korea, the tiger is seen as protective and benevolent and features in shamanistic creation stories, many Korean temples contain shrines to the San Shin Mountain spirits and the tiger,³⁹ with tigers often symbolizing anger.⁴⁰ Tiger pictures also appear on Buddhist temples in Thailand, Bhutan and China. Guru Rinpoche is said to have flown from Tibet to Bhutan on the back of the tiger, to establish the country's Tantric school of Buddhism.⁴¹ In Hindu traditions, the ten-armed warrior goddess Durga (Shakti or Kali) rides the tiger, representing power and immortality,⁴² and the tiger is associated with Lord Ayyapa of Sabarimala. In Bengal, the tiger god was worshipped by both Hindus and Muslims.⁴³

Many tiger reserves contain important religious buildings. Although not directly linked to tigers, one of the largest annual pilgrimages in the world takes place in the Periyar Tiger Reserve in India, visited by 10 million devotees each year.⁴⁴ Further to the east, the traditional Tungusic, Udege and Nanai peoples of Siberia consider the tiger a near-deity.⁴⁵

The religious and cultural significance of tigers can impact tolerance and be an important factor in coexistence. For example, in Sumatra, tolerance to tigers has been attributed to an Islamic prohibition on eating animals that hunt with claws, and the Kerincinese and Minangkabau peoples have a long history of losing kin to tigers. Tolerance for these losses has developed with a spiritual connection to animals, and the belief that ancestral souls are embodied within tigers. These tigers serve as guardians of customary laws⁴⁶ and punish those who transgress moral codes; as a result, victims of HTC are stigmatized as being punished by the guardians.⁴⁷ Similarly, the Solegas, an Indigenous peoples in Karnataka State in northern India, believe that animals will come near them if they have sinned.⁴⁸ The Nanai and Udege people living in the Russian Far East believe that seeing a Siberian tiger is auspicious, and hunters leave behind parts of ungulate carcasses as offerings.⁴⁹

Attitudes toward animals that damage crops, or kill livestock and people, are seldom driven simply by practical considerations but are influenced by culture and tradition. Religious beliefs can also play an important role in increasing tolerance toward dangerous or destructive animals. Research in India, for instance, found high levels of acceptance of crop damage from elephants in some communities, because of a deep-seated belief in the elephant god Mahakal.⁵⁰ Animals that can kill people are often viewed ambivalently, both admired and hated by those who share their territory. Local perceptions of risks versus benefits are important in determining how people will react, along with factors such as emotional responses to species, personal control over risks and trust in management authorities. Even where there are problems and tensions, many stakeholders recognize the need for conservation, so that debates focus more on how conservation is managed and what kinds of compensation mechanisms exist.⁵¹ The realisation of benefits can increase tolerance.⁵²

Attitudes to predators can vary with gender. Research on gender has highlighted some underlying issues which impact attitudes (case study 1). In Indian Tiger Reserves (Sariska and Panna, two sites where tigers have been reintroduced), women are more negative toward large carnivores compared to men. Here researchers considered this negativity may relate to the fact that the women tend to bear a disproportionate burden of conflict costs but are often not included in decision-making processes.⁵³ In contrast, in Periyar National Park, the efforts of managers and staff to involve local people have been very successful in several ways, including women now taking an active role in voluntarily patrolling the forests.⁵⁴ In Panama, research on attitudes to jaguars (*Panthera onca*) around two national parks found that tolerance increased with education and was greater among men than women.⁵⁵ It was suggested that these factors (education levels and gender) may have been linked in that case. If such an association is valid then it is worth pointing out that the educational gap between men and women completing primary and secondary education has significantly reduced across all tiger regions between 2000 and 2017, with women surpassing men in educational attainment across most of Southeast Asia by 2017.⁵⁶

CASE STUDY 1: FACTORS INFLUENCING ATTITUDES TO TIGERS AROUND A NATIONAL PARK IN NEPAL

Introduction

The survival of tigers in the wild depends to a large extent on the degree to which people living in the area will tolerate their presence. Retaliatory killing, particularly by poisoning, is extremely hard to protect against, nor is it a simple matter to identify culprits. Reducing HTC in tiger landscapes and building positive attitudes toward tiger conservation, are therefore critical elements in tiger conservation strategies.

However, reducing conflict also means understanding the impacts of tigers and, crucially, how local people perceive levels of nuisance and risk, and their own views about the future of the tiger. Research in Nepal found that attitudes differ markedly, even within communities. They are influenced by a range of sometimes countervailing factors, varying from previous experience through to educational level, gender and socio-economic status. While it is presumptuous to seek to guess how individuals will react to HTC, some generalizations can be made at the level of a community.

Chitwan National Park

Chitwan National Park is the oldest national park in Nepal, designated in 1973, following a 70 per cent decline in forest area, a massive decline in wildlife in the area and settlement

by thousands of people. It is situated in the lowland Terai, and conserves important tropical rainforest and wetland ecosystems, along with globally significant populations of rhinoceros, elephant, gharial and tiger. The park was recognized as a UNESCO natural World Heritage site in 1984. Human-wildlife conflict occurs around the park and local people maintain watch towers in some areas to look out for problem animals so that they can be driven away. There have been efforts at fencing, with variable success.

A detailed research project sought to identify the range of attitudes toward tigers among the local population, the extent to which they differed in different strata of society and what local people saw as desirable future tiger population numbers. Almost 500 people were interviewed, all living within 2km of the protected area boundary. Around 17 per cent of those interviewed had experienced threats or attacks to themselves and/or their livestock. Over 63 per cent of the people interviewed were women, a disparity created because many men go away from the area to find work. The location of Chitwan, as one of a set of protected areas conserving highly endangered species in an otherwise settled landscape, make it an ideal location to test research into “coupled human and natural systems (CHANS)”. The picture that emerges is complicated.

Factors influencing attitudes

Initial questions focused on the willingness of people to tolerate risks from tigers to both their own health and the survival of their livestock. Tolerance was found to be affected strongly by previous experience, perceptions of vulnerability and the extent to which people felt government officials were

It is difficult to get a clear picture of what people are thinking, particularly at a time of rapid social change. Attitudes are changing fast in many societies; what was obvious from research twenty years ago may no longer be so relevant or true today. Attitude surveys are notoriously difficult to get right (see case study 1); they almost inevitably try to distil what may be complex and only half-understood feelings down into a simple binary choice or set of choices, are prone to bias due to the formulation of the questions and often under-represent one or more sectors of society. Survey methods range from various Likert-like scaled approaches (belief statements or opinion statements), fixed response questions, yes/no or agree/disagree questions and open-ended questions, with various ways of randomizing the sample;⁵⁷ all have their limitations. Furthermore, asking people questions about issues they know little or nothing about can result in “pseudo-opinions” that provide little real guidance to decision-makers.⁵⁸ Peoples’ backgrounds are significant; in India, conservationists are generally quite positive about the success of protected areas as might be expected,⁵⁹ while many other groups are less enthusiastic. Personal experience is also very important, and it is significant that attitudes toward predators are likely to be more tolerant in places where the personal risks are low.

doing a decent job of keeping them safe. Illegal actions, including the poisoning of tigers, were more likely to be supported if the interviewee felt that the government had been letting them down. Preferences about future population size of tigers were also influenced by these factors, with negative experiences leading to a desire for less tigers in the landscape. Nonetheless, the majority of people interviewed felt that most risks could be avoided by care and adaptation. Understanding the trends was much less clear: a roughly equal number of people felt that problems were getting worse, getting better or staying about the same as before.

Analysis also suggested that previous experience is in many cases less significant than other factors, including socio-economic position. Negative feelings were commonest among those with less formal education, marginalized ethnic groups and, not surprisingly, people who had suffered directly from tigers. Attitudes were also spatially influenced, with hotspots emerging where problems were most acute.

Perceptions about tigers are also changing over time. Formal and informal social networks within the community influence attitudes of individuals. Positive feelings toward tigers would in the past have been closely linked with cultural values and traditions, in a country where the tiger often plays a prominent role in religion and folklore. Today, positive feelings are often more closely related to the importance of tigers as an attraction for tourists, because ecotourism plays an increasingly important role in the economy of the region. Furthermore, management policies, including the exclusion of people from parts of the national

Building understanding can draw on previous experience but needs to be refined on a case-by-case basis. Case study 2 includes an overview of recent perception surveys in communities’ relationships to tigers across the range. Reference to material in journals and in grey literature can be a shortcut to understanding, particularly if this covers a range of situations.⁶⁰ But responses to tigers are location-specific and are likely to be changing, both gradually as societies change but also in response to more immediate impacts such as recent HTC or conversely the emergence of lucrative ecotourism ventures. There is some evidence that younger people in resource-dependent communities are less tolerant of conservation than was the case in the past.⁶¹ It is therefore also important for those managing an area with tigers to have local and up-to-date knowledge based on careful interviews with a range of stakeholders. And these priorities do not end at the planning stage, continuous monitoring is also needed to understand if support is declining over time.⁶²

park, have altered attitudes and also changed the type and availability of ecosystem services.

Conclusions

These findings have a range of implications for conservation policy. Training in risk minimization is important, along with general levels of education in society and a raising of the status of the poorest and most marginalized members of society. Concentrating conservation efforts in the areas where problems are most acute makes sense, but it also changes perceptions beyond those areas as well. Mapping areas where attitudes were most negative can help conservationists to focus efforts where they are most needed. Translocating or killing “problem” animals remains an option but is best used with accompanying conservation actions.

Using the knowledge gained by surveys such as these can help to anticipate problems before they occur and take action before they become acute. Long-term studies of the type carried out in Chitwan are also important in building a more rounded picture of what people are thinking, because they provide an opportunity to see and measure attitudinal changes over time, rather than providing a single snapshot. A detailed understanding is the first stage in finding out how best to act to address the impacts of HTC.

Acknowledgements

This case study draws on a series of research papers⁶³ by Neil Carter and colleagues on assessing impacts of management and of human-wildlife conflict in Chitwan.

CASE STUDY 2: HUMAN TIGER COEXISTENCE PERCEPTIONS

Understanding human tiger perceptions is vital to developing appropriate strategies for coexistence. Below we review a range of studies from tiger landscapes.

- **Bangladesh, 385 respondents:** A study from 2014/2016 in the Sundarbans found most respondents (93 per cent) agreed that tigers should be protected as they benefit people by protecting the Sundarbans. An increasing tiger population was favoured by almost half the respondents (47 per cent) whereas a third (31 per cent) wanted the tiger population to stay at its current level and 22 per cent wanted the tiger population to decrease. Tolerance of tigers was highest among people who believed the tiger population was decreasing.⁶⁴ Retaliatory killing of tigers is linked to perceived risk (fear or worry about tigers attacking livestock/people) and perceived lack of effective response by authorities, both being strong drivers of tiger killing. More positive attitude toward tigers correlated with more negative attitude toward tiger killing, and vice versa.⁶⁵
- **Indonesia, 2,386 respondents:** A study published in 2018 found people's tolerance toward tigers was influenced by how likely they were to have encountered a tiger in the past as well as their beliefs and perceptions. Respondents were more likely to support an increase in tiger populations if they held beliefs concerning the importance of the animal for spiritual well-being.⁶⁶
- **Indonesia, 154 respondents:** Another 2018 study from Indonesia also noted community perceptions of HTC (tiger attacks and livestock depredation) differed for distinct ethnic groups living near Kerinci Seblat National Park, based on diverging understandings of the cultural and spiritual role of tigers. For example, the Minangkabau community were more likely to suggest killing tigers than were the Kerincinese, who view tigers as an ancestral and teaching figure and suggested reporting the attacks to authorities.⁶⁷
- **Nepal, 300 respondents:** A study from Bardia National Park published in 2014 found that despite livestock depredation and human casualties, local people's attitude toward tiger conservation was generally positive, with 63 per cent in favour of tigers. Their reasons included expected benefits from ecotourism (38.4 per cent), tigers as an indicator of intact ecosystems (26.2 per cent), population decline (21.5 per cent), beautiful appearance (11.6 per cent) and religious importance in Hinduism (2.3 per cent). Negative attitudes focused concern about human casualties (53 per cent) and livestock depredation (47 per cent). Men and those with a higher level of education had more positive attitudes toward tiger conservation compared to women and those with less education.⁶⁸
- **Nepal, 399 respondents:** A 2019 study in Chitwan National Park found that, overall, respondents were positive about wildlife conservation but 60 per cent were not satisfied with the buffer zone programmes, suggesting more focus on direct interventions to reduce wildlife impacts were needed. In particular, over 90 per cent were not satisfied with the long delay in compensation payments, which take on average just over six months. During focused group discussions, a majority expressed a preference for construction of wire mesh fences to reduce human-wildlife conflict that is effective for a wide range of species, of reasonable cost, durable and requiring a low level of maintenance⁶⁹ (see also case study 1).
- **India, 353 surveyed:** A study in the Terai Arc Landscape published in 2015 found the majority of households felt more threatened by leopards than tigers, even though tigers caused more financial damage, probably because leopard interactions with humans are more frequent. About a quarter of households expressed a willingness for elimination of leopards, but only 4 per cent were willing for tigers to be eliminated. Respondents suggested that the Forest Department should maintain deterrents (e.g., solar powered electric fencing), and want community rights over forest resources in exchange for assisting with conflict management and conservation. Although there were no reports of poisoning incidents, 14 per cent of respondents thought that large carnivores should be culled when they pose conflicts.⁷⁰
- **India, Number of respondents unknown:** A 2021 study of the Soliga/Solega of southern Karnataka reported that most people do not feel animosity toward predators, and tigers are accepted as a natural part of the forest. There are also religious beliefs that come into play, such as tigers being the Madeswara's (the creator of the Solegas) animal and if harm should befall the tiger, Madeswara will punish them. Solegas believe that animals will come near them if they have sinned and they will avoid areas where wildlife are not wary of people (e.g., local corridors for animal movement). Crop-raiding by wildlife is accepted as a part of life and although Solegas will protect their crops, their methods are non-lethal. Interestingly,

Solegas perceive tiger numbers to be decreasing over the years, contrary to official reports.⁷¹

- **India, 374 respondents:** A 2019 study in the Nilgiri Biosphere Reserve found about half the respondents were positive about wildlife conservation and that there were hardly any human casualties from large carnivore attacks. Many of the semi-nomadic ethnicities were neutral toward tiger conservation while ethnicities who had previously worked with the Forest Department had positive attitudes.^{71a}
- **India, 1,932 respondents:** A 2021 study in Satkosia Tiger Reserve had mixed messages. Over 90 per cent of respondents felt conserving the forest was important, just over 70 per cent supported wildlife conservation but only 35 per cent felt it was important to conserve tigers. The results suggested that at the household level attitudes toward tiger conservation were influenced positively by economic well-being, sense of forest ecosystem services and resource dependence, and negatively influenced by restrictions from the forest department and previous experience of loss due to wildlife. At the village level, literacy, resource dependence, access to clean cooking fuel and cooperation from the forest department predicted a positive attitude toward tiger conservation. Restriction from the forest department, fear for livestock and experience of losses due to wildlife had a negative influence on attitude.⁷²
- **India, 346 respondents:** A 2021 study in Rajasthan found clear gendered delineations in perceptions, with male participants predominantly focused on economic and ecological benefits, and female participants highlighting threats to personal safety and hidden costs (e.g., potential abuse, dowry concerns). Women overwhelmingly identified costs and risks from tiger presence including physical safety risks, and associated fears linked to their daily activities, which involve walking, collecting fodder and wood, grazing livestock and squatting to urinate and defecate (a vulnerable position not required as often for men). The women also noted that they are emotionally and socially linked to their livestock because their position in society (i.e., marriage) are dependent on these animals.⁷³

Attitudes are influenced by both social and ecological conditions.

A study in Sumatra, Indonesia, found that people's tolerance for tigers was related to underlying attitudes, emotions, norms and spiritual beliefs, but also to their likelihood of encountering tigers which was greater in known movement corridors (rivers, forests, etc.). Overall support for an increase in tiger populations was more prevalent in people who held beliefs concerning the importance of tigers for spiritual well-being (see above).⁷⁴ Experience with lion conservation in Africa also shows that building tolerance of predators is particularly important in corridors, where there are increased chances of interaction.⁷⁵ Combining social and ecological conditions increases the chances of reducing livestock predation and human attack by focusing effort onto the areas where the chances of interaction are highest.⁷⁶ Similarly, combining social and ecological data for threatened animal species when developing zonation priorities, as compared to use of ecological data alone, can achieve a similar degree of protection for target species, with fewer social tensions.⁷⁷

It is important to integrate local and Indigenous practices directly into management where possible.

Indigenous peoples and local communities have probably developed their own strategies to minimize risk against tiger predation of livestock or attacks on humans. While they are often looking for additional support, it is important to integrate Indigenous practices directly into management^{78,79} and, for instance, to focus efforts in areas considered most at risk. These practices are likely to be very context specific, are often characterized by low population density, minimal infrastructure, etc. Local people will also frequently have more detailed knowledge about the presence and location of species than protected area authorities and others, and this can be utilized in management.⁸⁰



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2.2 DEVELOPING PARTNERSHIPS WITH COMMUNITIES

Conservation successes over the last decade in parts of South Asia and East Asia have led to tiger populations dispersing into and re-establishing a presence in areas they have been absent from for extended periods – even decades. In such cases the local communities may find the new tiger presence more challenging or psychologically impactful than is the case for those communities with a long and unbroken association with these animals.⁸¹ As such, it is important that governments engage with such groups early and often – to hear their concerns, help reduce risks and discuss possible opportunities. Ideally, engagement should start well before a conservation area has been set up or a project begun, but as many protected areas in tiger landscapes have a long history, this is clearly not always possible. The good practices identified below can thus be drawn on at any stage of a management cycle.⁸²

The concept of equity, in terms of recognition, procedure and distribution, needs to be the starting place for developing partnerships for conservation.

The CBD enshrined the three elements of equity (recognition, procedure and distribution).⁸³ For all those involved in protected, and all other conservation areas, this means ensuring:

- **Recognition:** in terms of recognition and respect for the rights of rights-holders and recognition and respect for all relevant actors and their knowledge
- **Procedure:** in terms of full and effective participation of all relevant actors in decision-making, transparency, information sharing and accountability for actions/inactions; access to justice including effective dispute resolution processes and fair and effective law enforcement (or, more broadly, the rule of law)
- **Distribution:** in terms of effective mitigation of negative impacts on relevant actors and benefits equitably shared among relevant actors.⁸⁴

Indigenous people and community rights must be respected. The Universal Declaration of Human Rights (UDHR) was adopted by the United Nations General Assembly in 1948. This was the first Declaration in human history to set out basic civil, political, economic, social and cultural rights that all human beings should enjoy.⁸⁵ More recently, there has been increased understanding of the relationship between human rights and the environment. Of specific relevance here are the 16 framework principles related to human rights and the environment,⁸⁶ that should be the foundation of policies and implementation worldwide, including in the interpretation of human rights law in relation to the environment. Developed by the UN Human Rights Council appointed Special Rapporteur on human rights and the environment, the framework is aimed at states to implement, but nonetheless all those involved

in conservation should be aware of the principles and their intent. The principles of Free, Prior and Informed Consent (FPIC) (box 4), specific rights that pertain to Indigenous peoples, should be adhered to ensuring Indigenous peoples have the right to give or withhold consent to a project that may affect them or their territories.⁸⁷

Conservation managers need to understand the social landscape they are working in, who influences tiger conservation and how to ensure effective engagement and community partnerships.

Engagement efforts only work effectively if (i) they are built on trust⁸⁸ and (ii) they include all the relevant parts of a society (and not just the most powerful or vocal). The PARTNERS Principles have been developed over decades of working with communities around snow leopard conservation in Mongolia.⁸⁹ This work has led to the identification of eight broad principles for engaging local communities in wildlife conservation:

1. Relationship-building through the sustained and long-term **presence** of conservationists in the local community.
2. The **aptness** of specific community-based interventions with respect to addressing the main threats to biodiversity, the underlying science, the local culture, socio-economics, the available or potential social capital, and the value of multi-faceted programmes.
3. A relationship that views the community with dignity and **respect**, and interactions based on beneficence and non-maleficence.
4. High **transparency** in interactions with local communities with truthful and open communication regarding each other's interests, and visible equitability in programme benefits to community members.

Box 4: FPIC – Free, Prior and Informed Consent

FPIC is a specific right relating to Indigenous peoples and is recognized in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).⁹⁰ FPIC is also recognized in 16 principles related to human rights and the environment,⁹¹ based on existing implementation of the human rights system, including the so-called International Bill of Human Rights.⁹² It ensures that Indigenous peoples have the right to give or withhold consent to a project that may affect them or their territories. Once they have given their consent, they can withdraw it at any stage. Furthermore, FPIC enables Indigenous peoples to negotiate the conditions under which the project will be designed, implemented, monitored and evaluated. The legal standing of FPIC has enormously strengthened the negotiating power of Indigenous peoples throughout the world, although in some places and contexts it still is not effectively implemented.

5. Integrative **negotiations** with local communities and interventions based on formal agreements and conservation linkages.
6. The ability to view problems, constraints and opportunities from the community's perspective with a high level of **empathy**.
7. The ability to adaptively improve the programmes and address emerging problems and opportunities with a high level of **responsiveness** and creativity.
8. **Strategic support** to increase the resilience and reach of community-based conservation efforts through partnerships with governments in management planning and implementation, and policy and legal support.⁹³

Tiger dispersal modelling should guide the mapping of areas where such engagement is most important.

Ideally this engagement mapping exercise should be done before tigers re-establish themselves in a landscape. Given the recent momentum behind range expansion as an element of global tiger goal-making,⁹⁴ there will be a need for a corresponding emphasis on developing strong programmes and processes for early engagement and consultation with communities unaccustomed to tiger presence.

Local support is a critical element of tiger conservation.

This requires significant levels of social capital.⁹⁵ If relationships between conservation managers and Indigenous peoples and local communities are already tense or full of distrust, a period of trust-building will be needed before initiating meaningful cooperation.⁹⁶ This is likely to involve a combination of dialogue – particularly listening to, understanding and responding to grievances – and perhaps also changes in staff composition, their work schedules and priorities to allow more time for active community engagement and support.

Inequality is identified as a major factor undermining tolerance to coexistence with large cats and other predators.⁹⁷ While individual projects or protected areas cannot address deep-seated inequality in society, which exists throughout the world, they can ensure that everyone has a genuine voice which is heard in discussions and that access to benefits (see section 3) are available to anyone with a genuine claim. Inequality of representation can develop for many reasons: because one group is so powerful because of existing socio-economic and political disparities that other voices are nervous about speaking out; or due to inequalities in terms of gender, age, economic status, faith, class/caste, ability, language ability or simply the skill and confidence to put across a point of view. Long-term engagement and effort is needed to ensure a full range of voices is heard and that the marginalized are not excluded from the discussion.

Stakeholder engagement must be well planned and executed. Engagement can range from consultation on proposals developed by conservation staff/professionals to full co-design, where managers, staff and local people work together to develop, agree and initiate management actions.⁹⁸ It is usually impossible to talk with everyone; indeed, too large a consultation can be counterproductive, leading to generalized assessments that have limited value for driving action,⁹⁹ however good practices include:

- **Find out who should be involved:** Rights-holders with specific participation and consultation rights (or rights to consent in the case of Indigenous people in relation to FPIC) or a duty-bearer must be identified, and the potential impacts of any planned conservation intervention on them assessed.
- **Include people who can report back to specific interest groups:** Conservation managers need to identify people who can represent, and report back to, specific groups in society through careful analysis,¹⁰⁰ ensuring that all relevant sectors are included. Engaging with communities without fully understanding how they operate, interact both internally and with outside interests, and how they are changing over time is likely to lead to a poor result.
- **Use a range of communication options:** Every effort needs to be taken to reach out to communities to participate by thinking about the ways they commonly access information (e.g., meetings, local papers, local radio stations, social media options, web/phone alerts, etc.).
- **Avoid stakeholder fatigue:**¹⁰¹ People can get tired of talking, discouraged by lack of progress and resentful of time spent away from their daily work, so timing and process need to be carefully planned.
- **Make sure there is meaningful inclusion:** Stakeholders must be able to interact meaningfully; wherever possible ensuring that one group is not dominant, and that, for example, women, young people, people from different faith groups or social groupings do not feel inhibited from contributing. People with the best access to education, and confidence in public speaking, can easily dominate discussions, so stakeholder engagement processes need to be careful to avoid a skewed view, through good facilitation or by separating groups. Other potential barriers to participation, including language, logistical and time barriers and funds to facilitate participation also need to be considered.¹⁰²
- **Choose the best location to talk:** Meetings are best held on stakeholders' own ground, particularly in the case of marginalized groups, and taking the discussion to them – to places where they feel able to speak freely – can break down barriers in communication. Churches, mosques, temples, club houses, places of

work, bars or communal meeting areas, for example, are all places where people mix with their peers and often feel most comfortable meeting. These places may not be buildings; a spreading tree in the middle of the village where everyone sits, or a well, or favoured spot in the cool by a river may be just as useful, if it is somewhere where a particular group feels secure.

- **Choose the best time to talk:** Meetings need to be timed to ensure participation by all, especially women and other marginal groups who have either household/family responsibilities to tend to or obligations at specific times of the month (e.g., going to local markets, etc.).

It is important to understand stakeholder

motivations for engagement. Motivations vary greatly. They may be financial, such as access to grants, donor funds, compensation schemes or ecotourism opportunities, and these are examined in greater detail in section 3. Other non-financial motivation may also be present and often dominant. In the case of tigers these may be practical, such as the opportunity to reduce hazards, or cultural because people care about species such as the tiger or about ecosystem services. The process of working collaboratively toward a common goal may be a significant factor encouraging involvement in some cases.¹⁰³ A critical step is to identify stakeholders' willingness to engage, and points of contact where values are shared. Discussions between religious leaders and conservationists in the Eastern Himalayas found agreement on many conservation strategies, although the route to these decisions differed markedly between the faith and conservation groups.¹⁰⁴ Stakeholders are likely to have mixed feelings; not everything will be black and white. Research in the Sundarbans, West Bengal, India, found a high awareness of the importance of maintaining tigers as an attraction for tourists, while also recognizing that tigers were killing people in the area.¹⁰⁵

Ensure gender and inter-generational balance for effective engagement. In many societies, women and young people have less opportunity to make their opinions known due to social norms and inequalities and are likely to be ignored even if they speak out. But their perspectives are important and should influence conservation strategies. Research on gender attitudes (see above) in tiger landscapes in Nepal and India found women are more impacted by tigers than men, and less positive about tiger presence.^{106,107} While individual projects or protected areas cannot address deep-seated inequality in society, which exists throughout the world, they can take steps to listen and try to create spaces for the perspectives of more diverse voices to be heard. Women-only meetings may be needed in some circumstances, ideally held in places where women already meet and feel secure; similar steps may be needed to talk with younger members of the community, for example by consulting directly in schools and colleges.

Establishing successful partnerships will take time. Research shows that the most productive forms of collaboration often build on a long-term base of trust,¹⁰⁸ as

stressed above. This creates a tension between the urgency to act and the time needed to build the relationships to ensure that actions are successful. The short timeframes of many projects can add to this stress by not running long enough to allow long-term and sustainable partnerships to emerge.

Transparency, monitoring, feedback and efficient and effective procedures to report grievances can all support the sustenance of partnerships in the long term. Partnerships not only have to be created, but they also must be sustained through long years of effort, which will inevitably involve some setbacks. There is always the risk that social capital built gradually is lost in a few poorly managed incidents. Maintaining trust and enthusiasm in the long term is difficult, and is hard to encapsulate in a few strategies, but all these steps can help:

- **Delivering positive results:** This sounds obvious, but conservation needs to deliver whatever has been promised, and to keep delivering over time. So, if management measures are being introduced to control tigers or other animals, these need to be installed at the date suggested and regularly maintained; experience suggests this is often not the case in integrated conservation and development projects involving tigers for instance,¹⁰⁹ with broken promises, long-delayed payments and half-finished projects.
- **Reporting back:** Regular reporting of progress (or reasons for lack of progress) and results is important, both to reassure the people most directly affected that promises are being kept, and more subtly to maintain communication channels between different groups.
- **Maintaining transparency:** It is as important to report failure as it is to report about success.¹¹⁰ In fact, the former is probably more useful in terms of learning how to do better, but there is a strong tendency to keep quiet about things that go wrong.¹¹¹ Local stakeholders are far more likely to forgive occasional errors or failures if these are admitted immediately and a clear explanation (and if necessary apology) is forthcoming.
- **Managing interventions:** While reporting and communication is essential, it can also be intrusive if not carefully planned; too much consultation can be almost as problematic as too little and is also likely to result in a skewed view in that only a limited number of people will have the time to engage. There is no magic formula for optimizing the number and timing of communications and meetings, which must respond to need.
- **Developing and implementing good monitoring:** Stakeholders need to know what is happening; project managers can adapt management approaches if necessary and bring in other stakeholders to provide assurance that adequate steps are being taken to ensure peaceful coexistence.¹¹² So, monitoring does not just need to look at the physical changes in population and movement, but also, just as importantly, at how human

populations perceive these changes.¹¹³ Monitoring processes need to be standardized¹¹⁴ and protocols developed so that data quality remains consistent even if personnel change.¹¹⁵

- **Setting up a grievance procedure:** As well as reporting back, there needs to be a clear way in which people can tell project managers if they feel unhappy with something. This is a key aspect of trust building, and it is important that people feel safe to report (itself only possible if a level of trust has developed) and that the responsible person reacts. Minor grievances are important, not just major problems, and there should be transparent systems in place to monitor grievance procedures¹¹⁶ to ensure they are adequate and effective (box 5).

Box 5: Good practice principles for grievance mechanisms

Grievance mechanisms are a way for people or communities to express their concerns about a project, process, action or person. The ideal is for all community members and protected areas staff to be supportive of the conservation activities; if they're not, grievance mechanisms provide a structure for addressing a problem. Most organizations have mechanisms in place (e.g. WWF's Environmental and Social Safeguards Framework).¹²⁷

IUCN has outlined the key principles that should guide a grievance mechanism:

- **Accessible:** Mechanism is fully accessible to all parties that might be affected.
- **Practical:** Mechanism is cost-effective and practical in its implementation and doesn't create a burden for implementers.
- **Effective and timely response:** The provisions and steps for responding to complaints and seeking solutions are effective and timely.
- **Transparent:** Decisions are taken in a transparent way, and complainants are kept in touch with updates on progress made in responding to grievances.
- **Independent:** the oversight body and designated investigator are independent of the project, process, action or person the complaint has been made against.
- **Protection from retaliation:** Procedures are in place to protect the complainant and minimize the risk of retaliation.
- **Maintenance of records:** Diligent documentation of negotiations and agreements and good maintenance of records on all cases and issues brought forward for review.¹²⁸

Drawing on citizen science and traditional ecological knowledge contributes to management and can build support for conservation.

Participation works best if everyone feels engaged and contributing actively rather than as a passive spectator being asked an opinion (see box 6). Providing information, about population numbers, animal movements and the like, is a key contribution and where local communities are often better versed than outside specialists. The role of traditional ecological knowledge,¹¹⁷ and more generally of citizen science,¹¹⁸ is increasingly acknowledged in wildlife management,¹¹⁹ where it is often combined with information from Western-based science.¹²⁰ For example, local knowledge about the likely presence of jaguars in Mexico helped outside scientists to determine the most effective places to locate camera traps.¹²¹ Some basic steps are required:

- **Explaining what the information will be used for:** Before starting, it is important that everyone involved knows why they are taking part and what the information will be used for. At this stage, it may, depending on the questions asked, be important to manage expectations¹²² and explain that this is a data-gathering exercise and not a decision-making process. There should also be clear guidance on issues such as the use of human images captured during camera trapping.¹²³
- **Ensuring that the right questions are asked:** There are strengths and weaknesses of both citizen science and traditional ecological knowledge; local people may, for instance, be reluctant to give information about the location of species that are important to them for livelihood or economic reasons, while citizen scientists are considered best at monitoring ecological changes over large spaces and long time periods.¹²⁴ These approaches are therefore not a panacea, nor a replacement for more conventional science approaches, but need to be carefully designed into research and monitoring processes and protocols.
- **Reporting back:** Maintaining enthusiasm for data collecting is important; most monitoring exercises only have real value if they are kept up for a long time. Reporting is therefore important, both on the data collected, on what it means ecologically and how management will respond. The best citizen science exercises involve building a community of data collectors who feel involved in management; such people are also more likely to sympathize with the species being monitored¹²⁵ and they gain a stake.
- **Giving clear acknowledgement:** Intellectual property rights should be acknowledged and respected throughout any process of data gathering. It is important that everyone involved is acknowledged if the data are used publically, for instance in a published paper or a report.¹²⁶ Listing all data collectors in the acknowledgements (or including them as co-authors if there are only a small number) is a very important step that frequently gets forgotten.



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CASE STUDY 3: BUFFER ZONES: AN INTEGRATED CONSERVATION AND DEVELOPMENT STRATEGY IN NEPAL

Introduction

The buffer zone concept has been adopted as a national strategy in Nepal to ensure a balance between long-term conservation objectives and the immediate needs of local residents.¹²⁹ Buffer zone community forests are thus central to protected area management in Nepal, providing a decentralized and community-based forest management system in areas adjacent to national parks.¹³⁰

The provision for buffer zones was included in the fourth amendment of the National Park and Wildlife Conservation Act, 1973, to authorize park authorities to declare buffer zones on the peripheries of existing protected areas. Subsequently, Buffer Zone Management Regulations (1996)¹³¹ and Buffer Zone Management Guidelines (1999)¹³² were approved for the design of programmes compatible with national park management and to facilitate public participation in the conservation, design and management of buffer zones.¹³³

Buffer zones have three major objectives:

1. Improve the management of the natural resources
2. Improve ecological conditions and extend habitat for wildlife
3. Provide a benefits-sharing mechanism to fund implementation of conservation and community development programmes.¹³⁴

Buffer zones aim to have a range of outcomes including to:

1. Provide local community forest resource requirements (e.g., firewood and fodder) and reduce dependency on the protected area resources
2. Generate income from tourism
3. Improve forest management for the wildlife inside and outside of protected areas
4. Motivate local communities to take an active part in biodiversity conservation and forest management
5. Provide capacity building including financial management and conservation education and awareness
6. Mainstream gender and special target group in conservation management
7. Contribute to resolving park-people conflicts over resource use and improve park-people relations.¹³⁵

A benefits-sharing mechanism ensures 30-50 per cent of a protected area's revenues are retained for conservation and community development activities in the buffer zone which are also supported by grants and subsidies from conservation organizations and government agencies.¹³⁶ Funds are allocated for different objectives across conservation (30 per cent), community development (30 per cent), income generation and skills development (20 per cent), conservation education (10 per cent) and administration (10 per cent).¹³⁷

Governance

The legislation requires forests in the buffer zone to be handed over by the protected area administration to a buffer zone management committee. Forests can be sustainably managed as a community forest, religious forest or private forest.

If a local group is interested in managing an area within the prescribed zone they apply to the protected area manager/warden to take over management. Applications need to be accompanied by a five-year work plan which is developed with the technical assistance of the park manager/warden who also approves the extent and quantity of forest resources to be used. The rights to use and manage forests in the buffer zones are based on this work plan. Upon approval, the manager/warden issues a certificate of registration of the buffer zone community forest.¹³⁸

Buffer zone community forest management is decentralized given the number of communities often involved (e.g., in Chitwan National Park there are 1,770 user groups and 22 user committees) with a three-tiered management approach:

1. A **user group** is formed at village level, members can access forest products as outlined in the approved work plan by paying a nominal fee. User groups are registered as a sub-committee of the user committees and thus do not have separate, clear legal status.
2. Representatives from each user group form a larger neighbourhood **users committee**, responsible for designing and implementing buffer zone programmes, liaison between the community and the park authority and for dealing with HWC compensation payments.
3. Chairpersons of the user committees form a buffer zone **management committee** for each protected area.¹³⁹

A tripartite agreement between the management committee, user groups and manager/warden is made to ensure implementation of the work plan and adherence to buffer zone legislation. Thus, although the day-to-day decision-making concerning forest use and conservation is carried out at community level, forest management and governance in the buffer zone falls within the authority

of the protected area manager/warden who has a considerable influence over the plans and functioning of user groups. The warden can dissolve user groups and committees if they act against the approved work plan or fail to accomplish their duties.

There are, at present, no collective regional or national networks of buffer zone community forests who could work together to negotiate rights, rules and regulations with the central protected area authority.¹⁴⁰

Rights and responsibilities

As buffer zone community forests are managed for sustainable use, there tends to be constraints in terms of tree-felling permits (e.g., in Sagarmatha National Park protected area staff rather than user groups handle permits), no commercial forest uses are allowed and the supply or sale of the forest products (e.g., timber and firewood) from these forests to areas outside the buffer zone is prohibited. User committees can, however, distribute excess forest products to neighbouring and/or other user committees within the buffer zone. Other forest products (e.g., medicinal plants, and Khair – *Acacia catechu*) can be sold outside the buffer with permission from the protected area authorities.

There are no clear rules to guide user group management of financial resources. However, in practice, groups usually operate bank accounts which are audited by the protected areas administration. Funds can be quite considerable. The annual budget of all buffer zone user committees in Chitwan National Park, for example, has been over US\$1.2 million in recent years (although this does not take into account the impacts of the COVID-19 pandemic),

averaging US\$558,000 per annum per user committee, with revenue shared by the national park contributing more than half of this budget allocation.¹⁴¹

Conclusion

The handing over of forests to local communities began legally in the late 1990s and increased rapidly. By 2016, there were 516 buffer zone community forests across the country.¹⁴²

The conservation success of the buffer zone programme in Nepal is clearly linked with the importance of agreed access to natural capital to local communities and resulting enhanced livelihood assets. However, this success is leading to increased reports of human-wildlife conflict as forests return to being suitable habitat for wildlife. Other challenges include pressures from increasing human population, especially in lowland areas of Nepal, and subsequent increasing local demand for timber and fuelwood. Buffer zones are also highly influenced by international tourism trends, with high demand leading to resource use pressures and low demand leading to considerable reductions in jobs, revenue, etc. The legal and institutional provisions are not considered strong enough for local institutions to function as autonomous and long-term community management bodies. In addition, the representation of marginalized groups, namely those that often suffer from social exclusion such as women, the poor, landless, so-called lower caste groups and Indigenous peoples, are often poor within buffer zone community forest governance structures.



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Box 6: Working with citizen scientists to monitor tiger movements in an important ecological corridor

WWF-Nepal has had a long-term project to restore forests in the Terai Arc Landscape. Local Community Forest Coordination Committees, or CFCCs, have been coordinating the efforts and have recruited young community members to take part in citizen science projects and join the local Community-based Antipoaching Poaching Unit, to monitor illegal activities in nearby forests.

A small group of “citizen scientists” are working directly with biologists from WWF-Nepal to help protect the tigers and other wildlife in and around Bardia National Park. They are monitoring tigers in the Khata Corridor which links Nepal’s Bardia National Park with India’s Katarniaghat Wildlife Sanctuary in the south. Each citizen scientist is assigned two to three sites in their local areas where animals are known to frequent, they then help set up and maintain camera traps. These volunteer scientists visit their allotted sites every other day to examine the status of the camera traps, change their batteries, swap out memory cards, check for animal movements, and download any pictures captured to send to the biologists. If a camera trap is to be placed in a new site, the citizen scientist will also conduct a thorough assessment of the surrounding vegetation, walking roughly 0.5km in all directions to record the types of plants and trees found in the area, their relative densities and stages of growth, and other details. As one young citizen scientist, Chain Kumar, notes *“My favourite part of the job is when I get to see the image of a tiger on a camera trap, especially in locations where we worked so hard to put them [the traps] up.”*

Over the past two years, the teams have managed to identify – through the network of camera traps they’ve set up throughout Khata’s community forests – more than 30 individual tigers using the corridor.¹⁴³

2.3 EXPANDING AREA-BASED CONSERVATION MODELS AND APPROACHES

A coalition of NGOs with long experience in tiger conservation have suggested that the new GTRP should set targets to expand and improve the quality of occupied habitat for tigers over 2022 levels and increase suitable habitat for tigers within each tiger range country above 2022 levels.¹⁴⁴ Carnivores need space, therefore working beyond the boundaries of protected areas will be an important part of this ambition and will require a range of outcomes including: land outside of protected areas to become safe havens for tigers; corridors for tigers to travel through; and restoration of habitat to ensure suitable habitat for species and prey. Area-based conservation is changing to better accommodate these broader approaches, away from a narrow focus on strictly protected areas to a plethora of models, many of which include landscapes where people live and work, and where conservation takes place alongside other activities. As the area of conserved land increases, such approaches will inevitably become more common.

A new type of area-based conservation has emerged – other effective area-based conservation measures or OECMs. In the last decade, changes in conservation have been accelerated by the emergence of a completely new designation of area-based conservation, “other effective area-based conservation measures” or OECMs¹⁴⁵ (sometimes also referred to as “conserved areas”), which are further altering the way in which conservation planners are looking at the future (see Appendix 1).

OECMs extend the range of what is possible within conservation planning. In 2010, Aichi Biodiversity Target 11¹⁴⁶ from the CBD invented a new phrase and started long debate about its implications: “By 2020, at least 17 per cent of terrestrial and inland water areas and 10 per cent of coastal and marine areas ... are conserved through ... systems of protected areas *and other effective area-based conservation measures...*” (our emphasis). IUCN was tasked with the job of providing technical advice on OECMs to Parties to the CBD. CBD signatories finally agreed a definition¹⁴⁷ in November 2018 at the 14th Conference of Parties in Egypt: *A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values.* IUCN has published technical guidelines on managing OECMs,¹⁴⁸ and implications are being explored, for instance for community conservation.¹⁴⁹

The idea that at least 30 per cent of the world should be within “protected and conserved areas” is gaining momentum.¹⁵⁰ This is an extraordinary change in public and government attitude and would have seemed impossible even a decade ago. It is driven by concern about the extinction

crisis, climate change, land degradation and loss of ecosystem services. This call for “30x30” is promoted by conservation NGOs,¹⁵¹ the High Ambition Coalition for Nature and People (HAC),¹⁵² the Nature Needs Half initiative¹⁵³ and others. It has recently been supported by around 90 governments in the Leaders’ Pledge for Nature.¹⁵⁴ WWF strongly supports 30x30, with appropriate equity caveats.¹⁵⁵ To date just three of ten tiger range countries (Bhutan, India and Nepal)¹⁵⁶ are signed up as HAC Member Countries and three (Bangladesh, Bhutan and Nepal) have endorsed the Leaders’ Pledge for Nature.¹⁵⁷ The moves are not universally welcome and there is some opposition to the global target, including from several human rights groups¹⁵⁸ Concern is rooted in fears that an expansion in area-based conservation will mean that more people are dispossessed of their land, through forcible removals and land grabbing, and there are also concerns about costs.¹⁵⁹

The new Global Biodiversity Framework is likely to address 30x30 and to include both protected areas and OECMs. The new draft targets from the CBD includes 30x30 as a key element in its goal of reducing threats to biodiversity: *Target 3. Ensure that at least 30 per cent globally of land areas and of sea areas, especially areas of particular importance for biodiversity and its contributions to people, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of **protected areas and other effective area-based conservation measures** and integrated into the wider landscapes and seascapes* (our emphasis).¹⁶⁰

Tiger range countries are particularly important in the context of 30x30 as they contain many areas of high biodiversity and provide vital ecosystem services outside of formal protected areas. Areas that contain tigers are, in most of the range, also places that generally contain high biodiversity.¹⁶¹ Other tiger landscapes with relatively less diversity than the tropical moist forests, such as parts of Bhutan and the Russian Federation, have unusually high ecosystem integrity. Furthermore, research shows that tiger habitats include areas with high levels of ecosystem service,¹⁶² so tiger conservation delivers far wider benefits than just the protection of an iconic species.¹⁶³ Tiger range countries are therefore likely to be particularly important in terms of achieving some of the wider aims of the draft target 3: “...*areas of particular importance for biodiversity and its contributions to people*”.

OECMs will necessarily be part of the conservation approach in tiger range countries. Although some countries containing tigers still retain large areas of near-pristine habitats and can rely primarily on protected areas, as is the case in Bhutan,¹⁶⁴ others are far more crowded, land is under pressure and a major increase in permanent set-asides is unlikely. Between now and 2030, only a fraction of the remaining tiger habitat outside formally protected areas is therefore expected to be incorporated into expanded or new reserves.¹⁶⁵ India accounts for just 2.4 per cent of the world surface area, yet supports 17.7 per cent of the world population,¹⁶⁶ along with more than 85 per

cent of the world’s greater one-horned rhinos (*Rhinoceros unicornis*) and more than 70 per cent of the world’s wild tigers.¹⁶⁷ Conservation planners are recognizing that they need to look beyond conventional protected areas to fulfil biodiversity conservation targets; for example, tea plantations have proved to be effective habitats for leopards and elephants.¹⁶⁸ Encouraging tigers in settled landscapes creates security problems, but lightly managed forestry operations, marginal or degraded habitats often found within palm oil concessions,¹⁶⁹ watershed protection areas and security areas along national borders may all offer sanctuary for tigers without disrupting human society. Studies suggest that enough habitat remains to achieve a near-tripling of the wild tiger population (from surveys conducted over 2018 into 2019) through OECM recognition and management.¹⁷⁰

Tiger range countries already contain significant land areas outside the protected area estate that could be identified and reported as OECMs. While there are likely to be increases in protected area coverage in some tiger range countries, others will be challenged to grow their protected area estate significantly, due to a combination of population and political pressures. India is a case in point. The Wildlife Institute of India reports a total protected area estate of a little over 5 per cent of the country, but that 20 per cent of the country is still covered with forest.¹⁷¹ While some of the forest will be intensively managed forest or plantation and offer poor habitat for wildlife, extensive native forest areas still exist. Prey availability and habitat quality, in addition to protected-area designation, has been found to influence tiger occupancy in India, with some forest areas having higher densities than comparable protected areas.¹⁷² Many of these are important for tigers and several Indian forest reserves, outside the formal protected area estate, are already accredited as effective tiger conservation areas by the Conservation Assured | Tiger Standards programme (see box 24).¹⁷³ Research in the Russian Far East found that existing strictly protected areas were far too limited to maintain healthy tiger populations and that a whole landscape approach was required.¹⁷⁴ Surveys in Peninsula Malaysia found tigers living in secondary forests and in forest reserves,¹⁷⁵ and in selectively logged forest reserves, including Gunung Basor Forest Reserve where densities were estimated at greater than two tigers per 100km²,^{176,177} albeit tiger densities were higher in protected areas.¹⁷⁸ Similar situations exist for other countries within the range. Effective long-term tiger conservation relies on working beyond the border of traditional protected areas and a proportion – possibly a large proportion – of these wider landscapes may meet the CBD criteria for OECMs (see Appendix 1) and conservation corridors.

CASE STUDY 4: RECOGNIZING RIGHTS AND DEVOLVING CONSERVATION TO TRIBAL PEOPLE

Introduction: Community Forest Resource Areas

There are 705 ethnic groups officially recognized as “Scheduled Tribes” or Adivasis, which literally means Indigenous peoples in India.¹⁷⁹ Many of these tribal people make their home in forested areas. However, colonial and post-colonial forest policy focused on the enclosure of forests and restricting access to, and resource use by, forest-dependent people.¹⁸⁰ India has several laws and constitutional provisions, such as the Fifth Schedule which covers much of India and the Sixth Schedule for certain areas of the northeast, that recognize the rights of tribal people to land and self-government.¹⁸¹ The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, or simply the Forest Rights Act (FRA), passed in 2006 and implemented from 2007 led to formal recognition of rights of tribal and other forest-dependent communities over forest land in India.

The FRA provides for the recognition of forest rights across India, including both individual rights for cultivation and habitation in forest areas and collective rights to control, manage and use forests. The FRA also recognized for the first time that: ... *“the forest rights on ancestral lands and their habitat were not adequately recognised in the consolidation of State forests during the colonial period as well as in independent India resulting in historical injustice to the forest dwelling Scheduled Tribes and other traditional forest dwellers who are integral to the very survival and sustainability of the forest ecosystem”*.¹⁸²

The rights which can be gained under the FRA fall into two main categories:

1. Private and/or communal land ownership rights, including restitution for past illegal eviction or displacement.
2. Community resource use rights, including collective management of common (or community) forest resources; rights over common property resources such as water; grazing rights (both for settled and nomadic communities); rights over “habitat” for so-called “Primitive Tribal Groups”; other customary rights and usufruct; and rights over non-timber forest produce.¹⁸³

Legislation is only judged effective when fully implemented, and in the case of the FRA recognizing the rights made possible by the Act involves a major devolution of power and resources from the state Forest Departments to local people and organizations. The implementation mechanism envisaged in the FRA involves a multi-level process to manage this devolution of power from recommendations from the Gram Sabhas (the village-governing institute) to four different committees (moving from local and state-wide powers) who develop, review and eventually approve the claims for recognized rights.¹⁸⁴

Vazhachal Community Forest Resource Area

WWF-India began engaging with tribal communities regarding sustainable use of the resource in the Vazhachal area, in Kerala state on the southwest coast of India, in 2007. In 2010, the communities requested help with facilitating the claiming of rights under FRA, and help to support mapping of the resource use area, collection of evidence on use of forests and resources, completing claim forms, etc. In 2014, nine tribal settlements received titles for Community Rights and a joint Community Forest Resource area title under the FRA. These are the first such rights recognized in Kerala State. The Community Forest Resource (CFR) area covers all nine settlements and all community members have equal rights over the area’s forest resources. Together these settlements have formed a body known as a Sangham which is the coordination mechanism of Gram Sabhas and settlement level CFR Management Committees (CFRMC). The decisions on CFR activities are taken by the Gram Sabhas and implemented through CFRMC at the village level.

The Vazhachal CFR Coordination Sangham (VCFRCS) was formed in 2014. All adult members from the tribal settlements are members of the VCFRCS and each Gram Sabha selects three members to sit on the Sangham’s coordination committee. The main purpose of the Sangham is to manage the area for conservation and sustainable use. Since assisting with the claims process, WWF-India has facilitated the communities in the development of community-led sustainable forest management plan.

The 400km² Vazhachal CFR Area falls under the Vazhachal Forest Division, Parambikulam Tiger Reserve and Malayattur Forest Division. The Forest Department has been managing the area according to their working plans and the Tiger Conservation Plan. According to Rule 4(1)(f) of the FRA, after the approval by the Gram Sabhas, the Community Forest Resource Conservation and Management Plan (CFRCMP) will be incorporated into the Forest Departments plans. In addition, according to FRA Rule 16, the Forest and all other Departments need to support the rights-holders to manage their rights and fulfil their duties.¹⁸⁵

Despite gaining rights to the forest, the VCFRCS's main activities over the last few years have been fighting a proposed hydro-electric project which would have submerged 104ha of forest and displaced Kadar communities from their traditional lands. Finally withdrawn in 2021,¹⁸⁶ the VCFRCS and their partners used different sections of the FRA to support their opposition to the proposal, demonstrating the effectiveness of local communities in protecting and managing their forests and resources, if supported by laws that are effectively implemented.

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Tiju C. Thomas of WWF-India contributed to this case study

New approaches to conservation will need to be community led. Initiatives such as the Community Forest Resource model in India (case study 4) and Community Conserved Protected Areas built into the new protected area law in Myanmar¹⁸⁷ could be implemented in other areas of the tiger range, although such legislative changes do take considerable time to achieve. Models from outside the tiger range should also be considered. One such example comes from Mongolia, where local herding families self-organize into conservation communities, with each community clearly mapping out Community Responsible Areas where they are responsible for conservation and protection. Community members then elect community rangers to patrol their area to prevent illegal activities such as poaching and mining.¹⁸⁸

Restoration and expansion of the tiger range, and associated habitat will be needed to meet GTRP and global biodiversity commitments. New types of conservation area will need to go hand in hand with restoration. Although research has shown that forest loss is not a major issue across many tiger habitats,¹⁸⁹ ecological restoration focusing on forest quality and associated species assemblages will be needed to expand the range. For example, significant progress toward the return of tigers, including extensive restoration of habitat and prey species, has been made in Kazakhstan, which presents opportunities for exchange of ideas and experience.¹⁹⁰ Restoration can also contribute toward countries achieving international conservation targets during this UN Decade on Ecosystem Restoration and new targets from the CBD and target 15 of the SDGs. Restoration in tiger habitat should focus on protecting remaining fragments of natural habitat and by reconnecting and buffering them through the restoration of degraded lands, thus aligning with the Bonn Challenge that seeks to restore 350 million ha of forest by 2030.¹⁹¹

2.4 OPPORTUNITIES FOR NEW PARTNERSHIPS TO EXPAND CONSERVATION APPROACHES

The implications of the designation of OECMs worldwide are still being worked out. There are concerns from Indigenous peoples and local communities that, like protected areas, they could become a way of expropriating lands and waters.¹⁹² Some critics argue that there is a risk they could become an easy option for governments, because they demand less of people living in the area, and they could end up as a form of greenwashing that offers little to biodiversity conservation.¹⁹³ More positively, OECMs could bring new or existing areas that are important for biodiversity conservation into overall conservation planning along with new partners for conservation, increase equity in conservation and provide an important new tool for governments and others to adopt.¹⁹⁴ They also change the debate about big new conservation targets. When the “half Earth” concept was first floated it proposed 50 per cent of the planet in IUCN I-VI protected areas; now the debate is more about 50 per cent under natural ecosystems, using a mixture of protected areas, OECMs and maybe other designations as well,¹⁹⁵ with the connectivity of conservation areas being a relevant factor here. So as well as developing more inclusive and transparent protected areas, conservation authorities and practitioners need to consider working with a far wider range of stakeholders to implement these approaches across the wide-reaching landscapes needed by tigers, and many other species. Development of interest in landscape approaches to conservation¹⁹⁶ thus need to focus on methodologies for building consensus about how a landscape mosaic might be managed.¹⁹⁷

Conservation outside protected areas increases the need to engage with a wide group of stakeholders. Many of these may be indifferent or antagonistic toward the idea of encouraging large predators onto their lands. Important collaborators are likely to include, depending on the situation in the area, government departments, NGOs, agricultural collectives, individual farmers and ranchers, the forestry sector, mining operations, fossil fuel companies, plantation owners and those involved in transport infrastructure. Tourism operators represent an important and rather different stakeholder group, which will likely be sympathetic to conservation aims if they encourage visitation.

Indigenous and community conserved areas (ICCAs) are likely to be “potential OECMs” but should only be identified and reported based on FPIC.

Territories and areas managed by Indigenous peoples and/or local communities (e.g., ICCAs) to maintain natural or near-natural ecosystems, with low levels of use of natural resources practised on a sustainable basis and in a way that does not degrade the area's biodiversity, are a class of potential OECMs (see Appendix 1).¹⁹⁸ There is potential for

such OECMs to overcome current challenges such as insecure rights, insufficient funding and exclusion of communities from decision-making, providing safeguarding processes such as FPIC are carefully followed. Despite being such a recent development, legislation is already being changed to implement OECMs. Indonesia, for example, has large areas of forest, wetland, lakes and coastal areas that are governed by Indigenous peoples and local communities. By 2020, more than 100,000km² had been documented and registered in Indonesia by their custodians, according to the Agency for the Registration of Indigenous Territories (known as BRWA in Indonesia).¹⁹⁹ The country has also started to revise its conservation laws to accommodate coastal OECMs, which could provide opportunities for Indigenous and local communities to gain legal recognition of their rights to use and manage fisheries, hopefully an initiative that will expand to other habitats. Forests across the tiger range probably offer important places to identify OECMs which emphasize human-tiger coexistence, according to the respective governance authority's free, prior and informed consent. For example, almost 25 per cent of Nepal's forests are governed by local communities.²⁰⁰

Effective ecological connectivity between protected areas and OECMs, and other intact natural habitat, is needed to ensure tigers can move across the landscape. The concept of connectivity is a well-established concept within tiger conservation, in policy and law,²⁰¹ and in India a Coalition for Wildlife Corridors²⁰² has been set-up by conservation partners promoting a mutually agreed charter. It is worth noting that the research and monitoring of connectivity still needs improvement. A recent review of published literature found the majority of studies do not use animal movement data and that they often fall short of capturing functional connectivity (two issues that are

no doubt linked).²⁰³ Guidelines on developing ecological corridors exist globally,²⁰⁴ and many countries within the range have studied options for corridors.²⁰⁵ Although the term corridor is widely used, the concept of connectivity is, however, perhaps a better place to start planning for the actual movement of individuals through a matrix of habitat patches in agricultural and forested landscapes (see figure 3), particularly as these areas are rarely a simple straight path between two protected or conserved areas and rely on myriad pathways for species to disperse across.²⁰⁶

Dynamic connectivity takes into consideration the changes occurring in a landscape over time.

Landscape connectivity should recognize changing landscapes, social conditions and ecological processes (particularly given the projected and predicted changes discussed in section 1).²⁰⁷ Unfortunately to date, research seems to be failing to investigate the combined impacts of climate and land-use change when designing connectivity conservation approaches.²⁰⁸

Connectivity should be designed with coexistence in mind. Research methodologies and conceptual plans for connectivity are common, particularly for tiger movements. However, a recent review of connectivity science in South Asia found none of the published studies identified mechanisms for implementation of their recommendations.²⁰⁹ Many of the strategies outlined in section 2 of this report on coexistence are clearly vital elements of connectivity design, as are strategies linked to restoration and sustainability achieved through nature-based solutions. In particular strategies for connectivity will require engagement with diverse actors that are present in, or influence decision-making in, landscape conservation.



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REFERENCES AND NOTES

- 1 Brosius, J.P. 2004. Indigenous Peoples and Protected Areas at the World Parks Congress. *Conservation Biology* 18: 609-612. DOI: 10.1111/j.1523-1739.2004.01834.x
- 2 Borrini-Feyerabend, G., Kothari, A. and Oviedo, G. 2004. *Indigenous and Local Communities and Protected Areas: Towards equity and enhanced conservation*. Best Practice Guidelines number 11. IUCN World Commission on Protected Areas, Gland, Switzerland. Retrieved from: <https://portals.iucn.org/library/sites/library/files/documents/PAG-011.pdf>
- 3 Borrini-Feyerabend, G., Dudley, N., Lassen, B., Pathak, N. and Sandwith, T. 2012. *Governance of Protected Areas: From Understanding to Action*. IUCN, CBD and GIZ, Gland, Switzerland. Retrieved from: <https://portals.iucn.org/library/sites/library/files/documents/PAG-020.pdf>
- 4 Dudley, N., Stolton, S., Pasha, M., Baltzer, M., Yap, W., Sharma, M. et al. 2020. How effective are tiger conservation areas at managing their sites against the Conservation Assured | Tiger Standards (CA|TS)? *PARKS* 26. DOI: 10.2305/IUCN.CH.2020.PARKS-26-2ND.en
- 5 Stern, M.J. 2008. Coercion, voluntary compliance and protest: the role of trust and legitimacy in combating local opposition to protected areas. *Environmental Conservation* 35: 200-210. DOI: 10.1017/S037689290800502X
- 6 Sodhi, N.S., Butler, R. and Raven, P.H. 2011. Bottom-up Conservation. *Biotropica* 43: 521-523. DOI: 10.1111/j.1744-7429.2011.00793.x
- 7 Cullen, D., McGee, G.J.A., Gunton, T.I. and Day, J.C. 2010. Collaborative Planning in Complex Stakeholder Environments: An Evaluation of a Two-Tiered Collaborative Planning Model. *Society & Natural Resources* 23: 332-350. DOI: 10.1080/08941920903002552
- 8 Ntuli, H., Jagers, S.C., Linell, A., Sjöstedt, M. and Muchapondwa, E. 2019. Factors influencing local communities' perceptions towards conservation of transboundary wildlife resources: the case of the Great Limpopo Trans-frontier Conservation Area. *Biodiversity and Conservation* 28: 2977-3003. DOI: 10.1007/s10531-019-01809-5
- 9 Rastogi, A., Hickey, G.M., Badola, R. and Hussain, S.A. 2012. Saving the superstar: A review of the social factors affecting tiger conservation in India. *Journal of Environmental Management* 113: 328-340. DOI: 10.1016/j.jenvman.2012.10.003
- 10 Maginnis, S., Jackson, W. and Dudley, N. 2004. Conservation landscapes. Whose landscapes? Whose trade-offs? In: T.O. McShane and M.P. Wells (eds) *Getting Biodiversity Projects to Work*. Columbia University Press, New York: 321-339.
- 11 Gulati, S., Karanth, K.K., Le, N.A. and Noack, F. 2021. Human casualties are the dominant cost of human-wildlife conflict in India. *Proceedings of the National Academy of Sciences of the United States of America* 118: e1921338118. DOI: 10.1073/pnas.1921338118.
- 12 See for example: Wang, S.W. and Macdonald, D.W. 2006. Livestock predation by carnivores in Jigme Singye Wangchuck National Park, Bhutan. *Biological Conservation* 129: 558-565. DOI: 10.1016/j.biocon.2005.11.024; Miller, J.R.B., Jhala, Y.V., Jena, J. and Schmitz, O.J. 2015. Landscape-scale accessibility of livestock to tigers: implications of spatial grain for modeling predation risk to mitigate human-carnivore conflict. *Ecology and Evolution* 5: 1354-1367. DOI: 10.1002/ece3.1440; Miller, J.R.B., Jhala, Y.V. and Jena, J. 2016. Livestock losses and hotspots of attack from tigers and leopards in Kanha Tiger Reserve, Central India. *Regional Environmental Change* 16: 17-29. DOI: 10.1007/s10113-015-0871-5
- 13 Torres, D.F., Oliveira, E.S. and Alves, R.R.N. 2018. Conflicts between Humans and Terrestrial Vertebrates: A Global Review. *Tropical Conservation Science* 11: 1-15. DOI: 10.1177/1940082918794084.
- 14 Marchini, S. and Crawshaw, P.G. 2015. Human-Wildlife Conflicts in Brazil: A Fast-Growing Issue. *Human Dimensions of Wildlife* 20: 323-328. DOI: 10.1080/10871209.2015.1004145.
- 15 Pooley, S. 2021. Coexistence for Whom? *Frontiers in Conservation Science* 2: 726991. DOI: 10.3389/fcosc.2021.726991
- 16 Hill, C.M. 2021. Conflict Is Integral to Human-Wildlife Coexistence. *Frontiers in Conservation Science* 2: 734314. DOI: 10.3389/fcosc.2021.734314.
- 17 Bhatia, S., Redpath, S.M., Suryawanshi, K. and Mishra, C. 2019. Beyond conflict: exploring the spectrum of human-wildlife interactions and their underlying mechanisms. *Oryx* 54: 621-628. DOI: 10.1017/S003060531800159X.
- 18 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. Retrieved from: https://wwfint.awsassets.panda.org/downloads/a_future_for_all_the_need_for_human_wildlife_coexistence.pdf
- 19 Jackson, P. 1999. The tiger in human consciousness and its significance in crafting solutions for tiger conservation. In: J. Seidensticker, S. Christie and P. Jackson (eds) *Riding the Tiger: Tiger conservation in human-dominated landscapes*, pp 50-54. Cambridge University Press, Cambridge, UK.
- 20 Li, J., Wang, D., Yin, H., Zhaxi, D., Jiagong, Z., Schaller, G.B. et al. 2014. Role of Tibetan Buddhist Monasteries in Snow Leopard Conservation. *Conservation Biology* 28: 87-94. DOI: 10.1111/cobi.12135
- 21 DoFPS. 2015. *Counting the Tigers in Bhutan: Report on the National Tiger Survey of Bhutan 2014-2015*. Department of Forests and

- Park Services, Ministry of Agriculture and Forests, Thimphu, Bhutan. DOI: 10.13140/RG.2.2.19373-33764
- 22 Ministry of Agriculture and Forests. 2016. *Bhutan State of Parks 2016*. Department of Forest and Park Services, Ministry of Agriculture and Forests, Royal Government of Bhutan, Thimphu, Bhutan.
- 23 Lopes, A.A. and Atallah, S.S. 2020. Worshipping the Tiger: Modeling Non-use Existence Values of Wildlife Spiritual Services. *Environmental & Resource Economics* 76: 69-90. DOI: 10.1007/s10640-020-00416-1.
- 24 Inskip, C., Carter, N., Riley, S., Roberts, T. and MacMillan, D. 2016. Toward Human-Carnivore Coexistence: Understanding Tolerance for Tigers in Bangladesh. *PLOS ONE* 11: e0145913. DOI: 10.1371/journal.pone.0145913.
- 25 McKay, J.E., St. John, F.A.V., Harihar, A., Martyr, D., Leader-Williams, N., Milliyanawati, B. et al. 2018. Tolerating tigers: Gaining local and spiritual perspectives on human-tiger interactions in Sumatra through rural community interviews. *PLOS ONE* 13: e0201447. DOI: 10.1371/journal.pone.0201447.
- 26 Qin, Y. and Nyhus, P.J. 2018. Assessing factors influencing a possible South China tiger reintroduction: a survey of international conservation professionals. *Environmental Conservation* 45: 58-66. DOI: 10.1017/S0376892917000182
- 27 Ishibashi, H., Inoue, M. and Tanaka, M. 2015. Historical change in the traditional use of forests and its association with belief in tiger spirits in the Cardamom Mountains, Cambodia: The impact of war and wildlife trade on the relationship between humans and tigers. *Tropics* 24: 119-138. DOI: 10.3759/tropics.24.119
- 28 Seeley, J. and Skabelund, A. 2015. Tigers—Real and Imagined—in Korea’s Physical and Cultural Landscape. *Environmental History* 20: 475-503. DOI: 10.1093/envhis/emv079
- 29 Karanth, K.K., DeFries, R., Srivathsa, A. and Sankaraman, V. 2012. Wildlife tourists in India’s emerging economy: potential for a conservation constituency? *Oryx* 46: 382-390. DOI: 10.1017/S003060531100086X
- 30 Bhatia, S., Redpath, S.M., Suryawanshi, K. and Mishra, C. 2017. The Relationship between Religion and Attitudes toward Large Carnivores in Northern India? *Human Dimensions of Wildlife* 22: 30-42. DOI: 10.1080/10871209.2016.1220034
- 31 Carter, N.H., Riley, S.J., Shortridge, A., Shrestha, B.K. and Liu, J. 2014. Spatial Assessment of Attitudes toward Tigers in Nepal. *AMBIO* 43: 125-137. DOI: 10.1007/s13280-013-0421-7
- 32 Campbell, S. and Gurney, L. 2020. Mapping and navigating ontologies in water governance: the case of the Ganges. *Water International* 45: 847-864. DOI: 10.1080/02508060.2020.1812268
- 33 Aiyadurai, A. 2020. The Implications of Legal Personhood to Nonhumans: Insights from India’s Tiger Conservation. *ISLE: Interdisciplinary Studies in Literature and Environment* 27: 633-647. DOI: 10.1093/isle/isa061
- 34 Clarke, P.A.B. and Linzey, A. (eds) 1990. *Political Theory and Animal Rights*. Pluto Press, London.
- 35 Stone, C.D. 2010. *Should Trees Have Standing? Law, morality and the environment*. Oxford University Press, Oxford.
- 36 Hails, C., O’Connor, S. and Soutter, R. 2022. *Securing a Viable Future for the Tiger*. Flora and Fauna International, IUCN, Panthera, TRAFFIC, WCS and WWF, Cambridge, UK. Retrieved from: <https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Asien/Tiger-Coalition-Vision-WWF-TRAFFIC-IUCN-Panthera-WCS-Fauna-and-Flora-International.pdf>
- 37 Cooper, J.C. 1992. *Symbolic and Mythological Animals*, pp 226-227. Aquarian Press, London.
- 38 Hammond, C.E. 1992. Sacred metamorphosis: the weretiger and the shaman. *Acta Orientalia Academiae Scientiarum Hungaricae* 46: 235-255. Retrieved from: <http://www.jstor.org/stable/23658449>
- 39 Green, S. 2006. *Tiger*. Reaktion Books, London.
- 40 Cooper, J.C. 1992. *Op cit*
- 41 Evans, A.S. 2007. An Analysis of ‘Meme Haylay Haylay and His Turquoise’ using Joseph Campbell’s Model of the Hero’s Journey. *Journal of Bhutan Studies* 15: 84-101. Retrieved from: http://www.bhutanstudies.org.bt/publicationFiles/JBS/JBS_Vol15/15-4.pdf
- 42 Reddy, C.S. and Yosef, R. 2016. Living on the Edge: Attitudes of Rural Communities toward Bengal Tigers (*Panthera tigris*) in Central India. *Anthrozoös* 29: 311-322. DOI: 10.1080/08927936.2016.1152763
- 43 Krishna, N. 2010. *Sacred Animals of India*. Penguin Books, New Delhi.
- 44 Verma, M., Negandhi, D., Khanna, C., Edgaonkar, A., David, A. et al. 2015. *Economic Valuation of Tiger Reserves in India: A Value+ Approach*. Indian Institute of Forest Management, Bhopal, India. Retrieved from: http://www.indiaenvironmentportal.org.in/files/file/IIFM_Tiger%20Report_2019.pdf
- 45 Matthiessen, P. and Hornocker, M. 2001. *Tigers in the Snow*. North Point Press.
- 46 Struebig, M.J., Linkie, M., Deere, N.J., Martyr, D.J., Millyanawati, B., Faulkner, S.C. et al. 2018. Addressing human-tiger conflict using socio-ecological information on tolerance and risk. *Nature Communications* 9: 3455. DOI: 10.1038/s41467-018-05983-y
- 47 Lubis, M.I., Pusparini, W., Prabowo, S.A., Marthy, W., Tarmizi, Andayani, N. et al. 2020. Unraveling the complexity of human-tiger conflicts in the Leuser Ecosystem, Sumatra. *Animal Conservation* 23: 741-749. DOI: 10.1111/acv.12591
- 48 Agnihotri, S., Madegowda, C. and Si, A. 2021. Tiger Becomes Termite Hill: Soliga/Solega Perceptions of Wildlife Interactions and Ecological Change. *Frontiers in Conservation Science* 2: 24. DOI: 10.3389/fcsc.2021.691900
- 49 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. Retrieved from: https://wwfint.awsassets.panda.org/downloads/a_future_for_all_the_need_for_human_wildlife_coexistence.pdf
- 50 Kshetry, A., Bhave, N., Das, P. and Athreya, V. 2021. Mahakal Blessed My Crop: Community Dynamics and Religious Beliefs Influence Efficacy of a Wildlife Compensation Program. *Frontiers in Conservation Science* 2: 52. DOI: 10.3389/fcsc.2021.727696
- 51 Bredin, Y.K., Lescureux, N. and Linnell, J.D.C. 2018. Local perceptions of jaguar conservation and environmental justice in Goiás, Matto Grosso and Roraima states (Brazil). *Global Ecology and Conservation* 13: e00369. DOI: 10.1016/j.gecco.2017.e00369.
- 52 Bruskotter, J.T. and Wilson, R.S. 2014. Determining Where the Wild Things will be: Using Psychological Theory to Find Tolerance for Large Carnivores. *Conservation Letters* 7: 158-165. DOI: 10.1111/conl.12072
- 53 Malviya, M., Kalyanasundaram, S. and Krishnamurthy, R. 2022. Paradox of Success-Mediated Conflicts: Analysing Attitudes of Local Communities towards Successfully Reintroduced Tigers in India. *Frontiers in Conservation Science* 2: 783467. DOI: 10.3389/fcsc.2021.783467
- 54 Pathak, N. (ed) 2009. *Community Conserved Areas in India – A Directory*. Kalpavriksh, Pune/Delhi.
- 55 Fort, J.L., Nielsen, C.K., Carver, A.D., Moreno, R. and Meyer, N.F.V. 2018. Factors influencing local attitudes and perceptions regarding jaguars *Panthera onca* and National Park conservation in Panama. *Oryx* 52: 282-291. DOI: 10.1017/S0030605317001016
- 56 <https://www.nature.com/articles/s41586-019-1872-1/figures/5> (accessed 7 April 2022).
- 57 Browne-Nuñez, C. and Jonker, S.A. 2008. Attitudes toward Wildlife and Conservation across Africa: A Review of Survey Research. *Human Dimensions of Wildlife* 13: 47-70. DOI: 10.1080/10871200701812936
- 58 Malone, E.L., Dooley, J.J. and Bradbury, J.A. 2010. Moving from misinformation derived from public attitude surveys on carbon dioxide capture and storage towards realistic stakeholder involvement. *International Journal of Greenhouse Gas Control* 4: 419-425. DOI: 10.1016/j.ijggc.2009.09.004
- 59 Karanth, K.K., Kramer, R.A., Qian, S.S. and Christensen, N.L. Jr. 2008. Examining conservation attitudes, perspectives, and challenges in India. *Biological Conservation* 141: 2357-2367. DOI: 10.1016/j.biocon.2008.06.027
- 60 See for example Klenzendorf, S., Wilson, S.M., Hickisch, R. and Klose, M. 2019. *European Perspectives on Coexistence with Large Carnivores. A Summary of Regional Stakeholder Perspectives on Managing Human Large Carnivore Conflicts: Challenges and Solutions*. EuroLargeCarnivores. WWF Deutschland. Berlin, Germany. Retrieved from: https://drive.google.com/file/d/1gSENBf5_caHDDJUZr3fwWS-oXumTj6T/view
- 61 Larson, L.R., Conway, A.L., Hernandez, S.M. and Carroll, J.P. 2016. Human-wildlife Conflict, Conservation Attitudes, and a Potential Role for Citizen Science in Sierra Leone, Africa. *Conservation and Society* 14: 205-217. DOI: 10.4103/0972-4923.191159
- 62 Chouksey, S., Singh, S., Pandey, R. and Tomer, V.S. 2018. Monitoring the status of human-wildlife conflict and its impact on community based conservation in Bandhavgarh tiger reserve, Madhya Pradesh, India. *Journal of Applied and Natural Science* 10: 710-715. DOI: 10.31018/jans.v10i2.1771
- 63 Carter, N.H., Riley, S.J. and Liu, J. 2012. Utility of a psychological framework for carnivore conservation. *Oryx* 46: 525-535. DOI: 10.1017/S0030605312000245; Carter, N.H., Riley, S.J., Shortridge, A., Shrestha, B.K. and Liu, J. 2014. Spatial Assessment of Attitudes toward Tigers in Nepal. *AMBIO* 43: 125-137. DOI: 10.1007/s13280-013-0421-7; Carter, N., Viña, A., Hull, V., McConnell, W., Axinn, W., Ghimire, D. et al. 2014. Coupled human and natural systems approach to wildlife research and conservation. *Ecology and Society* 19. DOI: 10.5751/ES-06881-190343
- 64 Inskip, C., Carter, N., Riley, S., Roberts, T. and MacMillan, D. 2016. Toward Human-Carnivore Coexistence: Understanding Tolerance for Tigers in Bangladesh. *PLOS ONE* 11: e0145913. DOI: 10.1371/journal.pone.0145913
- 65 Inskip, C., Fahad, Z., Tully, R., Roberts, T. and MacMillan, D. 2014. Understanding carnivore killing behaviour: Exploring the motivations for tiger killing in the Sundarbans, Bangladesh. *Biological Conservation* 180:

- 42-50. DOI: 10.1016/j.biocon.2014.09.028
- 66 Struebig, M.J., Linkie, M., Deere, N.J., Martyr, D.J., Millyanawati, B., Faulkner, S.C. et al. 2018. Addressing human-tiger conflict using socio-ecological information on tolerance and risk. *Nature Communications* 9: 3455. DOI: 10.1038/s41467-018-05983-y
- 67 McKay, J.E., John, F.A.V.S., Harihar, A., Martyr, D., Leader-Williams, N., Millyanawati, B. et al. 2018. Tolerating tigers: Gaining local and spiritual perspectives on human-tiger interactions in Sumatra through rural community interviews. *PLOS ONE* 13: e0201447. DOI: 10.1371/journal.pone.0201447
- 68 Bhattarai, B.R. and Fischer, K. 2014. Human-tiger *Panthera tigris* conflict and its perception in Bardia National Park, Nepal. *Oryx* 48: 522-528. DOI: 10.1017/S0030605313000483
- 69 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* 47: 95-110. DOI: 10.1007/s10745-019-0054-y
- 70 Malviya, M. and Ramesh, K. 2015. Human-Felid Conflict in Corridor Habitats: Implications for Tiger and Leopard Conservation in Terai Arc Landscape, India. *Human-Wildlife Interactions* 9. DOI: <https://doi.org/10.26077/x9tx-gb97>
- 71 Agnihotri, S., Madegowda, C., and Si, A. 2021. Tiger Becomes Termite Hill: Soliga/Solega Perceptions of Wildlife Interactions and Ecological Change. *Frontiers in Conservation Science* 2: 24. DOI: 10.3389/fcosc.2021.691900
- 71a: Ramesh, T., Kalle, R., Sankar, K., Qureshi, Q., Giordano, A.J. and Downs, C.T. 2019. To resettle or not? Socioeconomic characteristics, livelihoods, and perceptions toward resolving human-tiger conflict in the Nilgiri Biosphere Reserve, India. *Land Use Policy* 83: 32-46. DOI: 10.1016/j.landusepol.2019.01.019
- 72 Vasudeva, V., Ramasamy, P., Pal, R.S., Behera, G., Karat, P.R. and Krishnamurthy, R. 2021. Factors Influencing People's Response toward Tiger Translocation in Satkosia Tiger Reserve, Eastern India. *Frontiers in Conservation Science* 2: 11. DOI: 10.3389/fcosc.2021.664897
- 73 Doubleday, K.F. and Rubino, E.C. 2021. Tigers bringing risk and security: Gendered perceptions of tiger reintroduction in Rajasthan, India. *Ambio*. DOI: 10.1007/s13280-021-01649-0
- 74 Struebig, M.J., Linkie, M., Deere, N.J., Martyr, D.J., Millyanawati, B., Faulkner, S.C. et al. 2018. *Op cit*
- 75 Dolrenry, S., Hazzah, L. and Frank, L.G. 2020. Corridors of tolerance through human-dominated landscapes facilitate dispersal and connectivity between populations of African lions *Panthera leo*. *Oryx* 54: 847-850. DOI: 10.1017/S0030605319000656
- 76 Struebig, M.J., Linkie, M., Deere, N.J., Martyr, D.J., Millyanawati, B., Faulkner, S.C. et al. 2018. *Op cit*
- 77 Whitehead, A.L., Kujala, H., Ives, C.D., Gordon, A., Lentini, P.E., Wintle, B.A. et al. 2014. Integrating Biological and Social Values When Prioritizing Places for Biodiversity Conservation. *Conservation Biology* 28: 992-1003. DOI: 10.1111/cobi.12257
- 78 Popp, J.N., Priadka, P. and Kozmik, C. 2019. The rise of moose co-management and integration of Indigenous knowledge. *Human Dimensions of Wildlife* 24: 159-167. DOI: 10.1080/10871209.2019.1545953
- 79 Kadykalo, A.N., Cooke, S.J. and Young, N. 2021. The role of western-based scientific, Indigenous and local knowledge in wildlife management and conservation. *People and Nature* 3: 610-626. DOI: 10.1002/pan3.10194
- 80 Evangelista, P.H., Mohamed, A.M., Hussein, I.A., Saied, A.H., Mohammed, A.H. and Young, N.E. 2018. Integrating Indigenous local knowledge and species distribution modeling to detect wildlife in Somaliland. *Ecosphere* 9: e02134. DOI: 10.1002/ecs2.2134
- 81 Katkurwar, K. 2021. Tigers return to Gadchiroli forest after 30 years, human-animal conflict spikes. *Mongabay*, 27 October 2021. Retrieved from: <https://india.mongabay.com/2021/10/tigers-return-to-gadchiroli-forests-after-30-years-human-animal-conflict-spikes/>
- 82 This section draws heavily on research reported in Sterling, E.J., Betley, E., Sigouin, A., Gomez, A., Toomey, A., Cullman, G. et al. 2017. Assessing the evidence for stakeholder engagement in biodiversity conservation. *Biological Conservation* 209: 159-171. DOI: 10.1016/j.biocon.2017.02.008
- 83 Convention on Biological Diversity. 2018. *Decision adopted by the conference of the parties to the Convention on Biological Diversity*. CBD/COP/DEC/14/8, Sharm El-Sheikh, Egypt. Retrieved from: <https://www.cbd.int/doc/decisions/cop-14/cop-14-dec-08-en.pdf>
- 84 Franks, P. and Booker, F. 2020. *Equity in conservation – what, why and how?* IUCN WCPA Technical Note No. 7. IUCN, Gland, Switzerland. Retrieved from: https://www.iucn.org/sites/dev/files/media-uploads/2022/03/iucn_wcpa_technical_note_series_no._7.pdf
- 85 www.ohchr.org/Documents/Publications/FactSheet2Rev.1en.pdf (accessed 15 April 2022).
- 86 www.ohchr.org/en/issues/environment/srenvironment/pages/frameworkprinciplesreport.aspx (accessed 15 April 2022).
- 87 www.un.org/development/desa/indigenouseoples/declaration-on-the-rights-of-Indigenous-peoples.html
- 88 Davis, A. and Goldman, M.J. 2019. Beyond payments for ecosystem services: considerations of trust, livelihoods and tenure security in community-based conservation projects. *Oryx* 53: 491-496. DOI: 10.1017/S0030605317000898
- 89 <https://snowleopard.org/our-work/conservation-programs/partners-principles-old/#:~:text=The%20PARTNERS%20Principles%20include%3A&text=The%20Aptness%20of%20specific%20community,value%20of%20multi%2Dfaceted%20programs> (accessed 16 April 2022).
- 90 <https://www.un.org/development/desa/indigenouseoples/declaration-on-the-rights-of-indigenous-peoples.html>
- 91 <https://www.ohchr.org/Documents/Issues/Environment/SREnvironment/FrameworkPrinciplesUserFriendlyVersion.pdf>
- 92 <https://www.ohchr.org/Documents/Publications/FactSheet2Rev.1en.pdf>
- 93 Mishra, C. 2016. *The Partners Principles for community-based conservation*. Snow Leopard Trust, Seattle, USA. Retrieved from https://www.researchgate.net/publication/308888622_The_PARTNERS_Principles_for_Community-Based_Conservation
- 94 Hails, C., O'Connor, S. and Soutter, R. 2022. *Securing a Viable Future for the Tiger*. Flora and Fauna International, IUCN, Panthera, TRAFFIC, WCS and WWF, Cambridge, UK. Retrieved from: <https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Asien/Tiger-Coalition-Vision-WWF-TRAFFIC-IUCN-Panthera-WCS-Fauna-and-Flora-International.pdf>
- 95 Rastogi, A., Thapliyal, S. and Hickey, G.M. 2014. Community Action and Tiger Conservation: Assessing the Role of Social Capital. *Society & Natural Resources* 27: 1271-1287. DOI: 10.1080/08941920.2014.917753
- 96 Young, J.C., Searle, K., Butler, A., Simmons, P., Watt, A.D. and Jordan, A. 2016. The role of trust in the resolution of conservation conflicts. *Biological Conservation* 195: 196-202. DOI: 10.1016/j.biocon.2015.12.030
- 97 Jordan, N.R., Smith, B.P., Appleby, R.G., van Eeden, L.M. and Webster, H.S. 2020. Addressing inequality and intolerance in human-wildlife coexistence. *Conservation Biology* 34: 803-810. DOI: 10.1111/cobi.13471.
- 98 Borrini-Feyerabend, G., Pimbert, M., Farvar, M.T., Kothari, A. and Renard, Y. 2004. *Sharing Power: A global guide to collaborative management of natural resources*. Routledge. DOI: 10.4324/9781849772525
- 99 Büscher, B. and de Beer, E. 2011. The contemporary paradox of long-term planning for social-ecological change and its effects on the discourse-practice divide: evidence from Southern Africa. *Journal of Environmental Planning and Management* 54: 301-318. DOI: 10.1080/09640568.2010.506075
- 100 Manetti, L.M., Götter, T. and Esler, K.L. 2019. Identifying and categorizing stakeholders for protected area expansion around a national park in Namibia. *Ecology and Society* 24: 5. DOI:10.5751/ES-10790-240205
- 101 de Vente, J., Reed, M., Stringer, L., Valente, S. and Newig, J. 2016. How does the context and design of participatory decision making processes affect their outcomes? Evidence from sustainable land management in global drylands. *Ecology and Society* 21: 24. DOI: 10.5751/ES-08053-210224
- 102 Minter, T., van der Ploeg, J., Pedrablanca, M., Sunderland, T. and Persoon, G.A. 2014. Limits to Indigenous Participation: The Agta and the Northern Sierra Madre Natural Park, the Philippines. *Human Ecology* 42: 769-778. DOI: 10.1007/s10745-014-9673-5
- 103 Bhatt, S. 2003. Linking livelihoods with conservation – an enterprise-based approach to biosphere reserve management. *Journal of the National Science Foundation of Sri Lanka* 31: 147-158. DOI: 10.4038/jnsfsv.31ii-2.3030
- 104 Higgins-Zogib, L., Dudley, N. and Aziz, T. (eds) 2012. *The High Ground: Biocultural diversity and conservation of sacred natural sites in the Eastern Himalayas*. WWF-Bhutan, Thimphu. Retrieved from: https://wwfau.awsassets.panda.org/downloads/wwf_the_high_ground.pdf
- 105 Dube, P.P. 2021. Social Factors Affecting the Conservation of Tigers in the Samsher Nagar Area of Sunderbans. *Asian Journal of Biology* 12: 12-23. DOI: 10.9734/ajob/2021/v12i230158
- 106 Carter, N.H. and Allendorf, T.D. 2016. Gendered perceptions of tigers in Chitwan National Park, Nepal. *Biological Conservation* 202: 69-77. DOI: 10.1016/j.biocon.2016.08.002
- 107 Rubino, E. and Doubleday, K. 2021. A Gendered Environmental Justice Perspective of Tiger Reintroductions to Sariska Tiger Reserve. *Journal of Rural Social Sciences* 36: 1-19. Retrieved from: <https://egrove.olemiss.edu/jrss/vol36/iss1/5>
- 108 Richard, A.F. and Ratsirarson, J. 2013. Partnership in practice: making conservation work at Bezà Mahafaly, southwest Madagascar. *Madagascar Conservation & Development* 8: 12-20. DOI: 10.4314/mcd.v8i1.3
- 109 Gubbi, S., Linkie, M. and Leader-Williams, N. 2008. Evaluating the legacy of an integrated conservation and development project around

- a tiger reserve in India. *Environmental Conservation* 35: 331-339. DOI: 10.1017/S0376892908005225
- 110 Mishra, C., Young, J.C., Fiechter, M., Rutherford, B. and Redpath, S.M. 2017. Building partnerships with communities for biodiversity conservation: lessons from Asian mountains. *Journal of Applied Ecology* 54: 1583-1591. DOI: 10.1111/1365-2664.12918.
- 111 Catalano, A.S., Lyons-White, J., Mills, M.M. and Knight, A.T. 2019. Learning from published project failures in conservation. *Biological Conservation* 238: 108223. DOI: 10.1016/j.biocon.2019.108223
- 112 Larsen, B., Costa, A., Hall, M., McGinnis-Brown, L. and Fry, V. 2020. *Human Wildlife Conflict Monitoring: Understanding Human Wildlife Conflict through Big Data*. Boise State University Idaho Policy Institute Reports, Boise, USA. Retrieved from: https://scholarworks.boisestate.edu/cgi/viewcontent.cgi?article=1029&context=ipi_reports
- 113 Sibanda, L., van der Meer, E., Johnson, P.J., Hughes, C., Dlodlo, B., Parry, R.H. et al. 2021. Evaluating the effects of a conservation intervention on rural farmers' attitudes toward lions. *Human Dimensions of Wildlife* 26: 445-460. DOI: 10.1080/10871209.2020.1850933
- 114 Songhurst, A. 2017. Measuring human-wildlife conflicts: Comparing insights from different monitoring approaches. *Wildlife Society Bulletin* 41: 351-361. DOI: 10.1002/wsb.773
- 115 Hockings, M., James, R., Stolton, S., Dudley, N., Mathur, V., Makombo, J., Courrau, J. and Parrish, J.D. 2008. *Enhancing our Heritage Toolkit: Assessing Management Effectiveness of Natural World Heritage Sites*. World Heritage Papers 23. UNESCO, UN Foundation and IUCN, Paris. Retrieved from: <https://whc.unesco.org/document/100750>
- 116 IUCN. 2020. *Environmental and Social Management System (ESMS) ESMS Grievance Mechanism*, Guidance Note: Version 2.1. IUCN, Switzerland. Retrieved from: https://www.iucn.org/sites/dev/files/iucn_esms_grievance_mechanism_guidance_note-v2.1.pdf
- 117 Usher, P.J. 2000. Traditional Ecological Knowledge in Environmental Assessment and Management. *ARCTIC* 53: 183-193. DOI: 10.14430/arctic849
- 118 Locke, C.M., Anhalt-Depies, C.M., Frett, S., Stenglein, J.L., Cameron, S., Malleshappa, V. et al. 2019. Managing a large citizen science project to monitor wildlife. *Wildlife Society Bulletin* 43: 4-10. DOI: 10.1002/wsb.943
- 119 Dolrenry, S., Hazzah, L. and Frank, L.G. 2016. Conservation and monitoring of a persecuted African lion population by Maasai warriors: Maasai Warriors as Citizen Scientists. *Conservation Biology* 30: 467-475. DOI: 10.1111/cobi.12703
- 120 Moller, H., Berkes, F., Lyver, P.O. and Kislalioglu, M. 2004. Combining Science and Traditional Ecological Knowledge: Monitoring Populations for Co-Management. *Ecology and Society* 9. DOI: 10.5751/ES-00675-090302
- 121 Lavariaga, M.C., Rios-Solis, J.A., Flores-Martínez, J.J., Galindo-Aguilar, R.E., Sánchez-Cordero, V., Juan-Albino, S. and Soriano-Martínez, I. 2020. Community-Based Monitoring of Jaguar (*Panthera onca*) in the Chinantla Region, Mexico. *Tropical Conservation Science* 13: 1940082920917825. DOI: 10.1177/1940082920917825.
- 122 Robinson, J.A., Kocman, D., Speyer, O. and Gerasopoulos, E. 2021. Meeting volunteer expectations – a review of volunteer motivations in citizen science and best practices for their retention through implementation of functional features in CS tools. *Journal of Environmental Planning and Management* 64: 2089-2113. DOI: 10.1080/09640568.2020.1853507
- 123 Sharma, K., Fiechter, M., George, T., Young, J., Alexander, J.S., Bijoor, A. et al. 2020. Conservation and people: Towards an ethical code of conduct for the use of camera traps in wildlife research. *Ecological Solutions and Evidence* 1: e12033. DOI: 10.1002/2688-8319.12033
- 124 Adler, F.R., Green, A.M. and Şekercioğlu, Ç.H. 2020. Citizen science in ecology: a place for humans in nature. *Annals of the New York Academy of Sciences* 1469: 52-64. DOI: 10.1111/nyas.14340
- 125 *Ibid*
- 126 Hockings, M., Adams, W., Brooks, T.M., Dudley, N., Jonas, H., Lotter, W. et al. 2013. A draft code of practice for research and monitoring in protected areas. *PARKS* 19: 85-94. DOI: 10.2305/IUCN.CH.2013.PARKS-19-2.MH.en
- 127 www.worldwildlife.org/publications/environmental-and-social-safeguards-framework (accessed 15 April 2022).
- 128 IUCN. 2020. *Op cit*
- 129 Department of National Parks and Wildlife Conservation (DNPWC). 1996. *Buffer Zone Management Rules*. Kathmandu: Department of National Parks and Wildlife Conservation, Nepal.
- 130 Thing, S.J. and Poudel, B.S. 2017. Buffer Zone Community Forestry in Nepal: Examining Tenure and Management Outcomes. *Journal of Forest and Livelihood* 15(1).
- 131 Department of National Parks and Wildlife Conservation (DNPWC). 1996. *Op cit*
- 132 Department of National Parks and Wildlife Conservation (DNPWC). (1999). *Buffer Zone Management Guideline*. Kathmandu: Department of National Parks and Wildlife Conservation, Nepal. <http://www.forestation.org/app/webroot/js/tinyMCE/editor/plugins/filemanager/files/buffer%20zone%20management%20guideline%201999.pdf>
- 133 Dhakal, B. and Thapa, B. 2015. Buffer zone management issues in Chitwan national park, Nepal: a case study of Koluwa village development committee. *PARKS* 21 (2). DOI: 10.2305/IUCN.CH.2014.PARKS-21-2BD.en
- 134 *Ibid*
- 135 Thing, S.J. and Poudel, B.S. 2017. Buffer Zone Community Forestry in Nepal: Examining Tenure and Management Outcomes. *Journal of Forest and Livelihood* 15(1) and Dhakal, B. and Thapa, B. 2015. *Op cit*
- 136 Lamichhane, B.R., Persoon, G.A., Leirs, H., Poudel, S., Subedi, N., Pokhral, 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* 47: 95-110. DOI: 10.1007/s10745-019-0054-y
- 137 Dhakal, B. and Thapa, B. 2015. *Op cit*
- 138 Thing, S.J. and Poudel, B.S. 2017. *Op cit*
- 139 Lamichhane, B.R., Persoon, G.A., Leirs, H., Poudel, S., Subedi, N., Pokhral, 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* 47: 95-110. DOI: 10.1007/s10745-019-0054-y
- 140 Thing, S.J. and Poudel, B.S. 2017. *Op cit*
- 141 Lamichhane, B.R., Persoon, G.A., Leirs, H., Poudel, S., Subedi, N., Pokhral, C.P. et al. 2019. *Op cit*
- 142 Thing, S.J. and Poudel, B.S. 2017. *Op cit*
- 143 <https://www.worldwildlife.org/stories/citizen-scientists-help-protect-nepal-tigers-from-behind-the-lens> (accessed 9 March 2022).
- 144 Hails, C., O'Connor, S. and Soutter, R. 2022. *Securing a Viable Future for the Tiger*. Flora and Fauna International, IUCN, Panthera, TRAFFIC, WCS and WWF, Cambridge, UK. Retrieved from: <https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Asien/Tiger-Coalition-Vision-WWF-TRAFFIC-IUCN-Panthera-WCS-Fauna-and-Flora-International.pdf>
- 145 IUCN-WCPA Task Force on OECMs. 2019. *Recognising and reporting other effective area-based conservation measures*. IUCN, Gland, Switzerland.
- 146 <https://www.cbd.int/sp/targets/rationale/target-11/>
- 147 Convention on Biological Diversity. 2018. Decision adopted by the Conference of the Parties to the Convention on Biological Diversity: 14.8 Protected areas and other effective area-based conservation mechanisms. Fourteenth meeting, Sharm El-Sheik, Egypt, 17-29 November 2018, Agenda item 24. CBD/COP/14/8 30 November 2018.
- 148 IUCN-WCPA Task Force on OECMs. 2019. *Recognising and reporting other effective area-based conservation measures*. IUCN, Gland, Switzerland.
- 149 Jonas, H.D., Barbuto, V., Jonas, H.C., Kothari, A. and Nelson, F. 2014. New Steps of Change: Looking Beyond Protected Areas to Consider Other Effective Area-Based Conservation Measures. *PARKS* 20: 111-128. DOI: 10.2305/IUCN.CH.2014.PARKS-20-2.HDJ.en
- 150 Dinerstein, E., Yvonne, C., Sala, E., Joshi, A.R., Fernando, S., Lovejoy, T.E. et al. 2019. A Global Deal for Nature: Guiding principles, milestones, and targets. *Science Advances* 5: eaaw2869. DOI: 10.1126/sciadv.aaw2869
- 151 <https://explore.panda.org/newdeal> (accessed 15 March 2022).
- 152 <https://www.campaignfornature.org/> (accessed 15 March 2022).
- 153 <https://natureneedshalf.org/> (accessed 15 March 2022).
- 154 <https://www.leaderspledgefornature.org/> (accessed 15 March 2022).
- 155 WWF International. 2020. Post-2020 Global Biodiversity Framework Zero Draft: WWF Response. Position Paper. Gland, Switzerland.
- 156 <https://www.hacfornatureandpeople.org/hac-members> (accessed 15 March 2022).
- 157 <https://www.leaderspledgefornature.org/> (accessed 15 March 2022).
- 158 Minority Rights Group International, Rainforest Foundation and Survival. 2020. *NGO concerns over the proposed 30 per cent target for protected areas and absence of safeguards for Indigenous Peoples and local communities*, 1 September 2020.
- 159 Taylor, M. 2021. Analysis: Nature-pact goal to protect 30% of land and ocean hangs in the balance. Reuters. <https://www.reuters.com/business/cop/nature-pact-goal-protect-30-land-ocean-hangs-balance-2021-11-19/> (accessed 15 April 2022).
- 160 Convention on Biological Diversity. 2021. *First draft of the post-2020 Global Biodiversity Framework*. Open Ended Working Group on the Post-2020 Global Biodiversity Framework, Third Meeting, 23 August-3 September 2021, CBD/WG2020/3/3. Retrieved from: <https://www.cbd.int/doc/c/abb5/591f/2e46096d3f0330b08ce87a45/wg2020-03-03-en.pdf>
- 161 Dinerstein, E., Loucks, C., Wikramanayake, E., Ginsberg, J., Sanderson, E., Seidensticker, J. et al. 2007. The Fate of Wild Tigers. *BioScience* 57: 508-514. DOI: 10.1641/B570608
- 162 WWF. 2017. *Beyond the Stripes: Save tigers, save so much more*. WWF International, Gland, Switzerland. Retrieved from: https://files.worldwildlife.org/wwfemsprod/files/Publication/file/99xulvkuno_BEYOND_THE_STRIPES_WEB_VERSION.pdf?_ga=2.49016928.719134679.1650119851-

- 46536746.1648568655
- 163 Harihar, A. and Pandav, B. 2012. Influence of Connectivity, Wild Prey and Disturbance on Occupancy of Tigers in the Human-Dominated Western Terai Arc Landscape. *PLoS ONE* 7: e40105. DOI: 10.1371/journal.pone.0040105
- 164 Lham, D., Wangchuk, S., Stolton, S. and Dudley, N. 2019. Assessing the effectiveness of a protected area network: a case study of Bhutan. *Oryx* 53: 63-70. DOI: 10.1017/S0030605317001508
- 165 Dinerstein, E., Vynne, C., Sala, E., Joshi, A.R., Fernando, S., Lovejoy, T.E. et al. 2019. A Global Deal for Nature: Guiding principles, milestones, and targets. *Science Advances* 5: eaaw2869. DOI: 10.1126/sciadv.aaw2869
- 166 <https://population.un.org/wpp/Download/Standard/Population/>
- 167 Ghosh-Harihar, M., An, R., Athreya, R., Borthakur, U., Chanchani, P., Chetry, D. et al. 2019. Protected areas and biodiversity conservation in India. *Biological Conservation* 237: 114-124. DOI: 10.1016/j.biocon.2019.06.024
- 168 Kshetry, A., Vaidyanathan, S., Sukumar, R. and Athreya, V. 2020. Looking beyond protected areas: Identifying conservation compatible landscapes in agro-forest mosaics in north-eastern India. *Global Ecology and Conservation* 22: p.e00905. DOI: 10.1016/j.gecco.2020.e00905
- 169 Maddox, T., Priatna, D., Gemita, E. and Salampessy, A. 2007. *The conservation of tigers and other wildlife in oil palm plantations. Jambi Province, Sumatra, Indonesia*. ZSL Conservation Report No. 7. The Zoological Society of London, London.
- 170 Dinerstein, E., Vynne, C., Sala, E., Joshi, A.R., Fernando, S., Lovejoy, T.E. et al. 2019. *Op cit*
- 171 http://www.wiienviis.nic.in/Database/Protected_Area_854.aspx (accessed 2 January 2022).
- 172 Chanchani, P., Noon, B.R., Bailey, L.L. and Warrier, R.A. 2016. Conserving tigers in working landscapes. *Conservation Biology* 30: 649-660. DOI: 10.1111/cobi.12633
- 173 Pasha, M.K.S., Dudley, N., Stolton, S., Baltzer, M., Long, B., Roy, S. et al. 2018. Setting and Implementing Standards for Management of Wild Tigers. *Land* 7: 93. DOI: 10.3390/land7030093
- 174 Carroll, C. and Miquelle, D.G. 2006. Spatial viability analysis of Amur tiger *Panthera tigris altaica* in the Russian Far East: the role of protected areas and landscape matrix in population persistence. *Journal of Applied Ecology* 43: 1056-1068. DOI: 10.1111/j.1365-2664.2006.01237.x
- 175 Azlan, M.J. and Sharma, D.S.K. 2003. Camera trapping the IndoChinese tiger, *Panthera tigris corbetti*, in a secondary forest in Peninsular Malaysia. *The Raffles Bulletin of Zoology* 51: 421-427. Retrieved from: <https://ir.unimas.my/id/eprint/27228/>
- 176 Rayan, D.M. and Mohamad, S.W. 2009. The importance of selectively logged forests for tiger *Panthera tigris* conservation: a population density estimate in Peninsular Malaysia. *Oryx* 43: 48-51. DOI: 10.1017/S0030605308001890
- 177 Rayan, D.M., Mohamad, S., Wong, C., Elangkumaran, S.S., Lau, C.F., Hamirul, M. and Mohamed, A. 2013. *Conservation status of tigers and their prey in the Belum-Temengor Forest Complex*. WWF-Malaysia, Petaling Jaya, Selangor, Malaysia.
- 178 Rayan, D.M. and Linkie, M. 2015. Conserving tigers in Malaysia: A science-driven approach for eliciting conservation policy change. *Biological Conservation* 184: 18-26. DOI: 10.1016/j.biocon.2014.12.024
- 179 <https://www.iwgia.org/en/india>
- 180 Springate-Baginski, O., Sarin, M., Ghosh, S., Dasgupta, P., Bose, I., Banerjee, A. et al. 2009. *Redressing 'historical injustice' through the Indian Forest Rights Act 2006. A historical institutional analysis of contemporary forest rights reform*. IPPG Discussion Paper Series, 27. <https://www.iwgia.org/en/india>
- 181 <https://www.iwgia.org/en/india>
- 182 Government of India. 2006. *The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006*. Retrieved from: <https://www.indiacode.nic.in/bitstream/123456789/8311/1/a2007-02.pdf>
- 183 Springate-Baginski, O., Sarin, M., Ghosh, S., Dasgupta, P., Bose, I., Banerjee, A. et al. 2009. *Op cit*
- 184 *Ibid*
- 185 This section is sourced from the unpublished "CFR Conservation and Management Plan (CFRCMP) of Vazhachal CFR area" which is currently being finalized by the Grama Sabhas.
- 186 <https://www.downtoearth.org.in/news/governance/kerala-government-abandons-controversial-athirappilly-hydroelectric-project-amid-widespread-protests-79564#:~:text=The%20Kerala%20government%20has%20called,confirmed%20state%20electricity%20board%20officials> (accessed 23 March 2022).
- 187 Microsoft Word - Conservation of Biodiversity and Protected Areas Law_English_Draft_27 June 2018_NZHTun (informea.org) (accessed 19 May 2022).
- 188 Young, J.C., Alexander, J.S., Bijoor, A., Sharma, D., Dutta, A., Agvaantseren, B. et al. 2021. Community-Based Conservation for the Sustainable Management of Conservation Conflicts: Learning from Practitioners. *Sustainability* 13: 7557. DOI: 10.3390/sui13147557
- 189 Joshi, A.R., Dinerstein, E., Wikramanayake, E., Anderson, M.L., Olson, D., Jones, B.S. et al. 2016. Tracking changes and preventing loss in critical tiger habitat. *Science Advances* 2: e1501675. DOI: 10.1126/sciadv.1501675
- 190 Hails, C., O'Connor, S. and Soutter, R. 2022. *Securing a Viable Future for the Tiger*. Flora and Fauna International, IUCN, Panthera, TRAFFIC, WCS and WWF, Cambridge, UK. Retrieved from: <https://www.wwf.de/fileadmin/fm-wwf/Publicationen-PDF/Asien/Tiger-Coalition-Vision-WWF-TRAFFIC-IUCN-Panthera-WCS-Fauna-and-Flora-International.pdf>
- 191 Dinerstein, E., Vynne, C., Sala, E., Joshi, A.R., Fernando, S., Lovejoy, T.E. et al. 2019. *Op cit*
- 192 Ramos Castillo, A. and Tugendhat, H. 2022. *Indigenous peoples, local communities and area-based conservation targets*. ICCA Consortium and Forest Peoples Programme.
- 193 Dudley, N., and Stolton, S. (eds). 2022. *Best Practice in Delivering the 30x30 Target* (1st ed.). The Nature Conservancy and Equilibrium Research.
- 194 Gurney, G.G., Darling, E.S., Ahmadi, G.N., Agostini, V.N., Ban, N.C., Blythe, J. et al. 2021. Biodiversity needs every tool in the box: use OECMs. *Nature* 595: 646-649. DOI: 10.1038/d41586-021-02041-4
- 195 Dudley, N., Jonas, H., Nelson, F., Parrish, J., Pyhälä, A., Stolton, S. et al. 2018. The essential role of other effective area-based conservation measures in achieving big bold conservation targets. *Global Ecology and Conservation* 15: e00424. DOI: 10.1016/j.gecco.2018.e00424
- 196 Chatterton, P., Ledecq, T. and Dudley, N. (eds) 2017. *Landscape Elements: Steps to achieving sustainable landscape management*. WWF, Vienna.
- 197 Dudley, N., Baker, C., Chatterton, P., Ferwerda, W.H., Gutierrez, V. and Madgwick, J. 2021. *The 4 Returns Framework for Landscape Restoration*. Commonland, Wetlands International, Landscape Finance Lab and IUCN Commission on Ecosystem Management, Amsterdam. Retrieved from: <https://www.commonland.com/wp-content/uploads/2021/06/4>Returns-for-Landscape-Restoration-June-2021-UN-Decade-on-Ecosystem-Restoration.pdf>
- 198 Jonas, H., Lee, E., Jonas, H., Matallana-Tobon, C., Wright, K., Nelson, F. et al. 2017. Will 'other effective area-based conservation measures' increase recognition and support for ICCAs? *PARKS* 23: 63-78. DOI: 10.2305/IUCN.CH.2017.PARKS-23-2HDJ.en
- 199 ICCA Consortium. 2021. *Territories of Life: 2021 Report*. ICCA Consortium: worldwide. Available at: report.territoriesofflife.org
- 200 Gurney, G.G., Darling, E.S., Ahmadi, G.N., Agostini, V.N., Ban, N.C., Blythe, J. et al. 2021. Biodiversity needs every tool in the box: use OECMs. *Nature* 595: 646-649. DOI: 10.1038/d41586-021-02041-4
- 201 WWF. 2016. *Legal spaces for wildlife corridors*, WWF-India.
- 202 <http://corridorcoalition.org/> (accessed 16 March 2022).
- 203 Thatte, P., Tyagi, A., Neelakantan, A., Natesh, M., Sen, M. and Thekaekara, T. 2021. Trends in Wildlife Connectivity Science from the Biodiverse and Human-Dominated South Asia. *Journal of the Indian Institute of Science* 101: 177-193. DOI: 10.1007/s41745-021-00240-6
- 204 Hilty, J., Worboys, G.L., Keeley, A., Woodley, S., Lausche, B., Locke, H. et al. 2020. *Guidelines for conserving connectivity through ecological networks and corridors*. Best Practice Protected Area Guidelines Series No. 30. IUCN, Gland, Switzerland. Retrieved from: <https://portals.iucn.org/library/sites/library/files/documents/PAG-030-En.pdf>
- 205 Qureshi, Q., Saini, S., Basu, P., Gopal, R., Raza, R. and Jhala, Y. 2014. *Connecting Tiger Populations for Long-term Conservation*. National Tiger Conservation Authority & Wildlife Institute of India, Dehradun. TR2014-02. Retrieved from: https://wii.gov.in/images/images/documents/connecting_tiger.pdf
- 206 Thatte, P., Tyagi, A., Neelakantan, A., Natesh, M., Sen, M. and Thekaekara, T. 2021. *Op cit*
- 207 Zeller, K.A., Lewison, R., Fletcher, R.J., Tulbure, M.G. and Jennings, M.K. 2020. Understanding the Importance of Dynamic Landscape Connectivity. *Land* 9: 303. DOI: 10.3390/land9090303
- 208 Thatte, P., Tyagi, A., Neelakantan, A., Natesh, M., Sen, M. and Thekaekara, T. 2021. *Op cit*
- 209 *Ibid*

3. ENSURING THAT BENEFITS FLOW TO COMMUNITIES LIVING WITH TIGERS



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Why read this section?

Ensuring that Indigenous peoples and local communities do not disproportionately bear the costs of conservation needs to be a key component of strategies. This section looks at the issues facing communities living with tigers and provides a compendium of options for ensuring benefits go hand-in-hand with costs, including direct government investment, economic benefit-sharing models and an explanation of the roles of autonomy for local people as a way of developing sustainable management models.

INTRODUCTION

Living with tigers and other large carnivores brings both costs and benefits, understanding and acknowledging these is an important first step in finding viable ways of coexistence. As noted in section 2, living with tigers can bring a wide variety of costs; livestock and human attacks, loss of economic opportunities due to access restrictions in some protected areas, and a less tangible costs such as those associated with the fear of living with large carnivores. And tolerance is subjective, it is difficult to assess its indirect impacts, and perceptions of it vary.¹ Increasing population and the competition for land and resources between tigers and humans could lead to an increasing potential for conflict. In India, 320 people were killed by tigers between 2014 and 2020 according to the National Tiger Conservation Authority.² Tigers killed around 20 people from 2010-2014 in Nepal.³ Official records between 2008 and 2015 report an average of 23 people killed by tigers annually in Bangladesh, which is much less compared to the historical records but probably an under reported total because some people who are injured who later succumb to their wounds are not recorded, and those in the park illegally are unlikely to be reported by compatriots.⁴ Tiger attacks lead to human death with some regularity in Sumatra as well, with rare cases in other countries with tigers.^{5,6}

Livestock predation is an issue across much of the tiger range. From 400 to 600 cattle and goats are killed by tigers and leopards each year around Kanha Tiger Reserve, central India where livestock numbers are increasing (the reserve supports stable populations of around 70 tigers and 100 leopards; livestock numbers are around 59,000 cattle, 22,000 buffalo and 11,000 goats),⁷ and around Corbett National Park, further north, there were 8,365 incidents of livestock depredation by tigers and leopards between 2006 and 2015, with tigers killing more livestock than leopards.⁸

Most human tiger fatalities take place in forests (unlike the situation with many other large predators) and in many, but certainly not all, cases victims are in forest where access is restricted and fatalities are linked with illegal activities. To some extent, this can make the situation for those left behind – usually widows and children – even worse because of their association with criminal activity. Serious stigmatization and resultant mental illness have been recorded among almost half the tiger widows studied in one research project in the Sundarbans Reserve Forest in India,⁹ highlighting the long-term impacts of fatalities.

More pervasively, the presence of large predators makes large areas effectively out of bounds because they are perceived as too dangerous to enter. Animals that have value within the illegal wildlife trade also draw professional poachers into areas, bringing other disbenefits to the communities who live there, including direct threats to the lives of wildlife rangers, who often hail from the local community,¹⁰ and their families.

Conversely, tigers also bring benefits, particularly from wildlife tourism¹¹ but more generally because protecting the habitat of the tiger also maintains many associated ecosystem services. Hundreds of millions of people use high quality, regulated water from tiger reserves, which also provide disaster risk reduction against flooding, tidal surge and landslides. Protected areas also can help conserve crop wild relatives (wild plant species that are more or less genetically related to crops, but unlike them, have not been domesticated)¹² and wild food sources. Tiger landscapes, being more strictly protected than other forests, store more carbon on average than other forests in the region, helping to mitigate climate change.¹³ Some critical benefits from tiger conservation are outlined in box 7 below.

Box 7: Wider socio-economic benefits of tiger conservation

Tiger conservation provides a major motivation in setting aside areas of natural and near-natural habitat, which bring many additional benefits to human societies. Some key issues, with examples, are outlined below:

- **Biodiversity:** to date, 332 key biodiversity areas (KBAs) have been identified in tiger habitat, and conserving tigers protects many other associated species.¹⁴
- **Flood prevention:** retaining forests smooths water flow and mitigates flooding risk.¹⁵
- **Landslide and avalanche control:** forests also buffer against rock and snow movement.¹⁶
- **Tidal surge:** tiger habitat in coastal mangroves in the Sundarbans National Park in Bangladesh helps to mitigate against storms and tidal surge.¹⁷
- **Carbon storage and sequestration:** the carbon capture storage of forests in Corbett National Park, India, is worth around US\$220/ha/year.¹⁸
- **Food security:** Thung Yai Wildlife Sanctuary in Thailand conserves genetic resources of important crops such as mango, rambutan and longan.¹⁹
- **Water security:** tiger conservation landscapes overlap nine globally important watersheds, serving 830 million people in 2010.²⁰
- **Economic development:** particularly through tourism. Ranthambore National Park in India, for example, supports 3,000 tourist beds and generates revenues of US\$0.5 million per year. About 100 people from the local community have been trained as Nature Guides and earn their livelihood from tourism, and the 110 villages inside the 2km reserve buffer zone are classified as the eco-development zone where livelihood activities augment incomes.²¹

But these benefits only make a difference to attitudes at a local level if the communities living in and around protected areas, and other areas important for tigers such as conservation corridors, receive a meaningful share of the benefits.²² Providing water for a faraway community, or economic benefits for a large and remote tourism company, is not much compensation to a poor farmer who has lost livestock or to a village feeling threatened by a tiger. On the other hand, once benefits are received and acknowledged, these communities, who as noted in section 2 have often had long-term and culturally significant links to tigers, are more likely to support conservation and be far less tolerant of wildlife crime.

Creating the conditions in which Indigenous peoples and local communities can benefit from tiger conservation is not an automatic process and often needs strategic intervention by governments and the donor community, both in financial terms and through supportive policies and legislation. These challenges are acknowledged by those working in tiger conservation, but still need to be better reflected in national law. In a survey delivered to over 1,500 public sector patrol rangers (in 102 tiger conservation areas across ten countries) between 2016 and 2019, 30 per cent of rangers felt that the laws and regulations of the conservation area were not in line with the values of local community members. A related survey of 1,167 community members living in or around protected areas in Myanmar showed that rangers' perceptions of how those community members felt was largely in line of the actual community responses to the same question (within 3.5 per cent). A similar proportion of community members in Myanmar (roughly one-third) also agreed that current laws unfairly restricted their access to resources (e.g., firewood and medicinal resources) and enjoyment of cultural practices.²³

Box 8: Moving people away from tigers

Hundreds of thousands of people have been forcibly relocated from protected areas around the world since the start of the twentieth century, and this approach draws increasing levels of criticism.²⁴ There are a growing number of critiques of this approach to conservation from an ecological perspective as well.²⁵ Relocating people from areas with tigers, and tigers from areas with people are both controversial management strategies; although welcomed by some communities,²⁶ there have been relatively few studies of either short or long-term impacts, or looking critically at costs and benefits.²⁷

This report offers a wide range of strategies to promote human-tiger coexistence, which is the antithesis to the relocation approach. Furthermore, there are clear international guidelines from the Convention on Biological Diversity²⁸ on developments impacting Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities and IUCN's guidelines defining and categorizing protected areas are clear that protected areas "should not be used as an excuse for dispossessing people of their land".²⁹ Where relocations do occur, the UN's Framework Principles on Human Rights and the Environment states "that the relocation of Indigenous peoples or traditional communities may take place only with their free, prior and informed consent and after agreement on just and fair compensation and, where possible, with the option of return".³⁰

The Conservation Assured Tiger Standards (CA|TS) (see box 24) do not endorse relocation but accepts that there may be exceptional cases where relocation occurs and clarifies good practices on this issue:

Standard 12.2: Relocation processes are voluntary, equitable and monitored.

Criteria 12.2.1: Any relocation should be undertaken only with:

- Free (i.e., voluntary), prior, informed consent (see box 4);
- Full representation at community level to ensure equity in decision-making;
- Fair compensation packages (e.g., in kind or financial);
- The rationale for relocation being clearly stated and communicated to local communities.

Criteria 12.2.2: Ongoing monitoring (e.g., up to five years after relocation) of commitments to relocated communities is in place.³¹

3.1 BENEFITS VIA DIRECT GOVERNMENT INVESTMENT

Governments can support tiger coexistence through direct and indirect incentives (financial support, preferential job access, provision of ecosystem services, etc.) and by structuring programmes and benefits to encourage maximum community ownership. Such community investment programmes can, if properly planned and managed, themselves deliver important return values to the state or implementing agencies. However, investment in tiger conservation across tiger range countries falls behind that of other countries with iconic species which stimulates major tourism income.³² And people living in and around protected areas across the tiger range still suffer from a lack of access to benefits resulting in inadequate livelihood opportunities, often compounded by restrictions on use of forest products and access to forest areas.

Direct government incentives to people living in tiger landscapes are often an essential component of maintaining tiger populations. Some of these payments are direct tools to address human-wildlife conflict – like compensation payments for livestock predation – but governments also have a wide range of other investment options that can reduce social tensions. Direct payment approaches for maintaining wildlife populations have proven successful in some parts of the world (see section 5).³³ Giving preferential access to jobs in the protected area to Indigenous peoples³⁴ and local communities living in the area, and providing them with proper training,³⁵ can also reduce the tensions that arise when enforcement of protected area rules is seen as solely the remit of outsiders. Jobs also give local people a genuine stake in management, as well as making sure money invested stays within the region (case study 5). In some countries, lack of schooling may prevent local people from rising above junior level employment and this can act as a disincentive; supportive actions (either changes in requirements or provision of additional training) may be needed to address these issues. More generally, government intervention around protected areas can support communities through, for instance, provision of social services and community infrastructure.



CASE STUDY 5: PROMOTING INDIGENOUS RANGERS IN MALAYSIA

Context

Orang Asli is the collective name for the Indigenous peoples of Peninsular Malaysia. They account for about 0.7 per cent of the population, about 215,000 people. Being a group of people known for their inherited highly refined survival skills in the forest, the government acknowledges the potentially significant contribution of the Orang Asli toward tiger conservation. Since 2020, the Orang Asli have been hired by the government to aid in patrolling Malaysian forest; to search for and destroy snares and other threats that endanger tigers and other wildlife.^{36,37}

Belum-Temengor

Located in the northern region of the state of Perak, the continuous rainforest complex of Belum-Temengor in Peninsular Malaysia covers approximately 300,000ha, and includes the Royal Belum State Park, which is contiguous with Halabala National Park in Thailand. Royal Belum State Park was gazetted as a protected area in 2007 under the Perak State Parks Enactment 2001. The park, which encompasses a total area of 117,500ha, is managed by Perak State Parks Corporation (PSPC), a statutory body of the Perak State government.

According to 2011 figures, there are over 2,000 Orang Asli from about 450 families living in Belum-Temengor Forest, with about 800 living in Royal Belum State Park; all those in the park are from the Jahai community, with Temiar communities based mainly in Temengor.³⁸

New protection initiatives

Despite being one of Southeast Asia's most important tiger landscapes, in 2009-2018 tigers declined by 50 per cent across the forest complex of Belum-Temengor.³⁹ Poaching was rampant between 2009 and 2011,⁴⁰ and from 2015 to 2017, 200 snares were removed from the park⁴¹ and there were many signs of illegal activity and poachers camps.⁴² Across the state, the lack of anti-poaching personnel was identified as a major problem in failing to halt the rapid decline in tigers and other species.⁴³

Since the appointment of a new PSPC Director at the end of 2018, conservation measures have been initiated through various collaborations with local and international partners. Subsequently, an experienced officer who has been involved in tiger monitoring and anti-poaching has been hired to lead the enforcement and patrolling activities of PSPC which has resulted in more coordinated patrolling within Royal Belum.

Due to the vast and remote forests of Royal Belum, PSPC is collaborating with other stakeholders for additional boots on the ground. Major support was received from WWF-Malaysia through Project Stampede where 55 people from the Jahai community were hired to conduct regular foot patrols and to monitor encroachment and poaching activities. Project Stampede has been successful in removing snares and channelling information on poaching activities in Royal Belum, which also led to the arrest of six foreign poachers by the enforcement agencies in September 2019.⁴⁴ Based on data gathered by WWF-Malaysia, there has been a more than 95 per cent reduction in the snares encounter rate observed in 2016-2019 due to the intensified patrolling efforts.

In addition, PSPC has also established a community based anti-poaching team called “Menraq” through collaboration with a local NGO Rimau. With funding support from Rimau, PSPC hired 14 Indigenous people from the Jahai tribe who live within the park to be part of the Menraq patrol team to conduct patrolling in Royal Belum.

The vital role of Indigenous rangers

Involving the Jahai community in the protection of Belum has been a major key to success in reducing poaching pressure on the park. Mohamed Shah Redza Hussein, who directs PSPC, notes, “*Nobody’s going to take care of somebody else’s house, somebody else’s garden. But the Indigenous community will look after and defend their own forest.*”⁴⁵ But the initiative has not been without its challenges. Directly employing Orang Aslis as park employees is difficult as most people do not meet the minimum education prerequisite for government service. However, this problem was initially overcome by hiring them under the sponsorship of the community-based conservation programme mentioned above.

After some setbacks due to the COVID-19 pandemic,⁴⁶ the patrolling effort in the region is expanding further and is now coordinated under one programme, the Biodiversity Protection and Patrolling Program (known as BP3) which is mobilizing hundreds of rangers consisting of veteran army and police personnel and Indigenous people. In January 2022, 800 Wildlife Rangers were officially appointed under BP3, a significant increase from the 150 appointed in 2020, when the programme was launched.⁴⁷ The majority of the newly appointed rangers, 439, are Orang Aslis. BP3 is managed by the Department of Wildlife and National Parks (DWNP), the Ministry of Energy and Natural Resources, and involves the Peninsular Malaysia Forestry Department, the Royal Malaysia Police, other enforcement agencies and NGOs.⁴⁸ The rangers will be patrolling selected protected areas throughout Malaysia, including Royal Belum. The appointments were made directly after the close of the 4th Asia Ministerial Conference on Tiger Conservation hosted by Malaysia. At that meeting, a drastic increase in ranger density was announced as one of Malaysia’s four commitments to the Southeast Asia Tiger Recovery Action Plan. Another 2,000 or so rangers will need to be added to reach the final ranger density goal, but this is a major boost in that direction.

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Investment in communities can bring concrete returns to the state. Government investment in community development around protected areas is not simply an ongoing cost but can pay back in numerous ways. A protected area surrounded by supportive communities is likely to be much less prone to incursions and poaching. Direct local poaching will diminish, and communities also provide the best information sources to help police track illegal wildlife poachers.⁴⁹ Additionally, as noted earlier, in addition to protecting tigers, natural ecosystems also provide a range of ecosystem services, with both social and economic values. But governments largely fail to recognize these benefits, and even if they are acknowledged they are treated as free goods and not subject to valuation, so that returns on conservation investment remain unknown.⁵⁰

3.2 ECONOMIC BENEFIT-SHARING MODELS

Sharing benefits with local communities helps address the potential imbalance of local costs and national or global benefits that can arise from conservation projects. Successful conservation will ensure that a fair proportion of the benefits reach the local people who live in and around the protected area. Benefit-sharing should not be approached in isolation and must be considered in the context of the broader social risk and impact management process. The section below describes some good practices regarding understanding benefits and ensuring that these are equitably distributed, particularly regarding Indigenous peoples and local communities.

Benefit-sharing is vital if local communities are to remain supportive of conservation. Many economically successful ventures drawing on the resources of protected areas, including ecotourism ventures, fail to distribute anything but a very minor part of their revenue to the local communities who bear the bulk of the immediate costs of conservation. Even when benefits are shared, power imbalances can cause their distribution to be far from equitable.⁵¹ It is in the interests of both governments and private companies to have supportive communities in and around protected areas, and responsible, fair benefit-sharing schemes are a key contributor to local support and sustainable management. While such schemes are often (although not always) a feature of community-run ventures, they frequently require effort and special planning for state or private protected areas.

Principles for equitable benefit-sharing mechanisms exist. For example, a set developed for the IUCN Commission on Environmental, Economic and Social Policy includes: (i) using culturally appropriate approaches to identify economic and non-economic benefits from protected areas; (ii) recognizing the economic, social, cultural, spiritual and political dimensions of these benefits (i.e. ensuring that one aspect of benefits does not overshadow others); (iii) favouring those who bear significant costs of protection among the beneficiaries of ecosystem services; (iv) recognizing the need for values, principles and good

governance to ensure a just and fair process to equitable access, sharing and distribution of benefits; (v) not undermining conservation objectives in protected areas through prioritizing the management and use of ecosystem services; (vi) respecting the role, norms and institutions of resident and local communities when use and maintenance of ecosystem services requires active management; (vii) basing negotiations on culturally appropriate and locally legitimate approaches; (viii) recognizing both customary and statutory laws when these exist side by side; and (ix) ensuring compensation mechanisms when available ecosystem services are insufficient to compensate local communities for benefits foregone.⁵²

Benefit-sharing can come from an agreed and regular tariff, preferential employment opportunities and active support of associated ventures. Tariffs may be applied in the form of a regular agreed sum, or a proportion of the money collected such as gate fees, a fixed supplement to ecotourism fees or voluntary payments from tourists visiting the site. Decisions to only employ, or mainly employ, local people can bring important finances into a community; each employee is likely to be supporting several other family members. Protected and conserved areas can also through their policies and actions support other economic ventures in the area, sometimes by direct financial support (e.g., start-up funds for small businesses) but more usually and widely by providing space for local people to sell wares, working in tandem with hotels, guest houses, home stays and restaurants, using local guides and collaborating with ecotourism ventures.⁵³

A key step in ensuring effective benefit-sharing is for managers of protected and conserved areas to understand the range of actual and potential benefits to local communities. This may be very clear-cut in cases where area-based conservation is under the control of local stakeholders, but when managers come from far away (and are often in post for a relatively short time) they may be unaware of many of the ways in which local communities traditionally use these areas. Here the importance of recognition (in terms of recognition and respect for the rights of rights-holders) and procedure (in terms of full and effective participation of all relevant actors) as noted above are particularly important. A thorough understanding of the values and benefits can help management planning, often allowing opening up for uses that do not undermine the overall conservation objectives. There are an increasing number of tools available for assessing the ecosystem services available from a particular area.⁵⁴ We discuss one in box 9.

Private sector-community arrangements to share benefits may need additional facilitation. Benefit-sharing does not happen automatically. Enterprises working in and around protected and conserved areas are often managed by outsiders, who may have little knowledge or experience about engaging local communities in their operations; their default may be to hire in people from outside who they feel comfortable with. There may be language barriers, cultural barriers and the need for capacity building. Managers can help this process in a number of ways; by lending the assistance of rangers to help negotiate and facilitate agreements with local communities, by helping to develop or by running capacity building programmes so that local people develop the requisite skills to work in related tourism ventures. Section 5 discusses various options for payments to provide support for coexistence.

Box 9: The Protected Area Benefits Assessment Tool

The Protected Areas Benefits Assessment Tool Plus (PA-BAT+) describes how to run a participatory, consensus-led evaluation of the range of ecosystem services available from a protected area (or any other defined area of land or water). It brings together a diverse range of stakeholders in a workshop. A standardized set of questions helps to identify and assess the level of importance and distribution of current and potential ecosystem services ranging from tourism, through water security and disaster risk reduction, to cultural and spiritual benefits. Open discussion allows facilitators to discuss information on any additional benefits, problems, local experiences and stories, and suggestions for managers. Most importantly, managers get to hear the views of stakeholders, and different members of the community have a chance to interact and share ideas and experiences. The information gained can often feed directly into management plans or stimulate projects to help communities to benefit from protected areas in their vicinity.

The tool focuses on the legal use of resources which do not undermine conservation, so it is not a cost-benefit analysis; it can however also be used as a fact-finding assessment for looking in more depth at issues of resource use, rights, costs and benefit-sharing (see box 10).

Identifying the wider benefits of conservation also reassures governments that biodiversity conservation is not simply wasted space and helps donor agencies to plan associated projects. Although to date used mainly in state-run protected areas, the approach is completely compatible with looking at benefits from community-run and privately managed areas, whether protected areas or not, and for ICCAs.⁵⁵

3.3 LEGAL AUTONOMY FOR LOCAL PEOPLES

Tiger conservation across much of the range has tended to focus on a zoned approach to management; with provisions for a highly protected government managed core zone with a viable tiger source population and a buffer zone that is often a sink habitat within a wider landscape of multiple uses areas and habitat corridors that connect tiger populations.⁵⁶ As attitudes to conservation have changed, policies and legislation to realign conservation with the rights of communities and strengthen community governance institutions in conservation areas are beginning to be implemented. There are, however, continued reports of legislation being watered down, interpreted in ways that do not live up to policy claims and rights long fought for are still being undermined.^{57,58} Local participation in conservation is an essential step in ensuring coexistence with predators such as tigers; without it HTC and retaliation scenarios (see section 4) are likely to continue and even increase. Vital to this effort will be strategies which ensure livelihood opportunities and effective benefit-sharing.

Legal rights to governance of natural resources by Indigenous peoples, local communities or collectives should be acknowledged. Around the world the acknowledgement of the rights of Indigenous peoples, local communities or collectives to own or control resources as common property is increasing. In some cases these rights are also being recognized in legislation (e.g., the Nepalese Forest Act of 1993). Under customary tenure arrangements, people gain access to the commons as a social right due to their membership of the local community or specific collective. As of 2017, Indigenous people and local communities were, for example, legally recognized as owners of at least 447 million hectares of the world's forests and had designated rights to an additional 80 million hectares.⁵⁹

Devolved ownership can lead to increased sustainable management of resources. The role of Indigenous peoples and local communities in conservation has been noted above (see section 2).⁶⁰ There is also a growing evidence base that devolved rights over resources to communities can, in some circumstances,⁶¹ promote greater equity in benefits distribution and sustainability.^{62,63,64} Governance structures and management arrangements vary around the world, but the distinguishing feature of community-managed and owned forests is that the community as a whole is recognized as the rights-holder, and either new governance structures are established or existing ones are expressly given the mandate to govern and manage access to and use of the land/resources (see box 12). As joint holders of the resource rights, members of the community at large are then also the beneficiaries of revenue generated.⁶⁵

Box 10: Tools for assessing the social impacts, governance and equity of conservation

IIED has developed three practical and relatively low-cost tools for stakeholders/rights-holders (actors) to assess the social impacts, quality of governance and equity of conservation and associated development activities. The tools are listed below and a brief overview comparing the tools and their requirements has also been developed:⁶⁶

- Social assessment for protected areas (SAPA)⁶⁷ focuses on impacts of area-based conservation on the well-being of local people, plus a basic governance assessment. SAPA can be used with almost any type of protected or conserved area.
- Governance assessment for protected and conserved areas (GAPA)⁶⁸ focuses on governance challenges and underlying causes but only for protected and conserved areas where actors are willing to explore sensitive governance issues.
- Site-level assessment of governance and equity (SAGE)⁶⁹ focuses on governance and equity. SAGE is less deep than GAPA but covers a broader scope of issues and costs less. SAGE can be used with any type of protected and conserved areas.

Locally based management does not always include a change in land rights. Community resource boards or similar have been developed around the world (see boxes 11 and 13). In these cases, local communities with an interest in wildlife and natural resources apply to the wildlife or forestry authority to register a board. In Zambia, for example, once formally constituted, the wildlife authority and board consult on the development management plans and aim to develop an integrated approach to the management of human and natural resources. The board can develop co-management agreements, manage wildlife under its jurisdiction, appoint village scouts to assist in performing duties of wildlife rangers and can establish a fund to enhance the economic and social well-being of the local community.⁷⁰ An umbrella organization supports the governance of the 76 community resources boards set up to date. The boards are acknowledged as the “voice of the rural communities” who reside in protected areas and ensure communities derive tangible and sustainable benefits from the sustainable use of natural resources.⁷¹

Public sector and donor investments are critical to supporting devolution of resources. Researchers suggest that although different sources of financial investment can support community-managed and owned

resources, public sector and donor investments are critical in the first phase when risks to investors are highest. Private sector finance is more likely to be available when businesses are established. In Nepal, there are around 15,000 small-scale forest enterprises, most supporting furniture businesses (69 per cent), with 17 per cent supporting medicinal and aromatic plants and other NTFP enterprises and 13 per cent sawmills. Sustainable management has been focused on nature-based tourism,⁷² however as noted above, concentrating on one revenue stream in an uncertain world is not necessarily recommended.

Co-management agreements will need adequate funding support. Funding co-management is best based around equitable benefit-sharing models. In Bangladesh, the participation of local communities in the decision-making processes surrounding the management of protected areas is funded through communities receiving 50 per cent of park entrance fees and 75 per cent of income from plantations collectively managed in forested land in adjacent buffer zones (see box 13). The Co-Management Committee’s income from these revenues gives it a degree of independence and sustainability.⁷³

Box 11: Introducing a legal framework for community decision-making authority on biodiversity, an example from Namibia

Land in Namibia, outside urban areas, is mainly divided into areas held under private freehold tenure and communal land, which cannot be bought or sold and is held in trust by the state for the benefit of traditional communities.⁷⁴ The state has the duty to administer communal lands for the purpose of promoting the economic and social development of the Namibian people.⁷⁵

Developing community conservancies

Namibia gained independence from South Africa in 1990. Constitutional reform followed quickly. In 1995, the Ministry of Environment and Tourism (MET) established a framework for community-based natural resource management.^{76,77} This gave conditional rights over wildlife to communal areas and allowed communal conservancies to derive financial benefits from sustainable wildlife use and tourism.⁷⁸ The following year, the Nature Conservation Amendment Act gave communities residing on communal land, and desiring to have the area or any part of the area declared a conservancy, the mechanisms to apply to the Ministry to form a conservancy⁷⁹ and further gave conservancies the rights over wildlife and tourism in the area. The Amendment⁸⁰ stipulated that the geographic area proposed as a conservancy should be discussed with others before being proposed,⁸¹ and that conservancies could not be part of an existing game park.

Conservancies have transparent processes for elections of a conservancy management committee. Conservancy applications must include a constitution for the proposed conservancy committee that, i) provides for transparent elections of committee members; ii) specifies conditions under which committee members can be replaced (e.g., no confidence votes); iii) specifies how conflicts of interest in decision-making or benefit distribution will be addressed; and iv) provides mechanisms that ensure proper financial management. When the application is submitted, the Minister must be satisfied that the conservancy will represent the community living in the area.⁸²

Importantly, conservancies themselves decide how to spend wildlife related revenues. For instance, they can be directly distributed among households, or used toward other projects. They are also designed to manage wildlife for benefit of the residents in the conservancy, function as community-level institutions, and can enter directly into agreements with the private sector, among others.

Conclusions

It is not the role of the Ministry or NGOs actively to establish conservancies, but to support and assist those communities that indicate they want to form a conservancy. Legislative changes needed to promote these kinds of developments involve long-term processes, starting with an assessment of options and considering both legal avenues available and potential roadblocks to introducing changes of this kind.

Box 12: Eight conditions for effective community-based management

A classic in terms of defining the principles of sustainable and equitable management, Elinor Ostrom's eight principles for how commons can be governed, can be easily adapted to focus on community-based conservation management.⁸³

1. **Clearly define boundaries:** Individuals or households who have rights to manage resources must be clearly defined, as must be the boundaries of the area where management is taking place.
2. **Governance rules must match local needs and conditions:** Rules managing resource use are related to local conditions.
3. **Collective-choice arrangements:** Ensure that those affected by the rules can participate in modifying the rules.
4. **Monitoring and accountability:** Once rules have been set, communities need a way of checking that people are keeping to them.
5. **Graduated sanctions:** People who violate management rules are subject to graduated sanctions (depending on the seriousness and context of the offence) set by the community.
6. **Conflict-resolution mechanisms:** Mechanism to resolve conflicts should be easy to access, low-cost and local.
7. **Recognition of rights to organize:** The rights of users to devise their own management institutions are not challenged by external governmental authorities.
8. **Larger networks:** Regional cooperation or networks of community-based organizations ensure greater cooperation.

Box 13: Co-management in Bangladesh

Over 20 years, the concept of co-management has evolved through different government, non-government and donor agencies community-based natural resource management projects in Bangladesh. Co-management of protected areas is sanctioned in Bangladesh's Wildlife (Protection and Security) Act of 2012. Three tiers of management are recognized.

1. Households within 5km of the protected area can join Village Conservation Forums (VCFs) where a household nominates one individual to be the General Member of the VCF. Each VCF has a seven member Executive Body with 50 per cent women representation. The members of the forum assist the Co-management Committee and Bangladesh Forest Department (BFD) to design and implement the protected area management plan. The forums also raise awareness about forest resources usage, wildlife conservation and climate change issues to the community.
2. At the forest range level, a People's Forum (PF) is made up of representatives (one man and one woman) from the VCFs from PA landscape communities. The PF has an 11-person Executive body (which is nominated every two years). The forum raises awareness of natural resource management and biodiversity conservation and assists in project planning, and the PF is remitted to ensure participation by marginalized groups in project planning and implementation.
3. The Co-Management Committee (CMC) is a formal body of about 38 members from the community, central and local administration and civil society representation. The management arm is the 19-person Co-Management Executive Committee (CMEC) which has representation from all stakeholder groups. The CMEC is the functional entity of the co-management arrangement and leads on conservation and community welfare activities. The general CMC approves the management plan for the protected area and negotiates the necessary fund arrangements with the Bangladesh government. The CMC also initiates Community Patrol Groups, Youth Clubs and Eco-Tour guides selected from villages and represented in CMCs.

Although definitely seen as contributing to the local autonomy of protected area management, challenges to implementing co-management include accountability and transparency of CMCs; political manipulation and command and control by the local elites; laws, rules and policies not being widely and clearly shared with local communities; exploitation of protected areas in terms of local empowerment and overuse of biological resources (e.g., illegal logging, land encroachment, wildlife poaching; unplanned ecotourism; aquaculture and agricultural practices) and poor recognition of local and Indigenous people's traditional forest rights.⁸⁴

CASE STUDY 6: BIKIN NATIONAL PARK, RUSSIA: “THE TIGER AND THE UDEGE PEOPLE ARE THE SAME”⁸⁵

Overview

Bikin National Park in the region of Primorsky Krai of the Russian Far East is the first national park in Russia that considers the interests of Indigenous peoples through co-management.^{86,87} The story of how this evolved is complex, but so is protected area establishment and management in general.

The park, which preserves a large massif of intact forests in the Bikin River valley, was established in 2015 and was added to the World Heritage Site Central Sikhote-Alin in 2018. Covering more than 1.16 million ha, the area is sparsely inhabited but vitally important for the livelihoods of the Udege, Nanai and Orochs people. Many places, features and species have intangible cultural and spiritual values,⁸⁸ including the Siberian tiger which is considered to be an ancestor in the Udege creation story.⁸⁹ The area also has important gold and coal deposits, and a large volume of wood, especially valuable species such as cedar, oak, pine and ash, so has faced many threats from large-scale extractive industries.⁹⁰

There are only around 1,500 Udege people left in Russia, about 400 of them live in several small settlements neighbouring Bikin National Park,⁹¹ including the village of Krasny Yar, the unofficial capital of the Udege.⁹² Although the Udege are not the only Indigenous people in the area, their connection with the area and their leadership in the development of the protected area are the focus of this case study.

Communism, land reform and the market economy

Government involvement in resource management and related activities in the area can be traced back to the Beijing Treaty of 1860 which established the Amur region and Primorsky as territories of Russia. This brought a “Western” land tenure system into the region, although it did not dramatically impact the lifestyle of the inhabitants.⁹³ In 1957, the Udege and other people in the area moved into a new village Krasny Yar, chosen for its position on a high river bank away from flooding, which has been a persistent problem in the region. The state production organization, Gospromkhoz, was established in the village unifying the management of hunting, gathering and fishing activities,⁹⁴ with products sent directly to the government in return for state wages. Many Indigenous people left the traditional way of life and chose other professions, often away from the region.

Despite these changes, hunting remained far more important and profitable than forestry (for 80 per cent of the population hunting provided a significant part

of the family budget, the remaining 20 per cent came from working for the public sector)⁹⁵ and hunting grounds were, mainly, protected from logging.⁹⁶ By the middle of the 1970s, about 120 hunters were employed by Gospromkhoz, including about 90 on a permanent basis.⁹⁷ Management and governance, however, changed again when Communism collapsed in 1991 and a shift to a market economy began. Just a year later, logging plans were in place for the upper basin of the Bikin, proposed by a joint venture between a South-Korean company and the Primorsky regional government. This plan was strongly objected to by the Udege, and other local people, who called for the forest to be conserved.

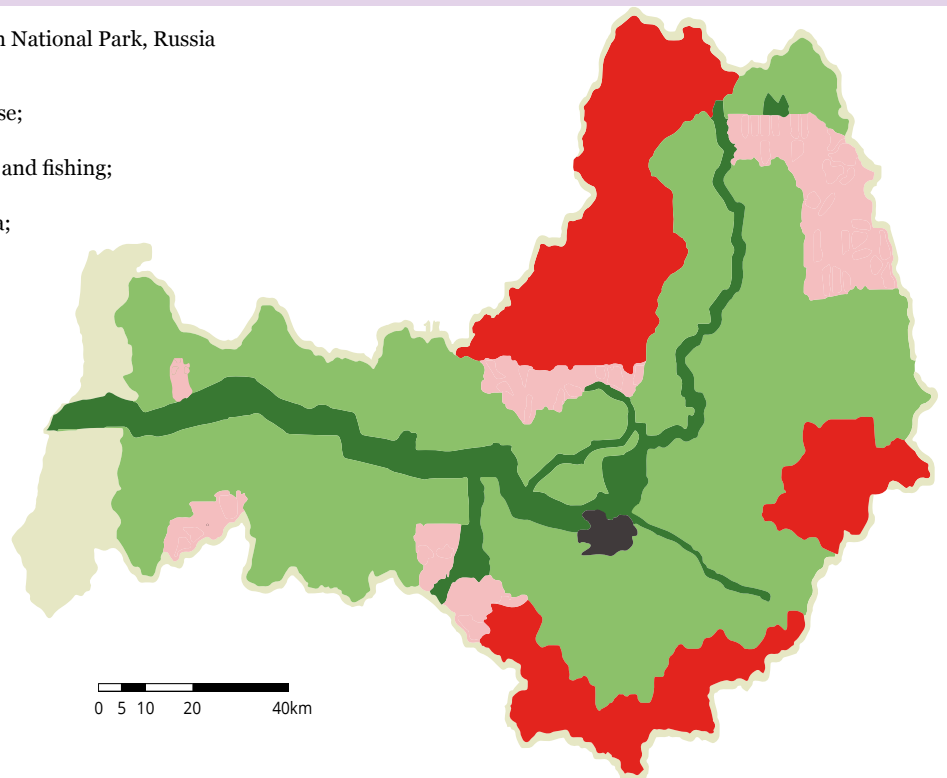
This appeal for conservation aligned with a parallel recognition of the need to change legislation and policy around governance of Indigenous territories linked to this period of land reform. In 1992, a Presidential Edict (No. 397), “On urgent measures for defending the places of residence and economic activity of the small-numbered peoples of the North,” identified that the preservation of Indigenous territories was reliant on the pursuit of “traditional” Indigenous activities, such as reindeer pasture, and hunting and fishing grounds. The edict called for the Russian Federation central and regional governments to determine territories of traditional nature use in the north and which without their agreement would not be subject to industrial or other development that is not connected with traditional economic activities.⁹⁸ Putting policy into national law took time, and only in 2001 did the “Territory of Traditional Nature-Use” (*territoriya traditsionnogo prirodopol'zovaniya*, or TTP) become federal law. However, on the strength of the Edict, numerous regions initiated their own legislative acts regarding the establishment and operation of TTPs.⁹⁹ This was the case in Primorsky Krai, where in 1992 the upper basin of the Bikin and about 1.25 million ha of the upper and middle basin of the Bikin were registered as a TTP¹⁰⁰ known as “The Tiger”¹⁰¹ (previously called the Bikin National Hunting Entity) which succeeded the Gospromkhoz.

A collaborative effort

In 2014, the calls for further conservation in Bikin became both complex and urgent as resource use plans continued to develop. Between 2013 and 2016, the Centre for Support of Indigenous Peoples of the North (CSIPN) led a top-level negotiation between the Udege and the Russian government for the creation of the National Park; with the aim of protecting and promoting Indigenous rights and the Udege’s full involvement in decision-making.¹⁰² With the assistance of the CSIPN and the Amur branch of WWF-Russia, roundtables were arranged between ecologists, scientists and representatives of Indigenous peoples within Russia that had conflicts with existing national parks. The results were formulated into seven proposals, which the Udege presented to the administration asking them to:

Figure 5: Zoning scheme in Bikin National Park, Russia

- Zone of traditional nature use;
- accessible areas for tourism and fishing;
- totally restricted nature area;
- partial use zone
- buffer zone



1. Guarantee the opportunity to engage in traditional fishing on national park land
2. Guarantee unhindered access to national park territory for all the inhabitants of the villages within its boundaries, as well as their relatives
3. Consider any products obtained by Udege hunters on the territory of the national park to be the property of the hunters, who can use them for any purposes, including commercial ones
4. Create a system of co-management of the national park with Indigenous people
5. Guarantee jobs at the national park for Indigenous people
6. Prohibit reduction of the territories of the Udege people under traditional stewardship under any circumstances—though they may be expanded
7. Utilize, and take into account without exception, ethnological surveys and expertise in the formation of the national park.¹⁰³

This wide-ranging advocacy and set of clearly articulated requests was successful. The first six proposals were agreed and later codified within the park regulations. On the final point, WWF-Russia partnered with the Udege to conclude an ethnographic survey that assessed Indigenous peoples' historic claims, customary rights, cosmovision and governance in the area.¹⁰⁴

A change to the Law on Protected Areas of the Russian Federation in 2015¹⁰⁵ meant that protected areas could now include areas “dominated by native, undisturbed or slightly disturbed landscapes and ecosystems, where Indigenous and local population perform their traditional activities that do not lead to the transformation of landscapes and ecosystems”,¹⁰⁶ and the law allowed for zoning in National Parks, including “zones of traditional extensive nature use dedicated to maintaining the living activities of small-in-numbers Indigenous peoples of the Russian Federation, within which traditional activities are permitted, along with the related types of sustainable nature use”.¹⁰⁷

Bikin National Park

As a consequence of these processes, decree No. 1187, also in 2015, established a protected area in the middle and upper parts of the Bikin Rivers basin. The park brought together the TTP in the middle reaches of the Bikin River and the contiguous Verkhnebikinsky Sanctuary in the upper reaches.¹⁰⁸ The Udege and Federal government agreed a co-management approach to natural resources and forest management, which respects traditional knowledge and customary law and all the proposals set out above.¹⁰⁹ WWF, community representatives, and other institutes formed a Bikin Working Group to draft key documents pertaining to the park.¹¹⁰ About 70 per cent of Bikin is used traditionally (see figure 5),¹¹¹ divided between Udege families in 24 ancestral hunting ranges.¹¹² The state authorities in Primorsky Krai are required to respect the traditional use of nature and the way of life of the Indigenous peoples, including through provision of tax

benefits and facilitation of cottage industries. Authorities support the education and employment of Indigenous youths, and Indigenous peoples are prioritized, depending on qualification and experience, when employing national park staff.¹¹³

The Permanent Council of Indigenous Peoples¹¹⁴ has been established under the national park management to lead and consult on all issues related to Indigenous peoples and their rights in the park, as an advisory board and self-governance entity.¹¹⁵ The Council is responsible for delineating boundaries of the hunting ranges, defining hunting limits and timeframe, and ecotourism development. The Committee has 15 elected members with a two-thirds majority of Indigenous representatives. The chair of the Committee serves as one of several deputy directors responsible for traditional resource use of the park.¹¹⁶ These owners have rights to control non-regulated visitors, inform the park management about violations, and conduct patrolling together with state inspectors. The 12 Indigenous members including hunters, elders, women and youth meet every week to discuss all the relevant issues related to traditional activities, like hunting and fishing

regulation, traditional knowledge and the promotion of ecotourism. Of a total park staff of 120, 70 per cent are Indigenous staff.¹¹⁷

In 2017, the first-ever camera trap monitoring was set up in Bikin; they recorded 10 male and 10 female tigers, along with two litters of cubs.¹¹⁸

Conclusions

- It took three years of negotiations to create the co-management approach and many years before that to put in place the enabling conditions for co-management.
- Indigenous leaders and many partners from multiple disciplines were involved in the negotiations.
- Legislation and policy change was vital for the success of making Bikin a protected area developed with, and for, the local Indigenous people.

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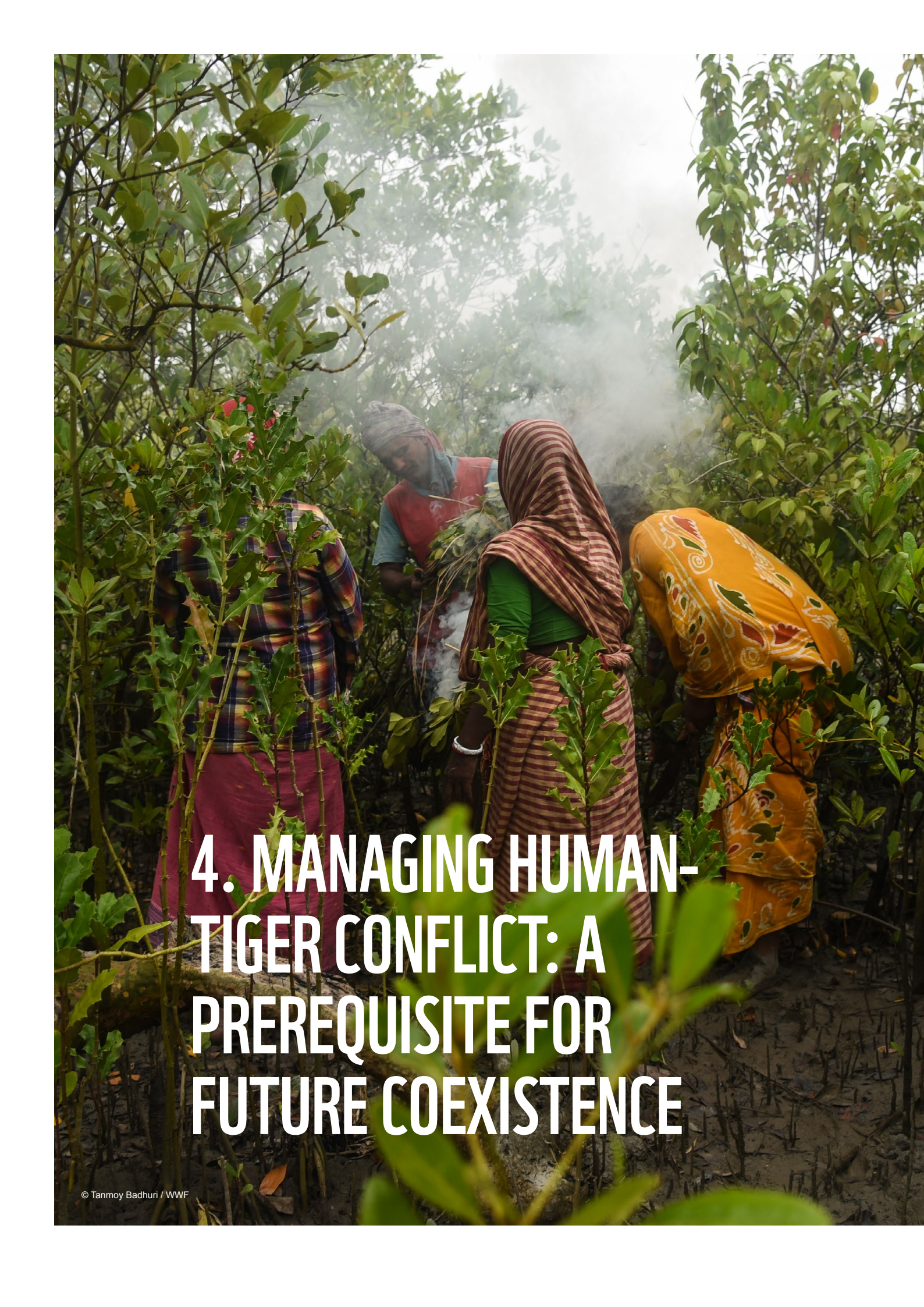


REFERENCES AND NOTES

- 1 Pooley, S. 2021. Coexistence for Whom? *Frontiers of Conservation Science* 2: 726991. DOI: 10.3389/fcosc.2021.726991
- 2 Manoj, E.J. 2021. 40 killed in tiger attacks in the country last year. *The Hindu*, 13 September 2021. Retrieved from: <https://www.thehindu.com/news/national/kerala/40-killed-in-tiger-attacks-in-the-country-last-year/article36442241.ece>
- 3 Acharya, K.P., Paudel, P.K., Neupane, P.R. and Köhl, M. 2016. Human-wildlife conflicts in Nepal: patterns of human fatalities and injuries caused by large mammals. *PLoS One* 11: e0161717. DOI: 10.1371/journal.pone.0161717.
- 4 Bangladesh Forest Department. 2018. Bangladesh Tiger action plan 2018-2027. Dhaka, Bangladesh.
- 5 Lubis, M.I., Puspardini, W., Prabowo, S.A., Marthy, W., Tarmizi, N., Andayani, M. et al. 2020. Unraveling the complexity of human-tiger conflicts in the Leuser Ecosystem, Sumatra. *Animal Conservation* 23: 741-749. DOI: 10.1111/acv.12591
- 6 Struebig, M.J., Linkie, M., Deere, N.J., Martyr, D.J., Millyanawati, B., Faulkner, S.C. et al. 2018. Addressing human-tiger conflict using socio-ecological information on tolerance and risk. *Nature Communications* 9: 3455. DOI: 10.1038/s41467-018-05983-y
- 7 Miller, J.R.B., Jhala, Y.V. and Jena, J. 2016. Livestock losses and hotspots of attack from tigers and leopards in Kanha Tiger Reserve, Central India. *Regional Environmental Change* 16: 17-29. DOI: 10.1007/s10113-015-0871-5
- 8 Bargali, H.S. and Ahmed, T. 2018. Patterns of livestock depredation by tiger (*Panthera tigris*) and leopard (*Panthera pardus*) in and around Corbett Tiger Reserve, Uttarakhand, India. *PLoS ONE* 13: e0195612. DOI: 10.1371/journal.pone.0195612
- 9 Chowdhury, A.N., Mondal, R., Brahma, A. and Biswas, M.K. 2016. Ecopsychosocial Aspects of Human-Tiger Conflict: An Ethnographic Study of Tiger Widows of Sundarban Delta, India. *Environmental Health Insights* 10: EHI.S24899. DOI: 10.4137/EHI.S24899.
- 10 Belecky, M., Singh, R. and Moreto, W. 2019. *Life on the Frontline 2019: A Global Survey of the Working Conditions of Rangers*. WWF.
- 11 Balmford, A., Green, J.M.H., Anderson, M., Beresford, J., Huang, C., Naidoo, R. et al. 2015. Walk on the Wild Side: Estimating the Global Magnitude of Visits to Protected Areas. *PLoS Biology* 13: e1002074. DOI: 10.1371/journal.pbio.1002074
- 12 <http://www.crowwildrelatives.org/cwr/> (accessed 16 May 2022).
- 13 WWF. 2017. *Beyond the Stripes: Save tigers, save so much more*. WWF International, Gland, Switzerland. Retrieved from: https://files.worldwildlife.org/wfcmprod/files/Publication/file/99xulvkuno_BEYOND_THE_STRIPES_WEB_VERSION.pdf?_ga=2.49016928.719134679.1650119851-46536746.1648568655
- 14 IUCN. 2016. *A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0*. First edition. IUCN, Gland, Switzerland. Retrieved from: <https://portals.iucn.org/library/sites/library/files/documents/2016-048.pdf>
- 15 Bradshaw, C.J.A., Sodhi, N.S., Peh, K.S.-H. and Brook, B.W. 2007. Global evidence that deforestation amplifies flood risk and severity in the developing world. *Global Change Biology* 13: 2379-2395. DOI: 10.1111/j.1365-2486.2007.01446.x
- 16 WWF. 2017. *Op cit*
- 17 Haque, U., Hashizume, M., Kolivras, K.N., Overgaard, H.J., Das, B. and Yamamoto, T. 2012. Reduced death rates from cyclones in Bangladesh: what more needs to be done? *Bulletin of the World Health Organization* 90: 150-156. DOI: 10.2471/BLT.11.088302
- 18 Badola, R., Hussain, S.A., Mishra, B.K., Konthoujam, B., Thapliyal, S. and Dhakate, P.M. 2010. An assessment of ecosystem services of Corbett Tiger Reserve, India. *The Environmentalist* 30: 320-329. DOI: 10.1007/s10669-010-9278-5
- 19 FAO. 1998. *The State of the World's Plant Genetic Resources for Food and Agriculture*. FAO, Rome and Cambridge University Press, Cambridge, UK.
- 20 Global Tiger Initiative Secretariat. 2011. *Global Tiger Recovery Plan*. The World Bank, Washington DC.
- 21 Verma, M., Negandhi, D., Khanna, C., Edgaonkar, A., David, A., Kadekodi, G. et al. 2015. *Economic Valuation of Tiger Reserves in India: A Value+ Approach*. Indian Institute of Forest Management. Bhopal, India. Retrieved from: http://www.indiaenvironmentportal.org.in/files/file/IIFM_Tiger%20Report_2019.pdf
- 22 Corbera, E., Kosoy, N. and Martínez Tuna, M. 2007. Equity implications of marketing ecosystem services in protected areas and rural communities: Case studies from Meso-America. *Global Environmental Change* 17: 365-380. DOI: 10.1016/j.gloenvcha.2006.12.005
- 23 Belecky, M., Singh, R. and Moreto, W. 2019. *Life on the Frontline 2019: A Global Survey of the Working Conditions of Rangers*. WWF. Retrieved from: https://files.worldwildlife.org/wfcmprod/files/Publication/file/k36blpy2c_wwf_rangers_survey_report_2019.pdf?_ga=2.44897378.719134679.1650119851-46536746.1648568655
- 24 Cernea, M.M. and Schmidt-Soltau, K. 2006. Poverty Risks and National Parks: Policy Issues in Conservation and Resettlement. *World Development* 34: 1808-1830. DOI: 10.1016/j.worlddev.2006.02.008
- 25 For example, Kabra, A. 2019. Ecological Critiques of Exclusionary Conservation. *Ecology, Economy and Society—the INSEE Journal* 2: 9-26. DOI: 10.37773/ees.v2i1.51
- 26 Harihar, A., Verissimo, D. and MacMillan, D.C. 2015. Beyond compensation: Integrating local communities' livelihood choices in large carnivore conservation. *Global Environmental Change* 33: 122-130. DOI: 10.1016/j.gloenvcha.2015.05.004
- 27 Lasgorceix, A. and Kothari, A. 2009. Displacement and Relocation of Protected Areas: A Synthesis and Analysis of Case Studies. *Economic and Political Weekly* 44: 37-47. Retrieved from: <https://www.epw.in/journal/2009/49/special-articles/displacement-and-relocation-protected-areas-synthesis-and-analysis>
- 28 Secretariat of the Convention on Biological Diversity. 2004. *Akwé: Kon Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessment regarding Developments Proposed to Take Place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities*. CBD, Montreal. Retrieved from: <https://www.cbd.int/doc/publications/akwe-brochure-en.pdf>
- 29 Dudley, N. 2008. *Guidelines for Applying Protected Area Management Categories*. IUCN, Gland, Switzerland. Retrieved from: <https://portals.iucn.org/library/sites/library/files/documents/pag-021.pdf>
- 30 www.ohchr.org/en/issues/environment/srenvironment/pages/frameworkprinciplesreport.aspx
- 31 Conservation Assured. 2020. *CA/TS Manual Version 2.1* January 2020, Conservation Assured, Singapore.
- 32 Landy, F., Rodary, E. and Calas, B. 2018. Why Did Leopards Kill Humans in Mumbai but not in Nairobi? Wildlife Management in and around Urban National Parks. In: F. Landy (ed), *From Urban National Parks to Natured Cities in the Global South: The Quest for Naturbanity*, pp 157-179. Springer, Singapore. DOI: 10.1007/978-981-10-8462-1_7
- 33 Eshoo, P.F., Johnson, A., Duangdala, S. and Hansel, T. 2018. Design, monitoring and evaluation of a direct payments approach for an ecotourism strategy to reduce illegal hunting and trade of wildlife in Lao PDR. *PLoS ONE* 13: e0186133. DOI: 10.1371/journal.pone.0186133.
- 34 Ayre, M., Yunupingu, D., Wearne, J., O'Dwyer, C., Vernes, T. and Marika, M. 2021. Accounting for Yolju ranger work in the Dhimurru Indigenous Protected Area, Australia. *Ecology and Society* 26: 24. DOI: 10.5751/ES-12149-260124
- 35 Appleton, M.R. 2016. *A Global Register of Competences for Protected Area Practitioners*. IUCN, Gland, Switzerland. Retrieved from: https://www.iucn.org/sites/dev/files/content/documents/global_register_of_competences_for_pa_practitioners_e_version_o.pdf
- 36 <https://www.aljazeera.com/news/2022/3/7/malaysia-last-chance-to-save-the-malayan-tiger> (accessed 22 March 2022).
- 37 [https://www.ketsa.gov.my/ms-my/pustakamedia/KenyataanMedia/SIARAN%20MEDIA%20MAJLIS%20PERASMIAN%20DAN%20PENYAMPAIAN%20WATIKAH%20PELANTIKAN%20VETERAN%20ANGKATAN%20TERENGA%20MALAYSIA%20DAN%20ORANG%20ASLI%20\(VetOA\)%20SEBAGAI%20RENJER%20HIDUPAN%20LIAR%20BAGI%20BIODIVERSITY%20PROTEKSI%2026%20PATROLLING%20PROGRAMME%20\(BP3\).pdf](https://www.ketsa.gov.my/ms-my/pustakamedia/KenyataanMedia/SIARAN%20MEDIA%20MAJLIS%20PERASMIAN%20DAN%20PENYAMPAIAN%20WATIKAH%20PELANTIKAN%20VETERAN%20ANGKATAN%20TERENGA%20MALAYSIA%20DAN%20ORANG%20ASLI%20(VetOA)%20SEBAGAI%20RENJER%20HIDUPAN%20LIAR%20BAGI%20BIODIVERSITY%20PROTEKSI%2026%20PATROLLING%20PROGRAMME%20(BP3).pdf) (accessed 22 March 2022).
- 38 Kamal, S. 2020. Rationalising the Role of Orang Asli in Comanagement of the Royal Belum State Park, Malaysia. *Journal of Tropical Forest Science* 32: 361-368. DOI: 10.26525/jtfs2020.32.4.361
- 39 Belecky, M. and Gray, T.N.E. 2020. *Silence of the Snares: Southeast Asia's Snaring Crisis*. WWF International. Retrieved from: https://wwfasia.awsassets.panda.org/downloads/southeast_asia_snaring_crisis_wwf_gJuly2020_v1_1.pdf
- 40 Schwabe, K.A., Carson, R.T., DeShazo, J.R., Potts, M.D., Reese, A.N. and Vincent, J.R. 2015. Creation of Malaysia's Royal Belum State Park: A Case Study of Conservation in a Developing Country. *The Journal of Environment & Development* 24: 54-81. DOI: 10.1177/1070496514551173
- 41 Belecky, M. and Gray, T.N.E. 2020. *Op cit*
- 42 <https://www.nst.com.my/lifestyle/sunday-vibes/2021/03/671647/orang-asli-wildlife-patrollers-are-new-heroes-royal-belum> (accessed 22 March 2022).
- 43 <https://www.aljazeera.com/news/2022/3/7/malaysia-last-chance-to-save-the-malayan-tiger> (accessed 22 March 2022).
- 44 <https://www.malaysiakini.com/news/496853> (accessed 15 April 2022).
- 45 <https://www.nst.com.my/lifestyle/sunday-vibes/2021/03/671647/orang-asli-wildlife-patrollers-are-new-heroes-royal-belum> (accessed 22 March 2022).
- 46 Belecky, M. and Gray, T.N.E. 2020. *Op cit*
- 47 <https://www.aljazeera.com/news/2022/3/7/malaysia-last-chance-to-save-the-malayan-tiger> (accessed 22 March 2022).
- 48 <https://www.ketsa.gov.my/ms-my/pustakamedia/KenyataanMedia/SIARAN%20MEDIA%20MAJLIS%20PERASMIAN%20DAN%20PENYAMPAIAN%20WATIKAH%20PELANTIKAN%20>

- VETERAN%20ANGKATAN%20
TENTERA%20MALAYSIA%20DAN%20
ORANG%20ASLI%20(VetOA)%20
SEBAGAI%20RENJER%20HIDUPAN%20
LIAR%20BAGI%20BIODIVERSITY%20
PROTECTION%20%26%20PATROLLING%20
PROGRAMME%20(BP3).pdf (accessed 22
March 2022).
- 49 Lamichhane, S., Joshi, R., Poudel, B. and
Subedi, P. 2020. Role of Community in
Leading Conservation: Effectiveness, Success
and Challenges of Community-Based Anti-
Poaching Unit in Nepal. *Grossroots Journal of
Natural Resources* 3 (4): 94-109. Doi: <https://doi.org/10.33002/nr2581.6853.03046>.
- 50 Verma, M., Negandhi, D., Khanna, C.,
Edgaonkar, A., David, A., Kadekodi, G. et al.
2017. Making the hidden visible: Economic
valuation of tiger reserves in India. *Ecosystem
Services* 26: 236-244. DOI: 10.1016/j.
ecoser.2017.05.006
- 51 Stolton, S., Timmins, H. and Dudley, N.
2021. *Making Money Local: Can Protected
Areas Deliver Both Economic Benefits and
Conservation Objectives?* Technical Series 97,
Secretariat of the Convention on Biological
Diversity, Montreal. Retrieved from: <https://www.cbd.int/doc/publications/cbd-ts-97-en.pdf>
- 52 Dudley, N., Burlando, C., Cooney, R., Jones,
S. and Kehaulani Watson, T. 2016. Draft
principles for justice and equity in access to
and distribution of benefits from ecosystem
services in protected areas. In: C. Burlando,
A. Te Pareake Mead, M. Marker Noshirwani,
C. Seagle and T. Kehaulani Watson (eds),
From Solutions to Resolutions: A New Social
Compact for Just and Effective Conservation of
Biodiversity. *Policy Matters* 20: 41-53. CEESP
and IUCN, Gland, Switzerland. Retrieved from:
<https://portals.iucn.org/library/sites/library/files/documents/Policy%20Matters-Issue%2020.pdf>
- 53 Xu, J., Lü, Y., Chen, L. and Liu, Y. 2009.
Contribution of tourism development to
protected area management: local stakeholder
perspectives. *International Journal of
Sustainable Development & World Ecology* 16:
30-36. DOI: 10.1080/13504500902757189
- 54 Neugarten, R.A., Langhammer, P.F., Osipova,
E., Bagstad, K.J., Bhagabati, N., Butchart,
S.H.M. et al. 2018. *Tools for measuring,
modelling, and valuing ecosystem services:
Guidance for Key Biodiversity Areas, natural
World Heritage Sites and protected areas.*
IUCN, Gland, Switzerland. DOI: 10.2305/
IUCN.CH.2018.PAG.28.en
- 55 Ivanić, K-Z., Stolton, S., Figueroa Arango, C.
and Dudley, N. 2020. *Protected Areas Benefits
Assessment Tool + (PA-BAT+): A tool to assess
local stakeholder perceptions of the flow of
benefits from protected areas.* IUCN, Gland,
Switzerland. DOI: 10.2305/IUCN.CH.2020.
PATRS.4.en
- 56 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* 3: 281-
293. DOI: 10.1002/pan3.10177
- 57 AIFFM and WRM. 2021. *Struggles for the
right to live in forests declared Protected
Areas in India. Experiences of Communities
in Maharashtra, Madhya Pradesh and
Chhattisgarh.* All India Forum of Forest
Movements (AIFFM) and World Rainforest
Movement (WRM). Retrieved from: <https://www.wrm.org.uy/sites/default/files/2022-03/Struggles-to-live-in-forests-Protected-Areas-India.pdf>
- 58 <https://jsis.washington.edu/aic/2017/05/31/pavel-sulyandziga-Indigenous-rights-activist-from-the-bikin-river/> (accessed 16 March 2022).
- 59 Gnych, S., Lawry, S., McLain, R., Monterroso,
I. and Adhikary, A. 2020. Is community tenure
facilitating investment in the commons for
inclusive and sustainable development? *Forest
Policy and Economics* 111: 102088. DOI:
10.1016/j.forpol.2019.102088
- 60 Swiderska, K., Argumedo, A., Song, Y.,
Rastogi, A., Gurung, N., Wekesa, C. et al.
2021. *Indigenous knowledge and values:
key for nature conservation.* IIED Briefing,
International Institute for Environment
and Development, London. Retrieved from:
<https://pubs.iied.org/sites/default/files/pdfs/2021-08/20351IIED.pdf>
- 61 Hajjar, R., Oldekop, J.A., Cronkleton, P.,
Newton, P., Russell, A.J.M. and Zhou, W.
2021. A global analysis of the social and
environmental outcomes of community forests.
Nature Sustainability 4: 216-224. DOI:
10.1038/s41893-020-00633-y
- 62 Sze, J.S., Carrasco, L.R., Childs, D. and
Edwards, D.P. 2022. Reduced deforestation
and degradation in Indigenous Lands pan-
tropically. *Nature Sustainability* 5: 123-130.
DOI: 10.1038/s41893-021-00815-2
- 63 Porter-Bolland, L., Ellis, E.A., Guariguata,
M.R., Ruiz-Mallén, I., Negrete-Yankelevich,
S. and Reyes-García, V. 2012. Community
managed forests and forest protected areas: An
assessment of their conservation effectiveness
across the tropics. *Forest Ecology and
Management* 268: 6-17. DOI: 10.1016/j.
foreco.2011.05.034
- 64 Porter-Bolland, L., Ellis, E.A., Guariguata,
M.R., Ruiz-Mallén, I., Negrete-Yankelevich, S.
and Reyes-García, V. 2012. *Op cit*
- 65 Gnych, S., Lawry, S., McLain, R., Monterroso,
I. and Adhikary, A. 2020. Is community tenure
facilitating investment in the commons for
inclusive and sustainable development? *Forest
Policy and Economics* 111: 102088. DOI:
10.1016/j.forpol.2019.102088
- 66 <https://pubs.iied.org/sites/default/files/pdfs/2021-01/17664IIED.pdf> (accessed 12
March 2022).
- 67 [https://www.iied.org/assessing-social-
impacts-protected-conserved-areas-sapa](https://www.iied.org/assessing-social-impacts-protected-conserved-areas-sapa)
(accessed 12 March 2022).
- 68 [https://www.iied.org/assessing-governance-
protected-conserved-areas-gapa](https://www.iied.org/assessing-governance-protected-conserved-areas-gapa) (accessed 12
March 2022).
- 69 [https://www.iied.org/site-level-assessment-
governance-equity-sage](https://www.iied.org/site-level-assessment-governance-equity-sage) (accessed 12 March
2022).
- 70 Zambia Wildlife Act No. 12 of 1998.
- 71 [https://land-links.org/document/zambia-
community-resources-board-association/](https://land-links.org/document/zambia-community-resources-board-association/)
- 72 Gnych, S., Lawry, S., McLain, R., Monterroso,
I. and Adhikary, A. 2020. *Op cit*
- 73 United Nations Development Programme.
2013. *Chunoti Co-Management Committee,
Bangladesh.* Equator Initiative Case Study
Series, New York, USA. Retrieved from:
[https://www.equatorinitiative.org/wp-content/
uploads/2017/05/case_1370356231_EN.pdf](https://www.equatorinitiative.org/wp-content/uploads/2017/05/case_1370356231_EN.pdf)
- 74 Jones, B. 2014. Namibia: case study. In: S.
Stolton, K.H. Redford and N. Dudley (eds), *The
Futures of Privately Protected Areas*, pp. 84-
86. IUCN, Gland, Switzerland. Retrieved from:
[https://portals.iucn.org/library/sites/library/
files/documents/PATRS-001.pdf](https://portals.iucn.org/library/sites/library/files/documents/PATRS-001.pdf)
- 75 LEAD and NFU. 2009. *Guide to the Communal
Land Reform Act, 2002 (No. 5 of 2002).* 2nd
Edition, Land, Environment and Development
Project Legal Assistance Centre and the
Advocacy Unit Namibia Windhoek. Retrieved
from: [http://www.lac.org.na/projects/lead/
Pdf/commlandedition2_eng.pdf](http://www.lac.org.na/projects/lead/Pdf/commlandedition2_eng.pdf)
- 76 Corbett A. and Daniels C. 1996. *Legislation
and Policies Affecting Community-Based
Natural Resources Management in Namibia.*
Social Science Division University of Namibia,
Windhoek, Namibia. Retrieved from: <http://www.lac.org.na/projects/lead/Pdf/cbnrm1.pdf>
- 77 MEFT/NACSO. 2021. *The state of community
conservation in Namibia (Annual Report
2019).* MEFT/NACSO, Windhoek, Namibia.
Retrieved from: [https://conservationnamibia.
com/other/meft-nacso-state-of-community-
conservation-2019.pdf](https://conservationnamibia.com/other/meft-nacso-state-of-community-conservation-2019.pdf)
- 78 LEAD and NFU. 2009. *Guide to the Communal
Land Reform Act, 2002 (No. 5 of 2002).* 2nd
Edition, Land, Environment and Development
Project Legal Assistance Centre and the
Advocacy Unit Namibia Windhoek. Retrieved
from: [http://www.lac.org.na/projects/lead/
Pdf/commlandedition2_eng.pdf](http://www.lac.org.na/projects/lead/Pdf/commlandedition2_eng.pdf)
- 79 Baker L. 2013. Communal Area Conservancies
in Namibia: A Simple Guide. *Republic of
Namibia Ministry of Environment and
Tourism*, Windhoek, Namibia. Retrieved from:
[https://www.namibweb.com/conservancies-
guide.pdf](https://www.namibweb.com/conservancies-guide.pdf)
- 80 RoN Government Gazette. 1996. *No. 5 of 1996:
Nature Conservation Amendment Act, 1996.*
Republic of Namibia.
- 81 Baker, L. 2013. *Op cit*
- 82 MET. 2013. *National Policy on Community-
Based Natural Resource Management.* MET.
Windhoek, Namibia. Retrieved from: [https://
fdocuments.in/document/national-policy-
on-community-based-natural-resource-to-
manage-the-provision-and.html](https://fdocuments.in/document/national-policy-on-community-based-natural-resource-to-manage-the-provision-and.html)
- 83 Adapted from: Ostrom, E. 1990. *Governing
the Commons: The Evolution of Institutions
for Collective Actions.* Cambridge University
Press, Cambridge, UK. DOI: 10.1017/
CBO9780511807763; Gari, S.R., Newton,
A., Icelly, J.D. and Delgado-Serrano, M.M.
2017. An Analysis of the Global Applicability
of Ostrom's Design Principles to Diagnose
the Functionality of Common-Pool Resource
Institutions. *Sustainability* 9: 1287. DOI:
10.3390/su9071287; Cox, M., Arnold, G. and
Villamayor Tomás, S. 2010. A Review of Design
Principles for Community-based Natural
Resource Management. *Ecology and Society*
15: 38. DOI: 10.5751/ES-03704-150438;
[https://www.onthecommons.org/magazine/
elinor-ostroms-8-principles-managing-
commons and https://earthbound.
report/2018/01/15/elinor-ostroms-8-rules-for-
managing-the-commons/](https://www.onthecommons.org/magazine/elinor-ostroms-8-principles-managing-commons-and-https://earthbound.report/2018/01/15/elinor-ostroms-8-rules-for-managing-the-commons/) (accessed 19 March
2022).
- 84 [https://www.nbsbangladesh.info/case_study/
forest-protected-area-co-management/](https://www.nbsbangladesh.info/case_study/forest-protected-area-co-management/)
(accessed 16 March 2022).
- 85 Bell, T. 2021. *Krasny Yar: A Village in the
Forest*, [https://peopleofthetiger.com/tag/
krasny-yar/](https://peopleofthetiger.com/tag/krasny-yar/)
- 86 The Indigenous peoples in these regions are
the inhabitants who have lived there before
the 17th century when the Russians invaded
Siberia and the Far East. The Udege are part
of the Indigenous Asian people of the Tungus-
Manchurian group.
- 87 Russian Federation. 2019. *Bikin River
Valley UNESCO Heritage Site Status Report
for 2018-2019.* Federal State Budgetary
Institution, Ministry of Natural Resources and
Ecology, Russian Federation. Retrieved from:
<https://whc.unesco.org/document/180900>
- 88 IUCN. 2018. *World Heritage Nomination
– IUCN Technical Evaluation Bikin River
Valley (Russian Federation).* ID N° 766 Bis.
Retrieved from: [https://whc.unesco.org/
document/168753](https://whc.unesco.org/document/168753)
- 89 Bocharnikova, A. 2015. When Home Becomes
a Protected Area: The Udege People and the
Bikin River Valley in the Russian Far East.
Langscape, 21 September 2021. Retrieved
from: [https://terralingua.org/langscape_
articles/when-home-becomes-a-protected-
area-the-udege-people-and-the-bikin-river-
valley-in-the-russian-far-east-2/](https://terralingua.org/langscape_articles/when-home-becomes-a-protected-area-the-udege-people-and-the-bikin-river-valley-in-the-russian-far-east-2/)
- 90 [https://jsis.washington.edu/aic/2017/05/31/
pavel-sulyandziga-Indigenous-rights-activist-
from-the-bikin-river/](https://jsis.washington.edu/aic/2017/05/31/pavel-sulyandziga-Indigenous-rights-activist-from-the-bikin-river/)
- 91 IUCN. 2018. *Op cit*

- 92 Kesserwan, K. 2017. Where North Meets South along Russia's Bikin River. *The New Humanitarian*, 22 June 2017. Retrieved from: <https://deeply.thenewhumanitarian.org/arctic/articles/2017/06/22/canadian-inuit-theater-troupe-breathes-new-life-into-an-old-legend>
- 93 Sasaki, S. 1998. *Fur Animal Hunting of the Indigenous People in the Russian Far East: History, Technology, and Economic Effects*. Research Report, 740. Institute for Global Environmental Strategies (IGES), Japan. Retrieved from: https://www.iges.or.jp/en/publication_documents/pub/researchreport/en/740/ir98-5-8.pdf
- 94 Sasaki, S. 1998. *Op cit*
- 95 Bocharnikova, A. 2020. Udege and the Bikin National Park: Co-management or Conflict? *Kunstkamera* 1. DOI: 10.31250/2618-8619-2020-1(7)-102-109
- 96 Sasaki, S. 1998. *Op cit*
- 97 IUCN. 2018. *Op cit*
- 98 Fondahl, G., Parlato, N., Filippova, V. and Savvinova, A. 2021. The Difference Place Makes: Regional Legislative Approaches to Territories of Traditional Nature Use in the Russian North. *Arctic Review* 12: 108-133. DOI: 10.23865/arctic.v12.2790
- 99 Fondahl, G., Parlato, N., Filippova, V. and Savvinova, A. 2021. *Op cit*
- 100 Sasaki, S. 1998. *Op cit*
- 101 IUCN. 2018. *Op cit*
- 102 <https://www.commonlandsnet.org/demo/14>
- 103 Sulyandziga, P. 2017. *Op cit*
- 104 WWF-Russia, unpublished report.
- 105 Federal Law dated 14.03.1995 No. 33-FZ (ed. 13.07.2015) 'On Specially Protected Natural Areas' (with amendments and additions as of 24.07.2015).
- 106 Stishov M.S. and Dudley N. 2019. *Protected Natural Areas of the Russian Federation and Their Categories*, WWF, Moscow. Retrieved from: <https://wwf.ru/en/resources/publications/booklets/okhranyaemye-prirodnye-territorii-rossiyskoy-federatsii-i-ikh-kategorii/>
- 107 Stishov M.S. and Dudley N. 2019. *Op cit*
- 108 IUCN. 2018. *Op cit*
- 109 <https://www.commonlandsnet.org/demo/14>
- 110 WWF-Russia, unpublished report.
- 111 <https://www.commonlandsnet.org/demo/14>
- 112 WWF-Russia, unpublished report.
- 113 Russian Federation. 2018. *Op cit*
- 114 This is also referred to as the Council of Indigenous Minorities, Committee for Indigenous Issues and Council of the Indigenous Small-Numbered Peoples in various documents related to the World Heritage site.
- 115 <https://www.commonlandsnet.org/demo/14>
- 116 IUCN. 2018. *Op cit*.
- 117 <https://www.commonlandsnet.org/demo/14>
- 118 WWF. 2019. *Your tiger's adoption update*. Issue 18. [https://apps4.wwf.org/hk/donation/gdp_template/tiger/img/wwf_Animal%20Updates\(issue18\)_tiger_eng_v01.pdf](https://apps4.wwf.org/hk/donation/gdp_template/tiger/img/wwf_Animal%20Updates(issue18)_tiger_eng_v01.pdf)



4. MANAGING HUMAN- TIGER CONFLICT: A PREREQUISITE FOR FUTURE COEXISTENCE

Why read this section?

People have been seeking ways to address the risks that tigers pose to human lives and livelihoods for many years, and a variety of tools and approaches have emerged as a result. Some of these are more effective than others, work in some circumstances and not in others, and a few are still under development. This section summarizes the current state of knowledge about managing human-tiger conflicts and lays out the options, looking at the pros and cons of each in turn, and stresses the need for integrated and holistic HTC management.

INTRODUCTION

Human-wildlife conflict has been defined as the: *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.*^{1,2}

Human-tiger conflict (HTC) presents a major threat to local people and to the continuing success of tiger conservation programmes; past HTC has resulted in local and regional extirpations of tigers from the islands of Java and Bali in Indonesia and from the Caspian and Aral Sea regions.³ The results of HTC are multiple, from human death, injury or significant economic or psychological impacts, impacts on livestock and other domesticated animals, to tiger mortality or removal from the wild and often increased negative attitudes toward tigers and reduced support for their conservation. Although coexistence does not imply an absence of conflict, it does aim for a sustainable, though dynamic, state of coexistence where inevitable negative interactions are effectively governed in socially legitimate ways.⁴

The drivers and impacts of HTC, of course, vary locally but have similarities across the range. Underlying drivers of conflict are linked to increasing habitat loss, decreasing prey and impacts of livestock grazing.⁵ In many parts of the range, the relationships between people and conservation have long, historical roots and in some places conservation policies are regarded as legacies of colonialism.⁶ Underlying issues thus exist because of unsolved social conflict leading to resentment, mistrust and in some places disruptive or uncooperative behaviours. This can be further exacerbated when people feel their person or group is threatened, resulting in a sense of being unacknowledged, disempowered and disrespected.⁷ Attempts to manage conflicts rapidly and without consideration of the underlying context can exacerbate pre-existing tensions and escalate conflict.⁸ Retaliatory killings can become a powerful yet anonymous signal of discontent about HTC but also about a range of other issues related to conservation decisions.⁹

It is however also possible, when processes for managing HTC are effective, to build reconciliation and conflict resolution to foster long-term collaboration and contribute to greater appreciation of different opinions and goals in relation to wild tigers, reduce prejudice and build more trusting relationships.¹⁰ Thus, building local pride in a country's biodiversity and support for conservation is critical in building confidence in the ability to appropriately manage HTC. Figure 6 suggests a simple schematic for thinking about levels of conflict and associated overarching management measures.

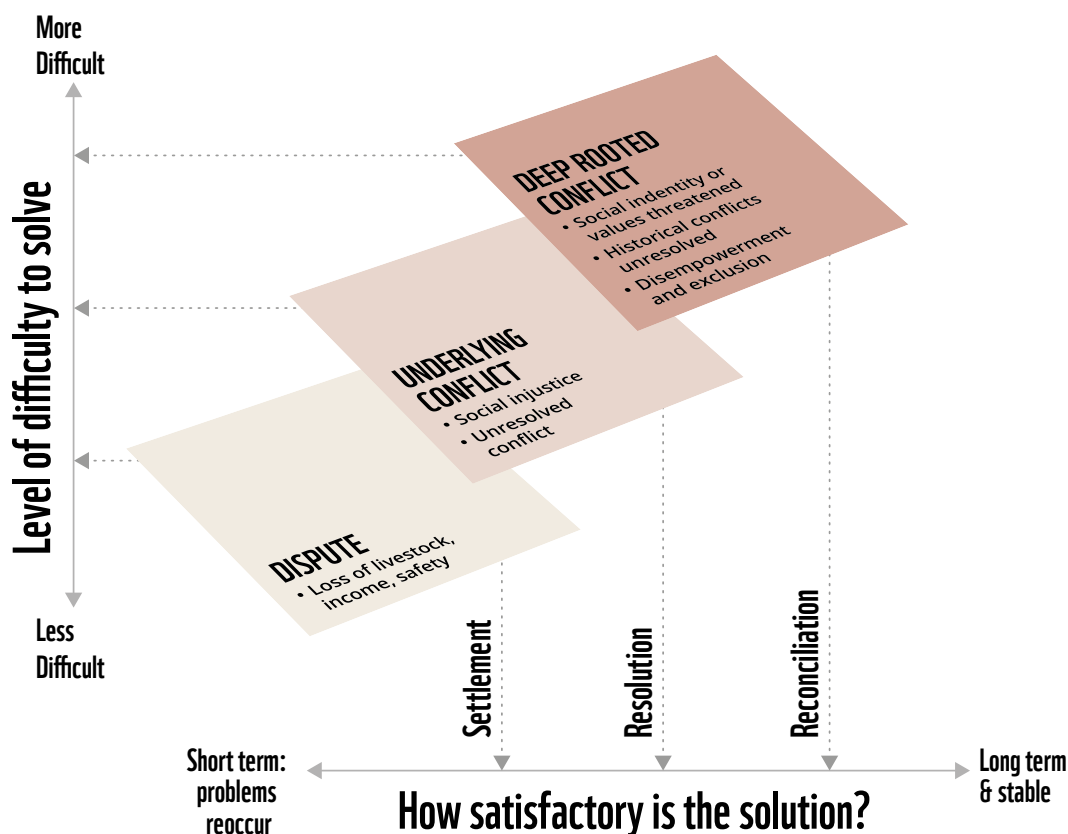


Figure 6: Three levels of conflict and mitigation management measures¹¹

HTC strategies need to distinguish between two issues: (1) impacts that deal with direct interactions between humans and wildlife; and (2) social conflicts that centre on human interactions between those seeking to conserve species and those with other goals.^{12,13} For example, integrated technical solutions may work well for impacts, but conflicts between people over conservation are more complex and require interdisciplinary approaches.¹⁴ Bringing both together leads to holistic management of HTC where the complex decision-making process should involve a variety of biological, social, psychological, economic and political considerations.¹⁵ The future success of tiger conservation will by necessity require learning across boundaries, both physical and disciplinary. Research, implementation and effective management and monitoring to lessen the perceived and actual threat of HTC will take expertise and funding.

The section below highlights the Safe Systems Approach (see box 14) as an organizing principle for developing HTC strategies. The six elements of HWC management (understanding, preventing, mitigating, responding, monitoring and policy), as reflected in the Safe Systems Approach, are used to outline a range of good practices which should together make up a comprehensive and integrated approach to developing a HTC management strategy.¹⁶ All six elements are essential and need to be implemented together to ensure a comprehensive and strategic approach to HTC.

HTC is not a binary relationship. Even simple assumptions, such as that reducing HTC will reduce retaliatory killings, need challenging. Context is all important, but research has found that perceived risk and lack of effective response to HTC can be strong drivers of retaliations.¹⁷ Indeed, large-scale literature reviews have consistently noted the lack of clear evidence of the effectiveness of any specific intervention intended to reduce human-wildlife conflict globally.¹⁸ So, practitioners should be under no illusion that there are simple fixes for these issues, emphasizing the need for comprehensive, integrated and holistic approaches.

Finally, despite the guidance given here, developing an intervention to prevent HTC is always best pursued as a process based on local context rather than a direct transfer of a specific method from one site to another. Each case of HTC has unique ecological, cultural, social, physical, economic and political characteristics, and each has different histories, attributes and opportunities.¹⁹

Box 14: The Safe Systems Approach to HTC

In 2016, the WWF Tigers Alive Initiative developed an integrated HTC management approach for designing and managing HTC programmes to address the dual challenge of recovering tiger numbers and addressing a potential increase in HTC. Known as the Safe Systems Approach, the process assesses conflict through a structured stakeholder consultation process, allowing managers, decision-makers and practitioners to develop HTC 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.

Global HWC projects and programmes have historically approached conflict through a threat mitigation lens that has often led to short-term project solutions that only address the symptoms of the conflict and do not address broader issues around what is driving conflict nor consider long-term implications/solutions. The Safe Systems Approach shifts programming and strategy away from truncated HWC prevention and mitigation projects, toward HWC management that integrates actions across six elements of conflict management: understanding the conflict, prevention, mitigation, response, policy and monitoring.

Designed initially for HTC, the approach is applicable to all species involved in conflict. Since 2016, the Safe Systems Approach has been initiated/implemented in more than 25 countries across WWF's network and for different species,

for example, Bhutan – tigers and integrated into the national HWC strategy; Mexico and Argentina – jaguars; Kenya and Mozambique – hyenas, lions and elephants.

A recent initial review by WWF concluded that the Safe Systems Approach needs to be simplified to make it more user friendly, especially for those working at the landscape level. Revision is also needed to make it more adaptable for different species and contexts. A review of the status of implementation of the approach found that monitoring HWC was the weakest of the elements across all countries along with policy addressing HWC.



Figure 7: Six elements of the Safe Systems Approach

The next section will dive deeper into each of the six elements of the Safe Systems Approach (see figure 7).

4.1 UNDERSTANDING HUMAN-TIGER CONFLICT

Researching all aspects of the conflict profile to understand the context for conflict in any given situation is a vital first step in a HTC strategy.²⁰ This will require working with a multidisciplinary team, including social scientists,²¹ to help develop an understanding of conflict and options for resolution.

A first step in any HTC strategy is to create a better understanding of drivers of conflict and how they interconnect. As the text in the sections above relate, multiple drivers (e.g., ecological, economic, social, political, cultural and historical) can generate multiple pressures or strengths, which, in turn, have impacts on biodiversity conservation and human welfare. Understanding these factors is crucial.²² The Safe Systems Approach (box 14) assesses conflict in a landscape through a structured stakeholder consultation process, an approach that allows managers, decision-makers and practitioners to develop strategies that gradually remove immediate risks and, over time, make the area safe for people, their assets, wildlife and its habitat.²³

Long-term planning is needed at a landscape-scale to understand the impacts of HTC. Tigers can range across highly fragmented habitats, and may do even more if populations increase, so understanding where people and wildlife will be able to share the landscape in the long term is going to be required along with the legal and development frameworks needed to enable this. Landscape-scale planning will also by necessity have to include wider sectoral collaborations such as agriculture, forestry, health, environment, transport and energy agencies and business.²⁴

The need for socio-ecological information in conservation conflict management is vital.^{25,26} HTC management has tended to focus on how to change tiger behaviour (e.g., deterrents such as hazing, barriers or relocation) or human practices (e.g., in terms of where people live, where and how they graze livestock) through piecemeal approaches. However, the practice of “environmental psychology”, that is the need to better understand how social motivations determine conflict behaviour, can be helpful in understanding and developing approaches to reduce conflict and is gaining increasing importance.²⁷

Understanding human tiger overlap and risk is vital to effective HTC management. Unfortunately, in some cases conflicts result in human death. Knowing both the places with highest risk, and human activities and behaviour associated with tiger attacks can be the basis of HTC education and the focus of funding alternative activities that reduce the risk of HTC, particularly in sites where human populations are close to tiger habitat. Between 1998 and 2006, for example, in Chitwan National Park in Nepal, the majority of human-killing by tigers occurred within 1km of the forest edge, either near degraded or intact forests and nearly half the people killed were grass/fodder collectors.²⁸ In the Sundarbans in Bangladesh, tigers known to have killed local people are collared and their movements carefully monitored.²⁹

It is important to consider opportunistic drivers of tiger behaviour leading to HTC. A wide range of issues may impact tiger behaviour. Ecological considerations can include seasonal changes, natural calamities, and the tiger's life cycles, impacts of sickness or injury (see below) as well as the movement patterns of tigers and their prey.³⁰ But tigers also respond to anthropogenic drivers. For example, Chitwan National Park in Nepal has suffered a high number of tiger induced human fatalities, and there is speculation that this could be due to tigers becoming more familiar with humans as prey due to two factors; the funerary practices of Bote and Darai communities who bury their dead in shallow graves along the Narayani River where tigers excavate and consume the corpses and casualties of fatal near-river bus accidents where bodies sometimes carried away by the river current become tiger prey.³¹

Sometimes highlighting HTC can, paradoxically, increase social tensions. Drawing attention to the possibility of conflict between humans and tigers may change attitudes to issues that have until now been accepted as part of normal life. For example, 98 per cent of households surveyed in the Rajaji-Corbett corridor in the Terai Arc Landscape of India, where tigers and leopards cause loss of livestock and human fatalities, did not consider either cat a serious threat and applied their own management strategies.³² Reinterpreting these issues as a problem for the government, or a non-governmental organization, can create a fundamental change in attitudes, passing the moral and legal responsibilities (the governance) to state or NGOs. Thus, when conservationists attempt to resolve conflicts, unless this is handled carefully, the problem animal can be directly associated with (and often perceived as owned by) the conservationists or conservation departments of government.³³ Getting the right balance is tricky. Calling a relatively mild situation a "conflict" can escalate it unnecessarily.³⁴ Conversely, ignoring conflict will leave communities feeling ignored.³⁵ Both situations may have unintended consequences for tigers and people.³⁶ Different cultures, languages, communities and countries will use different words to describe these situations.³⁷

Box 15: The six stages of understanding and addressing conflict

One approach advocated³⁸ to help better understand human-wildlife conflict in general, focuses on six stages³⁹ all of which should involve understanding and taking actions with multiple stakeholders:

1. Establish whether there is a conflict or an impact.
2. Understand the context of the conflict.
3. Develop a shared understanding of the conflict and goals.
4. Build a consensus on how to achieve the goals.⁴⁰
5. Jointly implement measures.
6. Monitor the outcomes through agreed protocols and adapt goals and measures as required.

Cultures and beliefs are not static and innovation can promote coexistence. There are examples where conservationists and local people have worked together to solve conservation problems by focusing on local belief systems. The Lion Guardians scheme in Amboseli, Kenya, for example, has worked with young Maasai men who previously gained social status by killing lions into achieving this same status through gaining skills and income from tracking and guarding lions.⁴¹

Communities should understand their rights and responsibilities related to HTC. Local communities should be provided information about laws regarding tiger conservation, and what their rights and responsibilities are relative to HTC and responses.⁴²

Understanding the economic consequences of HTC is vital. Consequences of HTC will be different depending on social groups; a wealthy cattle farmer can better cope with livestock loss than a subsistence pastoralist.⁴³ To properly understand losses, clear processes are needed. These should be agreed by all constituencies, strictly adhered to and be objective in quantifying economic losses and costs. Such processes can help bring greater transparency to the development of HTC management strategies.⁴⁴ They should note that, in some cases, even small losses can represent a significant loss of household income.⁴⁵ Also poorer members of communities often suffer greater losses due to lack of available alternative livelihoods and associated need to collect resources, or graze animals, in areas of high HTC risk. A study in Bardia National Park in Nepal found that the poorest respondents in a survey of wildlife damage from the past five years reported losses more than 50 per cent higher than the average loss.⁴⁶ HTC management in particular should focus on those less able to withstand losses.

It is important to understand the psychological consequences, which are often the hidden costs of HTC. Psychologically, communities that live near tigers can experience fear over potential encounters which can restrict social interactions, stop children attending school and reduce



people's willingness to travel, such as to work, markets or school. All this can lead to reduced life opportunities.⁴⁷ 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 toward wildlife – possibly even more important than direct losses.⁴⁸ Attitudes also differ along gender lines. Following reintroduction of tigers in Sariska Tiger Reserve, India, women highlighted fears of personal safety and a range of hidden costs while men generally identified economic benefits, the role of tigers in deterring cattle thieves and the advantages of tigers removing sick animals from the herd.⁴⁹ Some of the psychological consequences relate to knock-on effects of tiger conflict. A study using women-only focus groups from communities within 10km of Sariska not surprisingly identified fear of attack. But in that case there were also perceived risks of being punished by the government, and of increased gender-based violence if women do not meet the ideal of a “good Indian wife” due to decreased earnings following cattle predation.⁵⁰ Another concern is that inadequate compensation for buffalo loss could impact on women's marriage options, because milk sales are used to cover the dowry, leading to shame for both parents and daughters.⁵¹ A study of “tiger-widows” in the Sundarban Reserve Forest, India, found over half were living “below the poverty line” and almost half suffered from some designated mental illness. The study also stressed the need to address the cultural stigma of tiger attack to reduce the discrimination currently experienced by tiger-widows.⁵²

Cognitive interventions can change adverse perceptions and behaviours toward HTC. As noted above, fear and perceived risk in relation to actual predation or attack rates can lead to increased HTC. Alternatively, confidence in effective HTC strategies can lead to less concerns and prevention of conflict. So-called cognitive approaches to HTC thus aim to bring together the range of HTC strategic approaches to improve knowledge regarding the habits, movements of species, and ways in which impacts may be prevented or reduced. Although, as with other deterrent and mitigation strategies, few studies have systematically evaluated such approaches to conflict management, there is some evidence to suggest that tolerance, communication and social interaction are improved, increasing the likelihood of pro-conservation behaviours.⁵³

4.2 PREVENTION

Stopping or preventing HTC before it occurs is of course by far the best way to deal with HTC. HTC prevention techniques include early warning systems, predation maps, strategic guarding, fencing, etc.⁵⁴ Prevention strategies should consider issues such as local attitudes and perceptions of HTC (see above) and the sustainability and scalability of strategies.⁵⁵ Most importantly, the full costs of any interventions and the capacity to not only implement, but to monitor and adapt results and to effectively maintain the intervention, need to be carefully assessed.⁵⁶

Survey tiger movements to develop predation risk maps of current/predicted HTC. Understanding where tigers are likely to roam can help predict, and prevent, HTC. Modelling movements can be expensive as tiger and prey tracking requires expensive equipment and technology as well as access to significant expertise to identify, locate and sedate the animal, then to fit a satellite collar and collect and interpret location data.⁵⁷ However, profiling (e.g., analysing behavioural characteristics so as to predict habits) based on tiger sightings alone has shown to be successful, for example, in Sumatra where mapping focused on predicting HTC, as tiger attacks tended to be restricted to a few geographic areas.⁵⁸ Such approaches can be refined through a system of identifying human-animal geographies and can consider, as well as sightings, the geographies of animals (e.g., the type of preferred topography, location of water sources and presence of prey and other competing carnivore species) and human geographies, or use of space, including grazing areas, areas used to collect non-timber forest products, tourism sites, protected areas, etc.^{59,60,61} Predation risk maps can be developed from this information to identify areas where HTC has taken place or is likely to take place to help livestock farmers, and other local people, avoid conflict as much as possible.⁶²

Studies should consider spatial and temporal geographies, as actions such as minimizing peoples' use of forest areas during times when tigers are most active (dawn and dusk) helps reduce HTC events.⁶³ A study of HTC in Sundarban Reserve Forest, India, for example, found that most attacks took place in the months of November and December and the majority of incidents took place in the morning.⁶⁴ In the corridor between Corbett and Rajaji National Park, three-quarters of livestock attacks took place in winter, with the other quarter in the monsoon; with attacks most frequent during the night.⁶⁵ Such detailed studies are important but need to be thorough. In Corbett Tiger Reserve, India, the importance of the temporal and spatial has been emphasized. Research found that livestock depredation by tigers varied significantly among seasons in the southern zone of the reserve but not in the northern zone, most likely due to monsoon related vegetation increase hindering wild prey hunting in the south.⁶⁶ Links to weather, and specifically drought, were noted above (see section 1) in relation to climate change impacting water sources resulting in tigers moving into populated areas in search of water. This emphasizes the need not only to assess current tiger movements in risk maps but also to consider impacts of threats and pressures such as climate change. Detailed information not only informs HTC strategies but reinforces the importance of accurate and detailed monitoring of HTC .

Consider how tiger prey depletion can lead to HTC. A global review found that lack of wild prey was the greatest predictor of livestock killing by large predators,⁶⁷ suggesting that efforts to maintain prey populations is an important step in reducing livestock losses. Generally HTC occurs where wild prey has been depleted,⁶⁸ although there are exceptions such as the area around Corbett Tiger Reserve which has both high prey densities and high rates of livestock predation. Prey depletion is most often attributed to hunting, habitat

Box 16: The Bagh Mitras of Pilibhit

Pilibhit Tiger Reserve in India is within 5km of a densely populated area and had become a hotspot for violent tiger conflict. The boundaries between the reserve and the villages are blurred. Deforestation has reduced the forests to a very narrow strip and extensive sugarcane fields, wheat and rice fields provide dispersal routes and serve as breeding territories for tigers.

The Global Tiger Forum, Uttar Pradesh Forest Department and WWF-India have responded to this conflict in a number of ways. One important approach has involved the training of “Bagh Mitras” (‘tiger friends’), local residents who voluntarily act as both first responders and conflict managers in incidents involving tigers. Other activities undertaken by the roughly 200 Bagh Mitras based in communities surrounding Pilibhit Tiger Reserve include the monitoring of tiger movements, coordination activities with the Forest Department, and efforts to raise safety awareness in the villages in which they live. Other activities in the area include improved monitoring of farmland and wildlife, and strengthened inter-agency coordination and awareness campaigns that emphasize human safety.⁶⁹

degradation and competition with livestock.⁷⁰ Over-hunting of prey increases the likelihood of carnivores supplementing their diet with livestock.^{71,72} The development of prey biomass thresholds can help predict conflicts and identify conflict hotspots, and could be added to predation risk maps for priority management and interventions.⁷³ However, this level of mapping requires good data on prey densities, which are lacking across the vast majority of tiger landscapes. A good prey base is likely to increase tiger populations, thus it is vital that any planned (or for that matter unplanned) increase in prey needs to go hand-in-hand with a range of management measures to ensure no increase in HTC.⁷⁴

Predator alert systems can effectively reduce livestock depredation. The provision of real-time information to local residents regarding the location of the animals enables local people to avoid animals which are perceived to present a risk (see boxes 17 and 18). However, such systems require substantial datasets relating to species movements and home ranges,⁷⁵ although this information can be linked to predation risk mapping (see above). The widespread ownership of mobile phones worldwide provides an opportunity to develop alert systems to enable instant data access. Such alert systems rely on those receiving the information acting quickly and effectively, and thus need to be linked to protection strategies being in place to enable swift and effective response to threat.

Ensure local communities understand how to react when confronted with a tiger. Community support for HTC should include educating people how to react during an encounter with a tiger to prevent attack.⁷⁶ In villages around

the Tadoba Andhari Tiger Reserve in India, a manual has been developed in the local language explaining the reasons for conflict between tigers/leopards. The manual includes a code of conduct to help minimize attacks and illustrates different kinds of conflict that may occur and recommended action. This manual also has contact numbers of the local officers and the staff who attend to any conflict situation.⁷⁷

Local community wildlife guardians can help prevent conflict. The role of guardians changes between countries and ecosystems, but commonly involves integration of Indigenous and Western knowledge systems in monitoring, acting as mediators between communities

Box 17: Mobile phones and HWC management in Tanzania

As mobile phones spread ever further into different strata of society, numerous conservation applications are being developed, including for managing HWC. The “Internet of Things” can bring advanced technologies into play to enhance the possibilities.

Maasai agro-pastoralist communities next to Tarangire National Park face multiple types of HWC. Mobile phones are increasingly used to reduce both the incidence of attacks and their consequences. Evidence of wildlife such as spoor, dung or tracks is reported, with decisions about whether or not to phone being influenced by species, freshness of sign, how recently there have been related sightings, and location and direction of wildlife relative to people and property. While this kind of communication often takes place between herders (typically young men and boys), household heads also use phones to communicate the location and movements of wildlife. Phones have increased the capacity to communicate real-time attacks and thus coordinate effective responses, like driving away wildlife or delivering other support. Phones are also used to communicate about the need for veterinary or medical aid for livestock or their caretakers.⁷⁸

Elsewhere in the country, researchers are investigating a more sophisticated approach, a low-cost, Early Warning System for HWC using Internet of Things and Short Message Service (SMS). The three-pronged approach first uses a sensing unit consisting of a Passive Infrared (PIR) sensor, a Global Positioning System (GPS) and a Raspberry Pi camera. The PIR sensor detects the proximity of an animal using its heat signature, GPS senses and records the current location, while the Raspberry Pi camera takes a picture. Next, a processing unit with a Raspberry microcomputer performs data processing and image inferencing using the You Only Look Once (YOLO) algorithm. If the animal is identified, an SMS is sent to the listed numbers of the HWC response team, with the recipients varying depending on whether it is a dangerous animal, endangered, not dangerous, etc.⁷⁹

Box 18: Geofencing

An Information and Communication Technologies-based system in Botswana's Okavango Delta significantly reduced financial losses from livestock predation and was well received by local people (over 90 per cent satisfaction compared to 24 per cent satisfaction with compensation mechanisms).

The system relies on Global Positioning System (GPS) tracking technology and the agreement of so-called "geofences", or virtual boundaries, with alerts being triggered when a lion crosses them. In this case, lions with known or suspected conflict histories were radio collared and tracked (with lions this also allowed tracking of associated prides) as were selected cattle from free-roaming herds. Geofenced areas were created to match livestock grazing areas and home and agricultural areas to safeguard livestock and humans respectively. Regardless of the time of day, information (approximate distance and direction but not full GPS latitude/longitude information) was passed to the village headmen and herders when a lion was within 8.0km linear distance of Geofence 1 (grazing land) and within 5.0km linear distance of Geofence 2 (village) locations. This allowed for real-time knowledge of the proximity of predators to people and livestock, allowing for rapid prevention strategies, which should be developed in advance and as part of the HTC strategy to be taken.

Following a successful pilot, communities were involved in the final design of the lion alert platform.⁸⁰

and outside agencies, patrolling and active wildlife conflict management.⁸¹ Community Guardians are usually trained in skills such as tracking, use of radiotelemetry, GPS data collection (e.g., through SMART, see box 22), and conflict management techniques. The Lion Guardians scheme in East Africa has been successful in increasing support for lion conservation and decreasing human-lion conflict.⁸² Indigenous Guardianship Programs in Canada centre on community-led monitoring and management and are popular at community level, particularly when focused on ecologically and culturally important species such as the moose (*Alces alces*).⁸³ However, being a guardian may not always be cost-free, and guardians can themselves be the centre of conflict, particularly if called to support conservation measures unpopular with sections of the community.⁸⁴

Land-use planning and associated management can reduce HTC involving livestock. Changes to livestock husbandry, such as grazing livestock in different areas or moving livestock inside at night, may be the most financially feasible approach to reducing conflict.⁸⁵ Zoning can be developed with communities in agreed areas, with zones suitable for grazing and non-grazing zones in critical tiger habitat, with the goal of separating people and livestock from

Box 19: From poacher to conservationist

In Periyar National Park, Kerala, India, a group of arrested wildlife poachers took part in a three-month training programme to become active conservationists, carrying out patrols and anti-poaching activities as well as participating in the local tourism industry through safaris, bamboo-rafting and as tourist guides. If any of the individuals involved were found to be carrying out poaching activities, they are expelled from the group. Most of those involved have found stability through the project and many have been able to send their children on for further education as a result. The group has also facilitated the arrest of over 230 gangs engaged in poaching and smuggling in the park and they have transformed the Marayoor Sandalwood reserve into a poaching-free zone.⁸⁶

In Bhutan's Royal Manas National Park (RMNP), more than 35 individuals from Norbugang Gewog area in Pema Gatshel have renounced all hunting and poaching activities in recent years under an effort known as the "hunter to hermit" programme. It involved park officials and the Dhongang Tenpaling Monastery and is supported by WWF-Bhutan. Those participating have generally made commitments to actively support conservation efforts in the areas, rather than simply ceasing their hunting activities. The success of this initiative demonstrates the constructive role religious leaders can play in changing local attitudes toward species such as tigers.⁸⁷

critical tiger habitats and corridors wherever feasible.⁸⁸ Zoning, however, will only work well where legal status of land is agreed with all stakeholders, as land tenure is correlated to the level of tolerance to human-wildlife conflict in general.⁸⁹ No one response will be suitable in every situation however. Livestock management and its relationship to HTC can vary between and within communities. Understanding local norms and beliefs regarding livestock management is thus critical when considering HTC prevention strategies.⁹⁰

Predator-proof livestock enclosure and fencing, if appropriate, should be carefully planned. Electric fences⁹¹ and stockades⁹² are used to protect against predators throughout the world; the size and strength of tigers means that not all these options will work in this case. Predator-proof night corrals for penning in livestock overnight should be well constructed to keep out all predators and to avoid multiple livestock deaths should a predator get inside.⁹³ Corrals are generally more appropriate for smaller domestic animals, such as goats, sheep and pigs.⁹⁴ In tiger landscapes, the Sumatran tiger project built 11 tiger proof enclosures between 2017 and 2019 in Gunung Leuser National Park and Bukit Barisan Selatan National Park in Indonesia, which are still actively used to protect livestock and have reduced the risk of HTCs.⁹⁵ Any plan to fence areas should carefully consider the cost effectiveness of the intervention and the

support for fencing from the herders involved.⁹⁶ Studies in other contexts have found that installing and maintaining fences in high conflict-risk areas seldom generates sufficient return on investment to be worth the outlay, with funds being better spent on other HTC management strategies.⁹⁷

Tigers injured by the actions of people can prey on humans and livestock, reinforcing the need for anti-poaching efforts. There is some evidence that tigers, and other carnivores, which attack humans and livestock have often been wounded by humans, usually in poaching attempts. In Chitwan National Park, Nepal, a study of tigers removed from the park due to taking human life between 1998 and 2006, found nearly 60 per cent were impaired, including due to age related factors (e.g., damaged and missing teeth) and injuries caused by fights with other tigers and gunshot wounds.⁹⁸ A subsequent study from 2007 to 2014 found only a third had injuries,⁹⁹ although the number of tigers removed has decreased as had poaching pressure on the park.¹⁰⁰ A third study from 2007 to 2016 found nearly two-thirds (63 per cent) of tigers involved in conflict were physically impaired; and also noted a reduction in human casualties.¹⁰¹ A study in Bardia National Park, also Nepal, in 2019 found over half the tigers involved in human injury and death were either old or wounded.¹⁰² Anti-poaching, snare removal and other efforts that reduce the rate at which tigers are injured will help to reduce HTC.¹⁰³ Similarly, “problem” tiger control tends to focus on tigers that are injured, diseased or infirm in some way, which makes hunting difficult.¹⁰⁴

Artificial deterrents may reduce tiger and human overlap and reduce HTC. An overview of effective interventions against wild cats found that for tigers the impact of deterrents was variable. The most effective deterrents were visual (light), acoustic (firecrackers) and chemical (lithium chloride, pepper) deterrents.¹⁰⁵ Anecdotal evidence from villages bordering the Indian Sundarbans suggest that solar-powered lighting systems deterred tigers from entering their grounds.¹⁰⁶ So-called “foxlights” were developed in Australia to deter foxes from taking livestock by mimicking someone walking around the area with a flashlight, by using LED bulbs to create varying flashes with different time sequences.¹⁰⁷ Foxlights have been used to deter lions from entering bomas in Kenya, elephants from crop raiding in Zambia, snow leopards from corrals in Nepal, wolves in the US and pumas in Chile. However, there has been very little scientific study on their use, although one study found a significant decline in livestock depredation by leopards in sites with foxlights in the multiple use landscape in Uttarakhand state in the western Himalaya, India which includes the Rajaji and Corbett Tiger Reserves.¹⁰⁸ Similar devices have been manufactured and installed in farmers’ fields to deter animals, including tigers, in Karnataka state in India.¹⁰⁹ Such deterrents will never be sufficient on their own but can be a useful addition to an integrated approach to HTC management.

4.3 RESPONSE

Rapid responses to a very recent or ongoing HTC incident can potentially help reduce the level of threat, help alleviate community concerns or, more likely, confirm the HTC incident, which can be important when linked to verification for compensation payments and can also help identify causes of HTC and suggest prevention methods.¹¹⁰ Ideally, a team of trained personnel operating on widely supported and understood operating procedures, both within the conservation area management team and the local community, should coordinate and respond to individual HTC situations where human-tiger impacts are a major issue.

Rapid Response Teams (RRTs) should be set up to deal with all aspects of HTC. The goal of the team should be to reduce loss of human life and livelihoods, while minimizing tiger deaths. The team’s mandate should include community interaction, education, policy, law enforcement and monitoring, and a range of HTC strategies.¹¹¹ Establishment, operation and performance should follow good practices (see case study 7).¹¹²

Follow up on HTC incidences with targeted actions. The responses to incidents will depend on the nature and type of HTC. But each HTC incident should result in an appropriate response being developed, such as increased monitoring of protected/conserved area boundaries or developing educational programmes with local communities about animal husbandry or personal safety to reduce HTC.¹¹³

Verification of, and any compensation for, HTC should be quick. Verification of a conflict incident is not always easy. Processes should be in place so reports can be quickly verified (e.g., checking for evidence of tiger presence such as pugmarks, scats and incident impacts), usually through a site visit, by RRT teams or third-party verifiers (e.g., local academic or NGO staff).¹¹⁴

HTC management strategies should not undermine traditional knowledge. HTC has existed for millennia, and preventive actions have been developed. New thinking, evidence-based strategies and new technologies all have a part to play, but traditional knowledge can have an important role in promoting coexistence. Combining traditional knowledge with new approaches can also help overcome barriers to more community-based forms of conservation (see section 2) by improving mutual understanding between Indigenous peoples and local communities and authorities/managers on the differing values of nature and culture. Indeed, failing to understand traditional knowledge could make HTC worse. It has been surmised that (over)reliance on the government to address human-wildlife conflict in Kenya, for example, has resulted in loss of traditional skills for coexisting with wildlife, and that conflict rose steeply after the government took responsibility for wildlife protection and problem animal control.¹¹⁵



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4.4 MITIGATION

Mitigation reduces the impacts of HTC incidents after they occur.¹¹⁶ Most mitigation strategies are based on compensation and insurance programmes which provide payment for losses of livestock to depredation, cover medical expenses when people are attacked or provide compensation to a family when a life is lost.

Although commonly utilized to mitigate human-wildlife conflict worldwide,¹¹⁷ compensation schemes on their own rarely have the desired effect to reduce conflict as they only address the symptoms of conflict after the fact rather than the root causes. Such schemes should thus be linked to a comprehensive, integrated HTC strategy. When effective compensation is part of broader, integrated and holistic HTC management strategies, there can be an increase in tolerance and a decrease in retaliatory killing, but such schemes can also raise expectations and even create hostility when poorly managed.¹¹⁸ Compensation schemes are also vulnerable to corruption or fraud, can lack transparency, have inherent administrative delays, fail to account for transaction costs or provide sufficient support (see box 21).¹¹⁹

Moving tigers away from HTC situations has shown limited success. Dangerous animals are sometimes physically moved to another area where they are likely to cause less damage. However, a global survey concluded that translocation is often more costly and less effective than other options such as compensation or changing farming practices.¹²⁰ A survey in 2010 found translocation of tigers met with a 50 per cent success rate (e.g., tigers presence monitored and confirmed) based on four translocations. In the two unsuccessful translocations, tigers were moved to areas of high human activity and were killed by people.¹²¹ This lack of success clearly seems to be the result of poorly designed translocations, as translocations with the goal of reintroduction or population supplementation have been successful.¹²²

Box 20: Coexistence through community-led HTC management

Empowered, trained and well-equipped communities can effectively manage HTC at the local scale. In many cases, community-led HTC management is not only 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.¹²³

And “problem” tiger control can have long-term impacts on tiger populations. Clear guidelines or recommendations for the consistent management of problem tigers must be established.¹²⁴ Legally killing or removing tigers from the wild in response to conflict is a common reaction, for example lethal control made up 23 per cent of mortalities reported in Russia from 1970 to 1990,¹²⁵ but can have consequences well beyond the loss of an individual tiger.¹²⁶ In some circumstances such responses could provide the tipping point for population decline, but in all circumstances the response has to balance conservation and community needs. “Problem” tiger control should focus on tigers that are injured, diseased or infirm in some way that they are not fit to survive in the wild or have repeatedly been proven to have killed people and no other measures have worked. It should be noted that removing adult males can result in infanticide from new males taking over a territory and high mortality of adult female tigers can result in cub death and reduced reproduction.¹²⁷

Livelihood diversification options can help reduce HTC. Given that the poorest and most vulnerable households are generally most threatened by HWC, livelihood diversification strategies can sometimes contribute by spreading risk and reducing the immediate impacts of a single event. Diversification can increase food security overall,¹²⁸ although it should be noted that in practice “diversification” can include seasonal or permanent migration away from the area.¹²⁹ Diversifying options that reduce the amount of time spent in the tiger habitat, such as various carbon credit and Payment for Ecosystem Service schemes and livelihood alternatives,¹³⁰ offer particularly high potential in some areas. Ecotourism in various forms also provides an opportunity for diversification for families and the potential is being realized in many tiger reserves.¹³¹ The community homestay network in Nepal is a good example of a countrywide approach to social enterprise development which connects travellers with local communities.¹³²

Insurance schemes will only work effectively if people are willing to pay an insurance premium and a body exists to underwrite pay-outs. Insurance works by pooling together many people who face similar risks and who are prepared to pay an insurance premium to make sure that the people who experience loss are protected. Schemes also need managing by a body willing to underwrite the costs. Underwriting involves working out a premium that is low enough to attract a good number of buyers but high enough so that there will be enough money to sustainably administer the scheme and to pay any claims that might be made. Most insurance operates by making a profit for the body managing the scheme, but non-profit making schemes can help reduce premiums, as they can plan for lower profit margins (or break-even). Given the specific nature of HTC insurance, government-managed schemes are common and preferable to ensure reduced costs to communities. Where private companies or NGOs are willing to insure at reasonable rates, the system provides a sustainable mechanism for compensation for depredation by tigers.¹³³ Where premiums

CASE STUDY 7: RAPID INCIDENT RESPONSES

Introduction

Whether a medical emergency or an attack by a wild animal, responding rapidly to a crisis or conflict can save lives, ensure clarity around the causes and help develop strategies to secure a rapid resolution to an issue.

Rapid Response Teams (RRTs) are increasingly playing a critical role in coexistence strategies. They are an emergency service that can be called 24-7 to respond to reported HTC events. Their main roles are either dealing with HTC while it is taking place, assessing damage caused by a HTC incident (which can be linked to mitigation in the form of financial relief, etc.) and preparing affected communities to more effectively deal with future HTC incidents.¹³⁴ Tasks within this remit are varied. A WWF review of RRTs around the world lists a range of responsibilities including investigating and verifying incidents, anti-poaching activities, community advice and education, first-aid, crowd control, animal trapping, capture or killing and the difficult task of retrieving the bodies of humans killed because of conflict. According to the review, NGOs play a large role in designing/establishing RRT groups and the majority of people working on RRTs are volunteers from the local community.¹³⁵

Lessons learned in tiger landscapes

In 2019, 11 RRTs were reviewed by WWF and WildTeam across tiger landscapes. Six RRTs had been set up by governments (in Bangladesh, India and Russia), three by communities (in Bangladesh, India and Nepal) and two by NGOs (in Bangladesh and Indonesia). Of the more than 1,000 members, 60 per cent came from the three community-based schemes.¹³⁶

RRT operations in HTC generally follow four hierarchical steps: (i) investigating and confirming any reported HTC; (ii) monitoring the situation and determining if the tiger is still in the area; (iii) using techniques to attempt to frighten the tiger away and (iv) capturing the tiger and assessing its condition if conflict continues or if there is evidence that the tiger is wounded or diseased.¹³⁷ Greater presence of teams in villages particularly affected by HTC and clear communication channels ensure conflict situations are quickly addressed, preventing escalation and retaliation, and lead to more trusting relationships between communities and conservationists. RRT teams also help prepare village leaders and local communities in how to respond and report HTC.¹³⁸

Inside village incidents

START

1. A tiger is in a village and is near enough to the forest to be scared back.
2. A tiger has been sighted inside a village but is not there now.
3. A tiger has killed one or more livestock in a single attack and no concurrent incident has happened.
4. A tiger has killed/injured a person in provoked situation.
5. A tiger has already been identified as a non conflict tiger.
6. An injured tiger is in a village.
7. A tiger is in a village and too far from the forest to be scared back.
8. A tiger is in a village and is surrounded by unmanageable crowd.
9. A tiger is killing livestock on a regular basis from a particular village.
10. A tiger has killed/injured one or more people in an unprovoked situation.
11. An injured tiger has strayed into a village.
12. A tiger has already been identified as a conflict tiger.

Good practices for developing and managing RRTs in tiger landscapes include:

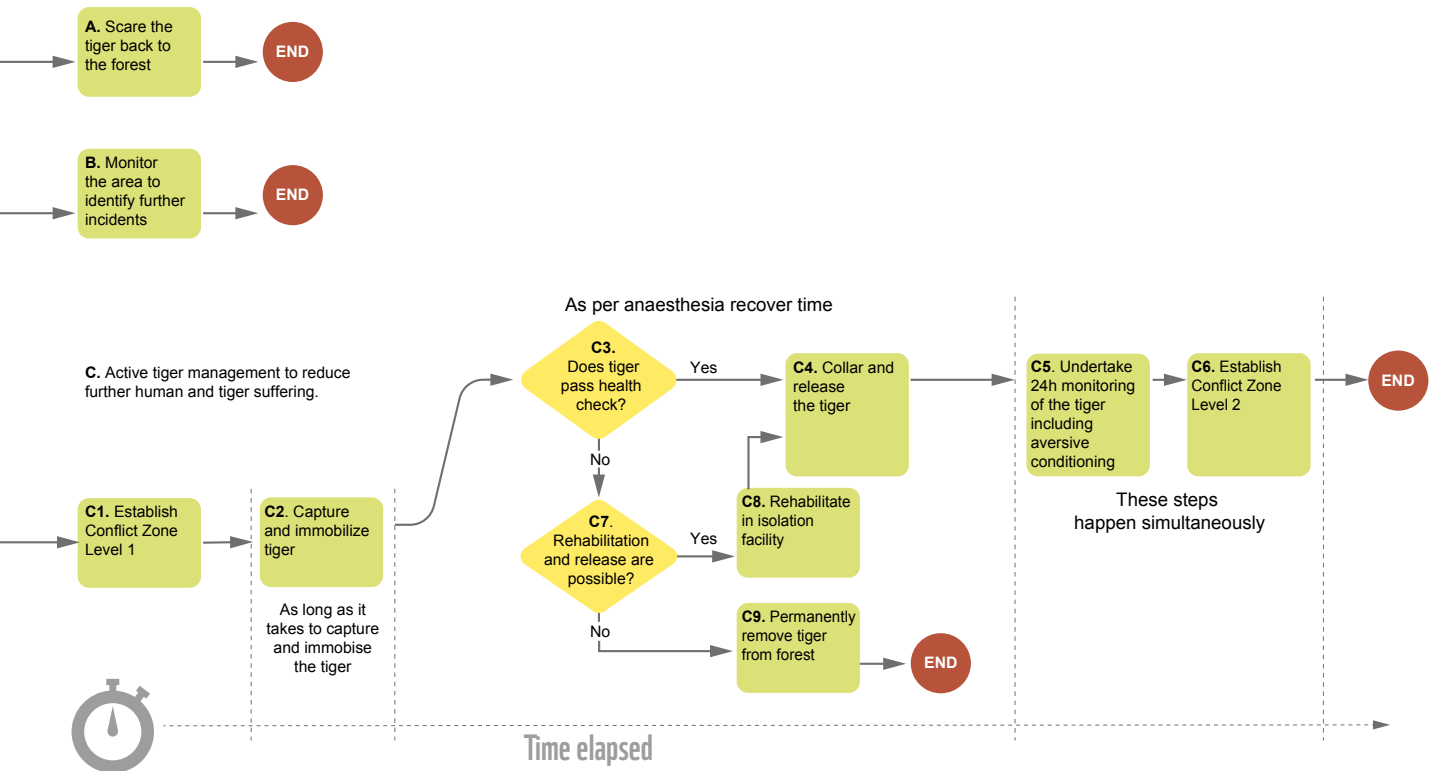
Establishment:

- Having clear authority for carrying out agreed functions;
- Being governed by the same group that operates the response team;¹³⁹
- Being made up of a range of individuals who are motivated to deal with HWC including, where appropriate, local government, NGOs and local communities¹⁴⁰ with access to a range of specializations including those with wildlife conservation and veterinary science and social science expertise.

Operation:

- Locating or setting up teams in areas with a history of conflict (see good practices around predation risk mapping), with response times being agreed with communities (e.g., no longer than six hours);¹⁴¹
- Defining clearly the area/areas where they operate;
- Having a single, official contact number for people to report conflict incidents;

Figure 8: WildTeam decision tree for response teams¹⁴⁷



- Ensuring the teams have enough members to effectively respond to HTC incidents, especially during periods of high conflict;
- Being sufficiently skilled and equipped (including transport) to be effective and timely when carrying out their functions;
- Having a documented protocol for carrying out their functions in response to the different types of HTC incidents;
- Linking operations to a conservation strategy.¹⁴²

Performance:

- Having a process in place to assess and improve the effectiveness of RRT operations;
- Ensuring teams collect HTC related data and share that data with regional, national or international databases;
- Having sufficient funds to cover the costs of carrying out their functions for the foreseeable future;¹⁴³
- Sharing experiences with other teams (e.g., visits, exchanges, etc.).¹⁴⁴

WildTeam’s Village Tiger Response Team (VTRT)

VTRT is the biggest tiger RRT, based on total members, in the review. Established in 2007 by the NGO WildTeam in the Chandpai range of the Sundarbans, Bangladesh, the success of the initial two teams has led to RRTs now covering 80 per cent of the border villages in four ranges of Sundarbans. 49 teams (as of 2018) have been formed with a total of 343 people including 20 women.¹⁴⁵ VTRTs are completely voluntary and do not receive payment but are incentivized by the social status they receive from being on the teams and having active roles in the conservation of their lands and in responding to and managing conflict. All VTRTs have diverse but necessary expertise and have access to a wildlife biologist, a sociologist and a wildlife veterinarian.

The VTRT’s main role is to manage HTC situations inside their village and collect HTC data for WildTeam’s HTC database. But over time this role has evolved to include activities such as social awareness, supporting compensation claims by tiger victims and their families and wild animal rescue (see figure 8). The teams work in coordination with WildTeam, Bangladesh Forest Department, local administrative bodies and other local bodies. From 2007 to 2018, VTRTs helped rescue and release three tigers, and around 350 other wild animals. They effectively managed 30 stray tiger incidents and returned them to the forest and recovered 27 dead bodies of tiger victims. They also provided emergency first-aid to seven people injured by tiger attacks and conducted almost 3,000 village meetings to raise awareness on HTC management. The VTRTs also helped the Forest Department and firefighters in 12 fire incidents.¹⁴⁶

are unaffordable, costs can be reduced by additional support from either the government or non-government sources, such as community financing or ecotourism.¹⁴⁸

Linking compensation and insurance payments with good husbandry and effective HTC management practices has proved effective. Linking good husbandry and funding where appropriate, with HTC management could help change perceptions around HTC by offering *performance payments* for the preservation of species through actions which reduce human tiger impacts, thus reducing retaliation, rather than *compensation payments* for livestock losses (see case study 8 on payments to encourage coexistence).¹⁴⁹ Compensation and insurance programmes for livestock depredation should therefore be linked to effective, well-defined and understood livestock management practices (e.g., livestock were not grazed in tiger habitat zones, were kept in enclosures at night, or avoided high risk areas or periods) as well as good HTC management practices in general.¹⁵⁰ In Indonesia, local governments reward villages practising good husbandry techniques with veterinary care for their livestock in the form of disease prevention, which is

responsible for a greater loss of livestock than tiger attacks. In Aceh province, for example, vaccination of more than 3,000 goats and buffaloes directly addressed a critical and unmet need of rural communities and resulted in increased local support for wildlife conservation activities.¹⁵¹ Payments should also be coupled with appropriate HTC management efforts (as outlined in this report) at the local level with a focus on improved awareness and safety measures, HTC management information and training on reducing conflict.

Ensure compensation and insurance schemes are rigorously and fairly applied. If transaction costs for reporting HTC are generally borne by the individual this can deter people from reporting incidents and obtaining compensation. Transaction costs (which can cover financial costs, such as transport, but also cover time and specifically time spent away from tending livestock, etc.) can be burdensome and entail reporting requirements such as documentation and photographs as well as multiple visits to government offices to file any claims and ensure they are processed (see box 21).¹⁵² Compensation schemes need to ensure payment plans are sustainable, claims can be quickly and efficiently verified, any attempts to falsify claims

Box 21: The importance of straightforward access to rapid compensation

Introduction

Compensation schemes not only need to be in place, but should also be easy and quick to use, and amounts must be comparable between different parts of the country. Lengthy and bureaucratic compensation claims processes can both cause economic hardship for economically vulnerable people and discourage the use of such systems – this in turn will defeat the aims of such programmes, and cause many to resort to retaliation on tigers. These problems may be further compounded when there is a distant authority making the rules for application and deciding outcomes, and where there is no local point of contact. Research in Rajasthan, India suggested that a mixture of overly complicated compensation processes and a focus on only charismatic megafauna like the tiger, meant that many people impacted by HWC were missing out, and that the schemes were developed more for conservation than social priorities.¹⁵³

Wide variation in compensation for HTC between jurisdictions is another factor that can lead to perceptions of unfairness and feelings of dissatisfaction. For instance, there was wide variation found between compensation paid by the three Indian states with the largest tiger populations (Karnataka, Madhya Pradesh and Uttarakhand) in terms of maximum payment for human fatality due to wildlife attack (US\$2,242-7,473) and permanent disability (US\$747-2,989 USD).¹⁵⁴

Rapid compensation mechanisms

Several programmes have sought to address these problems. Although governments should aim to improve the speed of

compensation payment disbursement and lower the administrative burden, organizations and agencies have stepped in to remove some of these burdens from local people.

For example, at the Corbett Tiger Reserve, and adjoining forest divisions in Uttarakhand state and the Kanha Tiger Reserve in Madhya Pradesh, the Corbett Foundation responds quickly to reported big cat attacks on livestock. Staff record evidence (photos, pugmarks, GPS location) and provide any needed veterinary assistance. They will file the claim with the state authorities, but also provide interim financial compensation within seven days of the incident (given that the full government compensation can take much longer to receive). Between 1995 and 2019, US\$238,000 of interim relief was provided in connection with 16,000 cattle depredation cases (tiger or leopard attacks).¹⁵⁵

Wild Seve was established in July 2015, to assist people living near Bandipur and Nagarhole National Parks in Karnataka, India to receive timely compensation for wildlife damage, including from tigers. It initially targeted 315 high conflict villages within 10km of the national parks. The programme established a toll-free number linked to an online portal with a playback recording (in the local language Kannada) asking callers to provide the location and details of any conflict incident. Wild Seve staff conducted an outreach campaign and held meetings with village representatives, community leaders and local governmental authorities. Documentation and information required to make a claim is sourced by programme staff, and each claim is filed with the respective Range Office of the State Forest Department.¹⁵⁶

are dealt with quickly and transparently, and methods of payment are well planned to ensure they can be made rapidly and accessed easily, even in remote areas.¹⁵⁷

Compensation schemes should include all human-wildlife conflict. There are multiple predator species in most parts of the tiger range. Compensating only losses to HTC will not necessarily reduce retaliatory maiming and killing as most methods used (e.g., snaring, poisoning and explosive traps) are indiscriminate.¹⁵⁸ Thus compensation schemes should not only focus on HTC but should be developed to compensate fairly and effectively major impact of other, especially other predator, species.

4.5 MONITORING

Monitoring is an essential part of good management. Evidence and data on the frequency and magnitude of damage caused by HTC and the temporal and spatial distribution of conflict incidents are the basis for informed and evidence-based decision-making.^{159,160} HTC management strategies should be implemented and revised based on sound evidence and stakeholder perspectives, ensuring that they are appropriate and relevant to a local context.¹⁶¹ To date, however, consistent evaluative measures of human-wildlife conflict in general are lacking.¹⁶² Literature reviews of global conflict management studies have concluded that few peer-reviewed studies have produced strong evidence on the effectiveness of interventions, in part due to a lack of consistent evidence.¹⁶³ This is problematic, as it limits the capacity to assess outcomes, adapt management and develop future strategies based on evidence and learning.¹⁶⁴ One highlighted drawback of many studies is the reliance on self-reporting of HTC, which often happens following a considerable time delay, which cannot be corroborated as opposed to data collected during actual incidents.¹⁶⁵

There are thus two main issues here that need to be addressed: (1) the lack of, or poor quality of, monitoring in some areas which suggests that many HTC events go unreported,¹⁶⁶ and (2) the need to consistently measure the performance and effectiveness of HTC management interventions over time to ensure strategies are effective or can be adapted as necessary.¹⁶⁷

Standard approaches to monitoring HTC are needed across the tiger range. At present various systems for monitoring are applied across the tiger range, but the example of the Polar Bear–Human Information Management System (PBHIMS) using SMART could be replicated (see box 22). Here, a standardized approach is being promoted across polar bear range states to unify data collection protocols documenting human-polar bear conflict incidences, to help information exchange on interactions with polar bears and on the tools that have been successfully used to manage the conflict.¹⁶⁸ Such range-wide tools should not outweigh national and locally developed systems but can be useful in providing data and promoting interchange of strategies and tools. They will be extremely useful in collating and reporting

HTC across the range to global targets such as those proposed in the CBD’s future conservation agreements. Consistent monitoring standards/criteria across tiger range countries would also help the understanding of hotspots, trends and success of interventions.

Involve the local community in monitoring conflict incidents. Multi-stakeholder methods for monitoring and evaluating HTC should be based on agreement by all affected parties on what is acceptable as good evidence of an issue¹⁶⁹ and on how data should be collected, used and stored. Documentation should be able to clearly identify predators at the time of, or soon after, an attack through assessment of tracks, scats and other signs at the site of an incident.¹⁷⁰ Involvement of trained local community members as enumerators, for example, one or two appointed community members who are seen as independent from those reporting the conflict (ideally this person would be someone less likely to suffer from HTC) and using agreed protocols, can ensure rapid recording and more accurate monitoring of incidents. It can also provide local employment. This approach does have logistical and financial constraints as local enumerators need to be recruited, trained, employed and monitored, which requires personnel and management as well as a sustainable financial base.¹⁷¹ This type of approach could be linked with insurance, as is common in most insurance schemes, but would inevitably increase insurance premiums. In Namibia’s communal conservancies, the Event Book System has been developed to monitor and record HWC damage. The system is community-owned and managed. Each community determines what needs to be monitored and recorded 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 event cards, which are reported to the Event Book, and data belong to the conservancy and remain at its administration offices. Data is summarized annually and independently reviewed. Summary data per conservancy are used at the national level to evaluate conservancy performance, implement adaptive management interventions and compile Namibia’s annual State of Conservancies report.¹⁷²

Detailed monitoring of HTC incidents allows for tracking trends in conflict over time and space. Data sheets and a database should be developed to allow for the characterization of conflict, including GPS location, time and date, nature of conflict, number of domestic animals involved (including data on species, sex and age), people wounded or killed, and characteristics (e.g., age, sex and physical condition) of the tiger involved. Identification of the predator should be based on direct sightings and evidence (e.g., photographs) if possible or indirect evidence such as patterns of carcass consumption.¹⁷³ Analysis of such data will help identify conflict “hotspots”, support the development of predation risk maps and guide HTC interventions.¹⁷⁴ Databases need clear protocols for data entry and management plans for the long term.

Monitoring impacts of HTC strategies should demonstrate successes and failures. HTC management strategies should include monitoring and reporting plans to enable learning from successes¹⁷⁵ and failures. Indicators should be wide ranging to include social and conservation outcomes. For example, data on tiger populations, including data on any retaliatory harm to tigers and relocations due to HTC, along with the number and severity of HTC, costs involved, community attitudes, etc. should be kept, assessed and reported.¹⁷⁶ Monitoring of management strategies should incorporate measures of effectiveness and rates of adoption among target users.¹⁷⁷ Monitoring of social impacts based on social structures, for example, impact on women and other marginal groups must be part of the monitoring strategy. Monitoring should also always be based on agreed and consistently used protocols for collecting, assessing and storing data, and monitoring results should be fed back into management.

Consider counterfactuals when developing interventions to aid monitoring. Counterfactual analysis allows the analysis of cause and effect between interventions and outcomes. The “counterfactual” (or “control”) measures are what would have happened in the absence of the intervention, and impact is estimated by comparing counterfactual outcomes to those observed under the intervention. For example, the effectiveness of an intervention used to protect a livestock herd can be compared against a livestock herd that is not exposed to the intervention. However, care needs to be taken to replicate as many factors as possible to ensure any success or failure is due to the intervention and not to other factors.¹⁷⁸ There is also an ethical consideration to using counterfactuals if it leaves a “control” community at greater risk of HTC due to the lack of any HTC management.

4.6 POLICY

Legal frameworks and guidelines addressing HTC drivers and HTC management can help ensure lasting solutions that yield net, tangible benefits to rural communities who coexist with wildlife. Policies and regulations governing human-wildlife conflict in general, and more specifically the goal of coexistence, are currently missing from international conventions and frameworks, although the CBD’s much delayed draft post-2020 framework, which is due to be finalized toward the end of 2022, includes within its Target 4 a reference to human-wildlife conflict,¹⁷⁹ although the wording around this target (as of early 2022) is still subject to discussion.¹⁸⁰ Nationally, policy instruments include a range of declarations, statements of interest, standards, guidelines, recommendations, memorandums of understanding and codes of conduct or practice, and law.¹⁸¹

There is an absence of a truly comprehensive policy specific to human-tiger conflict across the tiger range countries, although certain elements of the topic are covered to varying degrees through a patchwork of instruments in some of those countries. This ranges from no tiger-specific policies

Box 22: SMART

SMART (Spatial Monitoring and Reporting Tool)¹⁸² is an integrated, multi-platform conservation area management system, used in combination with associated capacity building and standards (collectively termed “the SMART Approach”). It is designed to improve the management effectiveness of area-based conservation by enabling practitioners to collect information about the areas they manage, and to use this to evaluate, adapt and improve management over time. SMART is built on a foundation of field-based monitoring by rangers, protected area staff and community members. It encompasses three software platforms: SMART Mobile, a smartphone app for standardized, *in-situ* collection of observation data and tracklogs (e.g., during ranger patrols or site surveys); SMART Desktop, a desktop solution for administration, analysis, mapping and reporting of collected data, and strategic planning of future management activities (e.g., patrols); and SMART Connect, a cloud-based solution for centralized data management and sharing, and sending real-time alerts to staff in the field. SMART can be used as a stand-alone monitoring system or as a way of collecting information for existing assessment tools such as the Management Effectiveness Tracking Tool, METT.¹⁸³

Since its inception over a decade ago, SMART has continued to evolve from what was an area-based conservation tool used primarily by protected area rangers for law enforcement purposes to an all-encompassing monitoring system. SMART is now deployed for many purposes, including law enforcement monitoring, case tracking, outreach activities, forestry activities and human-wildlife conflict, among others. SMART is also no longer reliant on “patrol” data, with recent developments to enable independent observations by staff as well as from community members or citizen scientists through the newly developed “SMART Collect” application. SMART Collect enables any user (dependent upon permissions) to download data collection packages and upload data to a central database located anywhere on Earth.

The development of the “Independent Incident” modes of data collection has been central to efforts to roll out SMART as the primary tool for the monitoring of polar bear conflict events in all range countries after an agreement by all parties to transition the Polar Bear Human Information Management System (PBHIMS) to SMART. This functionality is allowing researchers, protected area staff and community members in all range countries to collect data on a mobile application using a shared, specialized, polar bear conflict model, meaning data collection, sharing and analysis between countries will be better and easier than ever before. In addition, SMART has developed a powerful new analytical tool called “SMART Profiles” which allows for the creation of records of conflict, associating these conflict events with individual animals, species, locations and other entities, enabling detailed analysis of conflict events in any given area.

at all in some countries, to extensive policies, as is seen in India.¹⁸⁴ Considerable guidance on HTC management and response – including preventative measures – are outlined in the Indian Standard Operating Procedure to deal with Emergency Arising due to Straying of Tigers in Human Dominated Landscapes.¹⁸⁵ The Wild Life (Protection) Act of India, 1972, also empowers the Chief Wildlife Wardens of the States to enable measures for the coexistence of humans and wildlife inside and outside national parks and sanctuaries.¹⁸⁶ Although not as detailed in terms of roles and responsibilities, the Tiger Action Plan for Bhutan (2018-2023) lays out a broad set of actions that the government will strive to implement in order to adequately address the many aspects of HTC.¹⁸⁷ Bangladesh has identified (rapid) tiger response teams (see case study 7) as a primary means through which to implement HTC policy in that country, while also recognizing the need for further protocols specific to the topic.¹⁸⁸

Governance issues are paramount. There is a growing recognition of the role governance plays in conservation and sustainable development. Many organizations focus on good governance as being equitable, transparent, accountable, effective, responsive, inclusive and working toward building consensus while remaining within the law,¹⁸⁹ all principles which should be the focus of any HTC strategy and policy. Indeed, it is often because one or more of these governance fundamentals is not in place that leads to or exacerbates conflict situations. When people lack access to governance over wildlife management, for example, informal actions, such as retaliatory killing or poaching, may be more likely to occur.¹⁹⁰

Policies should clearly define HTC and be developed with meaningful consultation with those actors that are impacted/influence conflict. The importance of consultation and involvement has been stressed above. Policies should clearly lay out what constitutes HTC and formally define the policies and measures that will be taken to address HTC in ways that reduce losses to human life and livelihood and reduce tiger deaths.¹⁹¹ In India, the National Wildlife Action Plan 2017-2031 has a chapter dedicated to managing HWC, stipulating the development of national and regional conflict management plans, streamlining the process of providing post-conflict relief, and gathering relevant ecological information for the formation of local action plans.¹⁹²

HCT management strategies and policies should ensure diverse and locally adaptive solutions. Responses to HTC should be interdisciplinary, participatory and stakeholder-inclusive, and involve all relevant regulatory agencies, Indigenous peoples and community members working together to develop strategies and programmes that can collectively evaluate wildlife management goals and the potential trade-offs.^{193,194,195,196,197,198, 199} Because of the complexity of contexts, questionnaire-based studies²⁰⁰ are best complemented with more in-depth outreach that is capable of providing additional understanding of the layers,

histories and nuances of HTC in the local area.²⁰¹ It is worth noting that research assessing local communities' attitudes to HTC often groups local stakeholders based on socio-economic factors (e.g., commercial farmers, pastoralists, etc.), but this can overlook important cultural differences between people from different ethnic groups with different cultural and belief systems.²⁰²

Policies only work if they are effectively enforced. Policies only work if they are effectively implemented and enforced: a critique, for example, of compensation payments for human-wildlife conflict in India noted that officials often lack the power to fully enforce state laws and policies on the ground, while communities lack the power to fully access resources, leading to selective reporting, compliance and reimbursement.²⁰³ An analysis of approaches using local wildlife guardians found that inadequate or erratic payment could undermine goodwill and success. Lack of maintenance is often identified as a major limiting factor in the success of electric fencing. Grant-funded, capital-intensive interventions that lack the budget to maintain them, or that are not backed by effective laws and policies, are likely to fail.

Box 23: Characteristics of good human-wildlife conflict legislation

WWF suggests that human-wildlife conflict (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 among the strata of the government, including local and community-based administration, while ensuring decentralized control;
- Harmonize with policies from other sectors that may otherwise exacerbate HWC by influencing its drivers;
- Build in the flexibility needed to address the various sets of realities and contexts regarding HWC on provincial/state, city, town and neighbourhood levels.²⁰⁴

REFERENCES AND NOTES

- 1 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. Retrieved from: https://wwfint.awsassets.panda.org/downloads/a_future_for_all_the_need_for_human_wildlife_coexistence.pdf
- 2 IUCN. 2020. *IUCN SSC Position Statement on the Management of Human-Wildlife Conflict*. IUCN Species Survival Commission (SSC) Human-Wildlife Conflict Task Force. Retrieved from: https://www.iucn.org/sites/dev/files/ssc_human_wildlife_conflict_position_statement.pdf
- 3 Nowell, K. and Jackson, P. 1996. *Wild cats: status survey and conservation action plan*. IUCN, Gland, Switzerland. Retrieved from: <https://portals.iucn.org/library/sites/library/files/documents/1996-008.pdf>
- 4 Pooley, S. 2021. Coexistence for Whom? *Frontiers in Conservation Science* 2: 726991. DOI: 10.3389/fcosc.2021.726991
- 5 Lubis, M.I., Pusparini, W., Prabowo, S.A., Marthy, W., Tarmizi, N., Andayani, M. et al. 2020. Unraveling the complexity of human-tiger conflicts in the Leuser Ecosystem, Sumatra. *Animal Conservation* 23: 741-749. DOI: 10.1111/acv.12591
- 6 Pooley, S., Barua, M., Beinart, W., Dickman, A., Holmes, G., Lorimer, J. et al. 2017. An interdisciplinary review of current and future approaches to improving human-predator relations. *Conservation Biology* 31: 513-523. DOI: 10.1111/cobi.12859
- 7 Hill, C.M. 2021. Conflict Is Integral to Human-Wildlife Coexistence. *Frontiers in Conservation Science* 2: 734314. DOI: 10.3389/fcosc.2021.734314
- 8 IUCN. 2020. *IUCN SSC Position Statement on the Management of Human-Wildlife Conflict*. IUCN Species Survival Commission (SSC) Human-Wildlife Conflict Task Force. Retrieved from: https://www.iucn.org/sites/dev/files/ssc_human_wildlife_conflict_position_statement.pdf
- 9 Pooley, S., Barua, M., Beinart, W., Dickman, A., Holmes, G., Lorimer, J. et al. 2017. *Op cit*
- 10 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 11 Adapted from: Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 12 Kansky, R. and Knight, A.T. 2014. Key factors driving attitudes towards large mammals in conflict with humans. *Biological Conservation* 179: 93-105. DOI: 10.1016/j.biocon.2014.09.008
- 13 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *The State of Knowledge and Practice on Human-Wildlife Conflicts*. Luc Hoffmann Institute, Gland, Switzerland. Retrieved from: <https://luchoffmanninstitute.org/wp-content/uploads/2020/03/LucHoffmannInstitute-humanwildlifeconflict-web.pdf>
- 14 Young, J.C., Thompson, D.B.A., Moore, P., MacGugan, A., Watt, A. and Redpath, S.M. 2016. A conflict management tool for conservation agencies. *Journal of Applied Ecology* 53: 705-711. DOI: 10.1111/1365-2664.12612
- 15 Goodrich, J.M. 2010. Human-tiger conflict: A review and call for comprehensive plans. *Integrative Zoology* 5: 300-312. DOI: 10.1111/j.1749-4877.2010.00218.x
- 16 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 17 Inskip, C., Fahad, Z., Tully, R., Roberts, T. and MacMillan, D. 2014. Understanding carnivore killing behaviour: Exploring the motivations for tiger killing in the Sundarbans, Bangladesh. *Biological Conservation* 180: 42-50. DOI: 10.1016/j.biocon.2014.09.028
- 18 Eklund, A., López-Bao, J.V., Tourani, M., Chapron, G. and Frank, J. 2017. Limited evidence on the effectiveness of interventions to reduce livestock predation by large carnivores. *Scientific Reports* 7: 2097. DOI: 10.1038/s41598-017-02323-w
- 19 IUCN. 2020. *IUCN SSC Position Statement on the Management of Human-Wildlife Conflict*. IUCN Species Survival Commission (SSC) Human-Wildlife Conflict Task Force. Retrieved from: https://www.iucn.org/sites/dev/files/ssc_human_wildlife_conflict_position_statement.pdf
- 20 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 21 Mascia, M.B., Brosius, J.P., Dobson, T.A., Forbes, B.C., Horowitz, L., McKean, M.A. et al. 2003. Conservation and the Social Sciences. *Conservation Biology* 17: 649-650. DOI: 10.1046/j.1523-1739.2003.01738.x
- 22 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 23 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 24 IUCN. 2020. *IUCN SSC Position Statement on the Management of Human-Wildlife Conflict*. IUCN Species Survival Commission (SSC) Human-Wildlife Conflict Task Force. Retrieved from: https://www.iucn.org/sites/dev/files/ssc_human_wildlife_conflict_position_statement.pdf
- 25 Struebig, M.J., Linkie, M., Deere, N.J., Martyr, D.J., Millyanawati, B., Faulkner, S.C. et al. 2018. Addressing human-tiger conflict using socio-ecological information on tolerance and risk. *Nature Communications* 9: 3455. DOI: 10.1038/s41467-018-05983-y
- 26 Pooley, S., Barua, M., Beinart, W., Dickman, A., Holmes, G., Lorimer, J. et al. 2017. *Op cit*
- 27 Perry, L.R., Moorhouse, T.P., Loveridge, A.J. and Macdonald, D.W. 2020. The role of psychology in determining human-predator conflict across southern Kenya. *Conservation Biology* 34: 879-890. DOI: 10.1111/cobi.13474
- 28 Gurung, B., Smith, J.L.D., McDougal, C., Karki, J.B. and Barlow, A. 2008. Factors associated with human-killing tigers in Chitwan National Park, Nepal. *Biological Conservation* 141: 3069-3078. DOI: 10.1016/j.biocon.2008.09.013
- 29 Gross, J. 2016. Protecting People and Tigers in the Bangladesh Sundarbans. *The Jaguar and its Allies*. Retrieved from: <https://thejaguarandallies.com/2016/03/10/protecting-people-and-tigers-in-the-bangladesh-sundarbans/>
- 30 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 31 Bhattarai, B.R., Wright, W., Morgan, D., Cook, S. and Baral, H.S. 2019. Managing human-tiger conflict: lessons from Bardia and Chitwan National Parks, Nepal. *European Journal of Wildlife Research* 65: 34. DOI: 10.1007/s10344-019-1270-x
- 32 Malviya, M. and Ramesh, K. 2015. Human-felid conflict in corridor habitats: implications for tiger and leopard conservation in Terai Arc Landscape, India. *Human-Wildlife Interactions* 9(1): 48-57. DOI: 10.26077/x9tx-gb97
- 33 Pooley, S., Barua, M., Beinart, W., Dickman, A., Holmes, G., Lorimer, J. et al. 2017. *Op cit*
- 34 Landy, F., Rodary, E. and Calas, B. 2018. Why Did Leopards Kill Humans in Mumbai but not in Nairobi? Wildlife Management in and Around Urban National Parks to Natured Cities in the Global South: *The Quest for Naturbanity*, pp 157-179. Springer, Singapore. DOI: 10.1007/978-981-10-8462-1_7
- 35 IUCN. 2020. *IUCN SSC Position Statement on the Management of Human-Wildlife Conflict*. IUCN Species Survival Commission (SSC) Human-Wildlife Conflict Task Force. Retrieved from: https://www.iucn.org/sites/dev/files/ssc_human_wildlife_conflict_position_statement.pdf
- 36 Hill, C.M. 2021. Conflict Is Integral to Human-Wildlife Coexistence. *Frontiers in Conservation Science* 2: 734314. DOI: 10.3389/fcosc.2021.734314
- 37 IUCN. 2020. *Op cit*
- 38 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *The State of Knowledge and Practice on Human-Wildlife Conflicts*. Luc Hoffmann Institute, Gland, Switzerland. Retrieved from: <https://luchoffmanninstitute.org/wp-content/uploads/2020/03/LucHoffmannInstitute-humanwildlifeconflict-web.pdf>
- 39 Young, J.C., Thompson, D.B.A., Moore, P., MacGugan, A., Watt, A. and Redpath, S.M. 2016. A conflict management tool for conservation agencies. *Journal of Applied Ecology* 53: 705-711. DOI: 10.1111/1365-2664.12612
- 40 IUCN. 2020. *Op cit*
- 41 Pooley, S., Barua, M., Beinart, W., Dickman, A., Holmes, G., Lorimer, J. et al. 2017. *Op cit*
- 42 Goodrich, J.M. 2010. Human-tiger conflict: A review and call for comprehensive plans. *Integrative Zoology* 5: 300-312. DOI: 10.1111/j.1749-4877.2010.00218.x
- 43 Pooley, S., Barua, M., Beinart, W., Dickman, A., Holmes, G., Lorimer, J. et al. 2017. *Op cit*
- 44 König, H.J., Kiffner, C., Kramer-Schadt, S., Fürst, C., Keuling, O. and Ford, A.T. 2020. Human-wildlife coexistence in a changing world. *Conservation Biology* 34: 786-794. DOI: 10.1111/cobi.13513
- 45 Dickman, A.J., Macdonald, E.A. and 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 United States of America* 108: 13937-13944. DOI: 10.1073/pnas.1012972108
- 46 Shahi, K., Khanal, G., Jha, R.R., Joshi, A.K., Bhusal, P. and Silwal, T. 2021. Characterizing damages caused by wildlife: Learning from Bardia National Park, Nepal. *Human Dimensions of Wildlife*: 1-10. DOI: 10.1080/10871209.2021.1890862
- 47 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 48 Kansky, R. and Knight, A.T. 2014. Key factors driving attitudes towards large mammals in conflict with humans. *Biological Conservation* 179: 93-105. DOI: 10.1016/j.biocon.2014.09.008
- 49 Doubleday, K.F. and Rubino, E.C. 2021. Tigers bringing risk and security: Gendered perceptions of tiger reintroduction in Rajasthan, India. *Ambio*. DOI: 10.1007/s13280-021-01649-0
- 50 Doubleday, K.F. 2020. Tigers and "Good Indian Wives": Feminist Political Ecology Exposing the Gender-Based Violence of Human-Wildlife Conflict in Rajasthan, India. *Annals of the American Association of Geographers* 110: 1521-1539. DOI: 10.1080/24694452.2020.1723396

- 51 Doubleday, K.F. and 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: 976-998. DOI: 10.1177/2514848619875664.
- 52 Chowdhury, A.N., Mondal, R., Brahma, A. and Biswas, M.K. 2016. Ecopsychosocial Aspects of Human-Tiger Conflict: An Ethnographic Study of Tiger Widows of Sundarban Delta, India. *Environmental Health Insights* 10: EHI.S24899. DOI: 10.4137/EHI.S24899
- 53 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *The State of Knowledge and Practice on Human-Wildlife Conflicts*. Luc Hoffmann Institute, Gland, Switzerland. Retrieved from: <https://luchoffmanninstitute.org/wp-content/uploads/2020/03/LucHoffmannInstitute-humanwildlifeconflict-web.pdf>
- 54 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 55 König, H.J., Kiffner, C., Kramer-Schadt, S., Fürst, C., Keuling, O. and Ford, A.T. 2020. *Op cit*
- 56 Di Minin, E., Slotow, R., Fink, C., Bauer, H. and Packer, C. 2021. A pan-African spatial assessment of human conflicts with lions and elephants. *Nature Communications* 12: 2978. DOI: 10.1038/s41467-021-23283-w
- 57 Bhattarai, B.R., Wright, W., Morgan, D., Cook, S. and Baral, H.S. 2019. Managing human-tiger conflict: lessons from Bardia and Chitwan National Parks, Nepal. *European Journal of Wildlife Research* 65: 34. DOI: 10.1007/s10344-019-1270-x
- 58 Struebig, M.J., Linkie, M., Deere, N.J., Martyr, D.J., Millyanawati, B., Faulkner, S.C. et al. 2018. *Op cit*
- 59 Pooley, S., Barua, M., Beinart, W., Dickman, A., Holmes, G., Lorimer, J. et al. 2017. *Op cit*
- 60 Rostro-García, S., Tharchen, L., Abade, L., Astaras, C., Cushman, S.A. and Macdonald, D.W. 2016. Scale dependence of felid predation risk: identifying predictors of livestock kills by tiger and leopard in Bhutan. *Landscape Ecology* 31(6): 1277-1298. DOI: 10.1007/s10980-015-0335-9
- 61 Karanth, K.K., Gopalaswamy, A.M., Prasad, P.K. and Dasgupta, S. 2013. Patterns of human-wildlife conflicts and compensation: Insights from Western Ghats protected areas. *Biological Conservation* 166: 175-185. DOI: 10.1016/j.biocon.2013.06.027
- 62 Rostro-García, S., Tharchen, L., Abade, L., Astaras, C., Cushman, S.A. and Macdonald, D.W. 2016. *Op cit*
- 63 Bhattarai, B.R., Wright, W., Morgan, D., Cook, S. and Baral, H.S. 2019. Managing human-tiger conflict: lessons from Bardia and Chitwan National Parks, Nepal. *European Journal of Wildlife Research* 65: 34. DOI: 10.1007/s10344-019-1270-x
- 64 Chowdhury, A.N., Mondal, R., Brahma, A. and Biswas, M.K. 2016. Ecopsychosocial Aspects of Human-Tiger Conflict: An Ethnographic Study of Tiger Widows of Sundarban Delta, India. *Environmental Health Insights* 10: EHI.S24899. DOI: 10.4137/EHI.S24899
- 65 Malviya, M. and Ramesh, K. 2015. Human-felid conflict in corridor habitats: implications for tiger and leopard conservation in Terai Arc Landscape, India. *Human-Wildlife Interactions* 9(1): 48-57. DOI: 10.26077/x9tx-gb97
- 66 Bargali, H.S. and Ahmed, T. 2018. Patterns of livestock depredation by tiger (*Panthera tigris*) and leopard (*Panthera pardus*) in and around Corbett Tiger Reserve, Uttarakhand, India. *PLoS ONE* 13: e0195612. DOI: 10.1371/journal.pone.0195612
- 67 Khorozyan, I., Ghoddousi, A., Soofi, M. and Waltert, M. 2015. Big cats kill more livestock when wild prey reaches a minimum threshold. *Biological Conservation* 192: 268-275. DOI: 10.1016/j.biocon.2015.09.031.
- 68 *Ibid*
- 69 <https://www.tribuneindia.com/news/schools/bagh-mitras-to-help-check-man-animal-conflict-378955> and <https://thewire.in/environment/why-a-fence-is-not-the-answer-to-pilbhits-chronic-human-tiger-conflict> (accessed 11 March 2022).
- 70 Goodrich, J.M. 2010. Human-tiger conflict: A review and call for comprehensive plans. *Integrative Zoology* 5: 300-312. DOI: 10.1111/j.1749-4877.2010.00218.x
- 71 Lubis, M.I., Pusparini, W., Prabowo, S.A., Marthy, W., Tarmizi, N., Andayani, M. et al. 2020. Unraveling the complexity of human-tiger conflicts in the Leuser Ecosystem, Sumatra. *Animal Conservation* 23: 741-749. DOI: 10.1111/acv.12591
- 72 Soofi, M., Ghoddousi, A., Zeppenfeld, T., Shokri, S., Soufi, M., Egli, L. et al. 2019. Assessing the relationship between illegal hunting of ungulates, wild prey occurrence and livestock depredation rate by large carnivores. *Journal of Applied Ecology* 56: 365-374. DOI: 10.1111/1365-2664.13266
- 73 Khorozyan, I., Ghoddousi, A., Soofi, M. and Waltert, M. 2015. Big cats kill more livestock when wild prey reaches a minimum threshold. *Biological Conservation* 192: 268-275. DOI: 10.1016/j.biocon.2015.09.031
- 74 Lubis, M.I., Pusparini, W., Prabowo, S.A., Marthy, W., Tarmizi, N., Andayani, M. et al. 2020. *Op cit*
- 75 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *The State of Knowledge and Practice on Human-Wildlife Conflicts*. Luc Hoffmann Institute, Gland, Switzerland. Retrieved from: <https://luchoffmanninstitute.org/wp-content/uploads/2020/03/LucHoffmannInstitute-humanwildlifeconflict-web.pdf>
- 76 Goodrich, J.M. 2010. *Op cit*
- 77 <https://www.tractindia.org/initiatives.html> (accessed 12 February 2022).
- 78 Lewis, A.L., Baird, T.D. and Soric, M.G. 2016. Mobile Phone Use and Human-Wildlife Conflict in Northern Tanzania. *Environmental Management* 58: 117-129. DOI: 10.1007/s00267-016-0694-2
- 79 Ronoh, E.K., Mirau, S. and Dida, M.A. 2022. Human-Wildlife Conflict Early Warning System Using the Internet of Things and Short Message Service. *Engineering, Technology & Applied Science Research* 12: 8273-8277. DOI: 10.48084/etasr.4662
- 80 Weise, F.J., Hauptmeier, H., Stratford, K.J., Hayward, M.W., Aal, K., Heuer, M. et al. 2019. Lions at the Gates: Trans-disciplinary Design of an Early Warning System to Improve Human-Lion Coexistence. *Frontiers in Ecology and Evolution* 6. DOI: 10.3389/fevo.2018.00242
- 81 Reed, G., Brunet, N.D., Longboat, S. and Natcher, D.C. 2020. Indigenous guardians as an emerging approach to indigenous environmental governance. *Conservation Biology* 23 (1): 179-189. DOI 10.1111/cobi.13532.
- 82 Sibanda, L., van der Meer, E., Johnson, P.J., Hughes, C., Dlodlo, B., Parry, R.H. et al. 2021. Evaluating the effects of a conservation intervention on rural farmers' attitudes toward lions. *Human Dimensions of Wildlife* 26: 445-460. DOI: 10.1080/10871209.2020.1850933
- 83 Popp, J.N., Priadka, P., Young, M., Koch, K. and Morgan, J. 2020. Indigenous guardianship and moose monitoring: weaving Indigenous and Western ways of knowing. *Human-Wildlife Interactions* 14 (2): 296-308.
- 84 Singh, R. 2020. Notes from the field: Himal Rashaks of Sikkim: The burden of being flag-bearers of community-based conservation. *Ecology, Economy and Society – the INSEE Journal* 3 (2): 179-183.
- 85 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *The State of Knowledge and Practice on Human-Wildlife Conflicts*. Luc Hoffmann Institute, Gland, Switzerland. Retrieved from: <https://luchoffmanninstitute.org/wp-content/uploads/2020/03/LucHoffmannInstitute-humanwildlifeconflict-web.pdf>
- 86 <https://www.peoplenotpoaching.org/vidiyal-vanapathukappu-sangam-participatory-forest-management-india> (accessed 16 March 2022).
- 87 Unpublished document from WWF-Bhutan 'hunters to conservationists' <http://www.bbs.bt/news/?p=124259> (accessed 7 April 2022).
- 88 Goodrich, J.M. 2010. Human-tiger conflict: A review and call for comprehensive plans. *Integrative Zoology* 5: 300-312. DOI: 10.1111/j.1749-4877.2010.00218.x
- 89 Kansky, R. and Knight, A.T. 2014. Key factors driving attitudes towards large mammals in conflict with humans. *Biological Conservation* 179: 93-105. DOI: 10.1016/j.biocon.2014.09.008
- 90 Perry, L.R., Moorhouse, T.P., Loveridge, A.J. and Macdonald, D.W. 2020. The role of psychology in determining human-predator conflict across southern Kenya. *Conservation Biology* 34: 879-890. DOI: 10.1111/cobi.13474
- 91 Cavalcanti, S.M.C., Crawshaw, P.G. and Tortato, F.R. 2012. Use of Electric Fencing and Associated Measures as Deterrents to Jaguar Predation on Cattle in the Pantanal of Brazil. In: M.J. Somers and M. Hayward (eds), *Fencing for Conservation*, pp 295-309. Springer New York, NY. DOI: 10.1007/978-1-4614-0902-1_16
- 92 Lichtenfeld, L.L., Trout, C. and Kisimir, E.L. 2015. Evidence-based conservation: predator-proof bomas protect livestock and lions. *Biodiversity and Conservation* 24: 483-491. DOI: 10.1007/s10531-014-0828-x.
- 93 Goodrich, J.M. 2010. Human-tiger conflict: A review and call for comprehensive plans. *Integrative Zoology* 5: 300-312. DOI: 10.1111/j.1749-4877.2010.00218.x
- 94 Bhattarai, B.R., Wright, W., Morgan, D., Cook, S. and Baral, H.S. 2019. Managing human-tiger conflict: lessons from Bardia and Chitwan National Parks, Nepal. *European Journal of Wildlife Research* 65: 34. DOI: 10.1007/s10344-019-1270-x
- 95 <https://www.thegef.org/news/mitigating-human-wildlife-conflict-save-indonesias-summer-tigers> (accessed 8 March 2022).
- 96 Pooley, S., Barua, M., Beinart, W., Dickman, A., Holmes, G., Lorimer, J. et al. 2017. *Op cit*
- 97 Di Minin, E., Slotow, R., Fink, C., Bauer, H. and Packer, C. 2021. A pan-African spatial assessment of human conflicts with lions and elephants. *Nature Communications* 12: 2978. DOI: 10.1038/s41467-021-23283-w

- 98 Gurung, B., Smith, J.L.D., McDougal, C., Karki, J.B. and Barlow, A. 2008. Factors associated with human-killing tigers in Chitwan National Park, Nepal. *Biological Conservation* 141: 3069-3078. DOI: 10.1016/j.biocon.2008.09.013
- 99 Dhungana, R., Savini, T., Karki, J.B. and Bumrungsri, S. 2016. Mitigating Human-Tiger Conflict: An Assessment of Compensation Payments and Tiger Removals in Chitwan National Park, Nepal. *Tropical Conservation Science*. 776-787. DOI: 10.1177/194008291600900213
- 100 https://wwf.panda.org/wwf_news/?217050/Nepal-celebrates-Zero-Poaching-Year (accessed 8 March 2022).
- 101 Lamichhane, B.R., Persoon, G.A., Leirs, H., Musters, C.J.M., Subedi, N., Gairhe, K.P. et al. 2017. Are conflict-causing tigers different? Another perspective for understanding human-tiger conflict in Chitwan National Park, Nepal. *Global Ecology and Conservation* 11: 177-187. DOI: 10.1016/j.gecco.2017.06.003
- 102 Fitzmaurice, A., Poudel, P., Offord-Woolley, S., Macdonald, D., Thapa, S., Lamichhane, B.R. et al. 2021. *Complex consequences of conservation success: Emerging human-tiger conflicts in Nepal*. Cat News No. 72. IUCN/SSC Cat Specialist Group. Retrieved from: <http://www.catsg.org/index.php?id=718>
- 103 Goodrich, J.M. 2010. *Op cit*
- 104 *Ibid*
- 105 Khorozyan, I. and Waltert, M. 2021. A global view on evidence-based effectiveness of interventions used to protect livestock from wild cats. *Conservation Science and Practice* 3: e317. DOI: 10.1111/csp2.317
- 106 Ahmed, A. 2011. Lighting lives in the Sundarbans. WWF-India, 18 July 2011. Retrieved from: wwf.panda.org/?uNewsID=201051 (accessed 6 January 2022).
- 107 www.foxlightsaustralia.com.au/ (accessed 6 January 2022).
- 108 Naha, D., Chaudhary, P., Sonker, G. and Sathyakumar, S. 2020. Effectiveness of non-lethal predator deterrents to reduce livestock losses to leopard attacks within a multiple-use landscape of the Himalayan region. *PeerJ* 8: e9544. DOI: 10.7717/peerj.9544
- 109 Lakshmikantha, B.K. 2020. Solar-powered lights to deter animals a hit among farmers. *Times of India*, 9 April 2020. Retrieved from: https://timesofindia.indiatimes.com/city/mysuru/solar-powered-lights-to-deter-animals-a-hit-among-farmers/articleshow/75053261.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst (accessed 6 January 2022)
- 110 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 111 Goodrich, J.M. 2010. *Op cit*
- 112 Barlow, A. and Brooks, A. 2019. *Op cit*
- 113 Lubis, M.I., Pusparini, W., Prabowo, S.A., Marthy, W., Tarmizi, N., Andayani, M. et al. 2020. Unraveling the complexity of human-tiger conflicts in the Leuser Ecosystem, Sumatra. *Animal Conservation* 23: 741-749. DOI: 10.1111/acv.12591
- 114 *Ibid*
- 115 Western, D., Waithaka, J. and Kamanga, J. 2015. Finding space for wildlife beyond national parks and reducing conflict through community based conservation: the Kenya experience. *PARKS* 21: 51-62. DOI: 10.2305/IUCN.CH.2014.PARKS-21-IDW.en
- 116 *Ibid*
- 117 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *The State of Knowledge and Practice on Human-Wildlife Conflicts*. Luc Hoffmann Institute, Gland, Switzerland. Retrieved from: <https://luchoffmanninstitute.org/wp-content/uploads/2020/03/LucHoffmannInstitute-humanwildlifeconflict-web.pdf>
- 118 Karanth, K.K., Gopalaswamy, A.M., Prasad, P.K. and Dasgupta, S. 2013. Patterns of human-wildlife conflicts and compensation: Insights from Western Ghats protected areas. *Biological Conservation* 166: 175-185. DOI: 10.1016/j.biocon.2013.06.027
- 119 Karanth, K.K., Gupta, S. and Vanamamalai, A. 2018. Compensation payments, procedures and policies towards human-wildlife conflict management: Insights from India. *Biological Conservation* 227: 383-389. DOI: 10.1016/j.biocon.2018.07.006
- 120 Fontúrbel, F.E. and Simonetti, J.A. 2011. Translocations and human-carnivore conflicts: problem solving or problem creating? *Wildlife Biology* 17: 217-224. DOI: 10.2981/10-091
- 121 See Lamichhane, B.R., Persoon, G.A., Leirs, H., Musters, C.J.M., Subedi, N., Gairhe, K.P. et al. 2017. Are conflict-causing tigers different? Another perspective for understanding human-tiger conflict in Chitwan National Park, Nepal. *Global Ecology and Conservation* 11: 177-187. DOI: 10.1016/j.gecco.2017.06.003 and Goodrich, J.M. and Miquelle, D.G. 2005. Translocation of problem Amur tigers *Panthera tigris altaica* to alleviate tiger-human conflicts. *Oryx* 39: 454-457. DOI: 10.1017/S0030605305001146
- 122 Goodrich, J.M. 2010. *Op cit*
- 123 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 124 Bhattarai, B.R., Wright, W., Morgan, D., Cook, S. and Baral, H.S. 2019. Managing human-tiger conflict: lessons from Bardia and Chitwan National Parks, Nepal. *European Journal of Wildlife Research* 65: 34. DOI: 10.1007/s10344-019-1270-x
- 125 Nikolae, I.G. and Yudin, V.G. 1993. Tiger and man in conflict situations. Bulletin Moskovsky Obschestva Ispytateley Prirody, *Otdyel Biologiya* 98: 23-6 (In Russian), cited in Goodrich, J.M. 2010. Human-tiger conflict: A review and call for comprehensive plans. *Integrative Zoology* 5: 300-312. DOI: 10.1111/j.1749-4877.2010.00218.x
- 126 Goodrich, J.M. 2010. *Op cit*
- 127 *Ibid*
- 128 Ellis, F. 1998. Household strategies and rural livelihood diversification. *The Journal of Development Studies* 35: 1-38. DOI: 10.1080/00220389808422553
- 129 Naudiyal, N., Arunachalam, K., and Kumar, U. 2019. The future of mountain agriculture amidst continual farm-exit, livelihood diversification and outmigration in the Central Himalayan villages. *Journal of Mountain Science* 16: 755-768. DOI: 10.1007/s11629-018-5160-6
- 130 Roe, D., Booker, F., Wilson-Holt, O. and Cooney, R. 2020. *Diversifying Local Livelihoods While Sustaining Wildlife*. Luc Hoffmann Institute, Gland, Switzerland. Retrieved from: https://luchoffmanninstitute.org/wp-content/uploads/2020/02/Diversifying_Local_Livelihoods-2020_publication-FINAL_compressed.pdf
- 131 Navneet, A., Bhandari, B.S. and Bijlwan, K. 2019. Role of ecotourism potentials, livelihood improvement and environmental sustainable development in Rajaji Tiger Reserve; Uttarakhand, India. *American Journal of Research* 7-8: 269-283. DOI: 0.26739/2573-5616-2019-8-27
- 132 <https://www.communityhomestay.com/> (accessed 16 May 2022).
- 133 Goodrich, J.M. 2010. *Op cit*
- 134 Barlow, A. and Brooks, A. 2019. *Human Wildlife Conflict – Response Teams: Global lessons in design, operation, monitoring and sustainability*. HWC SAFE Series. WWF Tigers Alive, Gland, Switzerland. DOI: 10.13140/RG.2.2.28591.07842
- 135 *Ibid*
- 136 *Ibid*
- 137 Goodrich, J.M. 2010. *Op cit*
- 138 Lubis, M.I., Pusparini, W., Prabowo, S.A., Marthy, W., Tarmizi, N., Andayani, M. et al. 2020. Unraveling the complexity of human-tiger conflicts in the Leuser Ecosystem, Sumatra. *Animal Conservation* 23: 741-749. DOI: 10.1111/acv.12591
- 139 Barlow, A. and Brooks, A. 2019. *Op cit*
- 140 Goodrich, J.M. 2010. *Op cit*
- 141 Lubis, M.I., Pusparini, W., Prabowo, S.A., Marthy, W., Tarmizi, N., Andayani, M. et al. 2020. *Op cit*
- 142 Barlow, A. and Brooks, A. 2019. *Op cit*
- 143 *Ibid*
- 144 Wildlife Trust of India. 2019. Learning and Sharing for Tigers of the Sundarban Delta: A Transboundary Initiative. *WTI*, 20 June 2019. Retrieved from: <https://www.wti.org.in/news/learning-and-sharing-for-tigers-of-the-sundarban-delta-a-transboundary-initiative/>
- 145 Barlow, A. and Brooks, A. 2019. *Op cit*
- 146 <https://www.equatorinitiative.org/2020/04/24/solution10986/> (accessed 22 March 2022).
- 147 Barlow, A. and Brooks, A. 2019. *Op cit*
- 148 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *Op cit*
- 149 *Ibid*
- 150 Goodrich, J.M. 2010. *Op cit*
- 151 Dickman, A.J., Macdonald, E.A. and 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 United States of America* 108: 13937-13944. DOI: 10.1073/pnas.1012972108
- 152 Karanth, K.K., Gupta, S. and Vanamamalai, A. 2018. Compensation payments, procedures and policies towards human-wildlife conflict management: Insights from India. *Biological Conservation* 227: 383-389. DOI: 10.1016/j.biocon.2018.07.006
- 153 Johnson, M., Karanth, K. and Weinthal, E. 2018. Compensation as a Policy for Mitigating Human-wildlife Conflict around Four Protected Areas in Rajasthan, India. *Conservation and Society* 16: 305-319. DOI: 10.4103/cs.cs_17_1
- 154 Karanth, K.K., Gupta, S., and Vanamamalai, A. 2018. *Op cit*
- 155 ENCOSH. 2019. Interim Relief Scheme (Cattle Compensation Programme). Retrieved from: <https://encosh.org/en/initiatives/interim-relief-scheme-cattle-compensation-programme/?pdf>
- 156 Karanth, K.K. and Vanamamalai, A. 2020. Wild Seve: A Novel Conservation Intervention to Monitor and Address Human-Wildlife Conflict. *Frontiers in Ecology and Evolution* 8: 198. DOI: 10.3389/fevo.2020.00198
- 157 Goodrich, J.M. 2010. Human-tiger conflict: A review and call for comprehensive plans. *Integrative Zoology* 5: 300-312. DOI: 10.1111/j.1749-4877.2010.00218.x
- 158 Goodrich, J.M. 2010. Human-tiger conflict: A review and call for comprehensive plans. *Integrative Zoology* 5: 300-312. DOI: 10.1111/j.1749-4877.2010.00218.x
- 159 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*

- 160 Karanth, K.K., Gopalaswamy, A.M., Prasad, P.K. and Dasgupta, S. 2013. Patterns of human-wildlife conflicts and compensation: Insights from Western Ghats protected areas. *Biological Conservation* 166: 175-185. DOI: 10.1016/j.biocon.2013.06.027
- 161 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *Op cit*
- 162 *Ibid*
- 163 Thinley, P., Rajaratnam, R., Lassoie, J.P., Morreale, S.J., Curtis, P.D., Vernes, K. et al. 2018. The ecological benefit of tigers (*Panthera tigris*) to farmers in reducing crop and livestock losses in the eastern Himalayas: Implications for conservation of large apex predators. *Biological Conservation* 219: 119-125. DOI: 10.1016/j.biocon.2018.01.015
- 164 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *Op cit*
- 165 For example see: Karanth, K.K., Gopalaswamy, A.M., Prasad, P.K. and Dasgupta, S. 2013. *Op cit*
- 166 Lubis, M.I., Puspardini, W., Prabowo, S.A., Marthy, W., Tarmizi, N. Andayani, M. et al. 2020. Unraveling the complexity of human-tiger conflicts in the Leuser Ecosystem, Sumatra. *Animal Conservation* 23: 741-749. DOI: 10.1111/acv.12591
- 167 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 168 *Ibid*
- 169 Pooley, S., Barua, M., Beinart, W., Dickman, A., Holmes, G., Lorimer, J. et al. 2017. *Op cit*
- 170 Bhattarai, B.R., Wright, W., Morgan, D., Cook, S. and Baral, H.S. 2019. Managing human-tiger conflict: lessons from Bardia and Chitwan National Parks, Nepal. *European Journal of Wildlife Research* 65: 34. DOI: 10.1007/s10344-019-1270-x
- 171 Songhurst, A. 2017. Measuring human-wildlife conflicts: Comparing insights from different monitoring approaches. *Wildlife Society Bulletin* 41: 351-361. DOI: 10.1002/wsb.773
- 172 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 173 Bargali, H.S. and Ahmed, T. 2018. Patterns of livestock depredation by tiger (*Panthera tigris*) and leopard (*Panthera pardus*) in and around Corbett Tiger Reserve, Uttarakhand, India. *PLOS ONE* 13: e0195612. DOI: 10.1371/journal.pone.0195612
- 174 Goodrich, J.M. 2010. *Op cit*
- 175 *Ibid*
- 176 *Ibid*
- 177 König, H.J., Kiffner, C., Kramer-Schadt, S., Fürst, C., Keuling, O. and Ford, A.T. 2020. Human-wildlife coexistence in a changing world. *Conservation Biology* 34: 786-794. DOI: 10.1111/cobi.13513
- 178 Thinley, P., Rajaratnam, R., Lassoie, J.P., Morreale, S.J., Curtis, P.D., Vernes, K. et al. 2018. The ecological benefit of tigers (*Panthera tigris*) to farmers in reducing crop and livestock losses in the eastern Himalayas: Implications for conservation of large apex predators. *Biological Conservation* 219: 119-125. DOI: 10.1016/j.biocon.2018.01.015
- 179 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 180 IUCN. 2021. *Post-2020 Global Biodiversity Framework Information document on the inclusion of a target on Human-wildlife conflict in the framework*, IUCN Species Survival Commission (SSC). Retrieved from: https://428a9490-8cd7-406a-873f-6ada42789f4a.filesusr.com/ugd/7acc16_647ceff2283f4fd2a8c1525ac7e3a400.pdf
- 181 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *Op cit*
- 182 <https://smartconservationtools.org/> (accessed 7 April 2022).
- 183 <https://www.protectedplanet.net/en/thematic-areas/protected-areas-management-effectiveness-pame?tab=METT> (accessed 7 April 2022).
- 184 WWF-TAI. 2015. *Human tiger conflict workshop report*. WWF, Kuala Lumpur, Malaysia. https://wwfeu.awsassets.panda.org/downloads/9_human_tiger_conflict_workshop.pdf
- 185 NTCA. 2012. *Standard operating procedure to deal with emergency arising due to straying of tigers in human dominated landscapes*. National Tiger Conservation, Authority Ministry of Environment, Forest & Climate Change, Government of India, https://ntca.gov.in/assets/uploads/sops/SOP_Straying_Tiger.pdf
- 186 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.
- 187 GTF. 2019. *Tiger Action Plans of 13 Tiger Range Countries*. Secretariat of Global Tiger Forum, New Delhi, India. <https://globaltigerforum.org/wp-content/uploads/2019/01/ACTION-TIGER-4th-EDITION-1.pdf>
- 188 Bangladesh Forest Department. 2016. *National Tiger Recovery Program of Bangladesh, 2017-2022*, Bangladesh Forest Department, Dhaka, Bangladesh, http://103.48.18.141/library/wp-content/uploads/2018/10/Tiger-recovery-programme_8Mar17_low-res-1.pdf
- 189 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *The State of Knowledge and Practice on Human-Wildlife Conflicts*. Luc Hoffmann Institute, Gland, Switzerland. Retrieved from: <https://luchoffmanninstitute.org/wp-content/uploads/2020/03/LucHoffmannInstitute-humanwildlifeconflict-web.pdf>
- 190 König, H.J., Kiffner, C., Kramer-Schadt, S., Fürst, C., Keuling, O. and Ford, A.T. 2020. Human-wildlife coexistence in a changing world. *Conservation Biology* 34: 786-794. DOI: 10.1111/cobi.13513
- 191 Goodrich, J.M. 2010. *Op cit*
- 192 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 193 König, H.J., Kiffner, C., Kramer-Schadt, S., Fürst, C., Keuling, O. and Ford, A.T. 2020. Human-wildlife coexistence in a changing world. *Conservation Biology* 34: 786-794. DOI: 10.1111/cobi.13513
- 194 Pooley, S., Barua, M., Beinart, W., Dickman, A., Holmes, G., Lorimer, J. et al. 2017. *Op cit*
- 195 Kansky, R. and Knight, A.T. 2014. Key factors driving attitudes towards large mammals in conflict with humans. *Biological Conservation* 179: 93-105. DOI: 10.1016/j.biocon.2014.09.008
- 196 Thinley, P., Rajaratnam, R., Lassoie, J.P., Morreale, S.J., Curtis, P.D., Vernes, K. et al. 2018. The ecological benefit of tigers (*Panthera tigris*) to farmers in reducing crop and livestock losses in the eastern Himalayas: Implications for conservation of large apex predators. *Biological Conservation* 219: 119-125. DOI: 10.1016/j.biocon.2018.01.015
- 197 Hodgson, I.D., Redpath, S.M., Sandström, C. and Biggs, D. 2020. *Op cit*
- 198 IUCN. 2020. *IUCN SSC Position Statement on the Management of Human-Wildlife Conflict*. IUCN Species Survival Commission (SSC) Human-Wildlife Conflict Task Force. Retrieved from: https://www.iucn.org/sites/dev/files/ssc_human_wildlife_conflict_position_statement.pdf
- 199 Western, D., Waithaka, J. and Kamanga, J. 2015. Finding space for wildlife beyond national parks and reducing conflict through community based conservation: the Kenya experience. *PARKS* 21: 51-62. DOI: 10.2305/IUCN.CH.2014.PARKS-21-1DW.en
- 200 See for example the survey used and described by Perry et al. (2020) in Africa which could be adapted to HTC situations: <https://conbio.onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1111/percent2Fcobi.13474&file=cobi13474-sup-0001-SuppMat.docx>
- 201 IUCN. 2020. *IUCN SSC Position Statement on the Management of Human-Wildlife Conflict*. IUCN Species Survival Commission (SSC) Human-Wildlife Conflict Task Force. Retrieved from: https://www.iucn.org/sites/dev/files/ssc_human_wildlife_conflict_position_statement.pdf
- 202 Pooley, S., Barua, M., Beinart, W., Dickman, A., Holmes, G., Lorimer, J. et al. 2017. *Op cit*
- 203 Karanth, K.K., Gupta, S. and Vanamamalai, A. 2018. *Compensation payments, procedures and policies towards human-wildlife conflict management: Insights from India*. *Biological Conservation* 227: 383-389. DOI: HYPERLINK "https://doi.org/10.1016/j.biocon.2018.07.006" 10.1016/j.biocon.2018.07.006
- 204 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*

5. SUSTAINABLE FINANCING OPTIONS



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Why read this section?

As the previous sections outline, an expansion of tiger populations and range will require new and more inclusive approaches to area-based conservation. None of this can be achieved without funding. This section looks at how new types of funding could help ensure a sustainable funding future.

INTRODUCTION

While revenue-sharing needs to be a major focus of conservation finance in the future (see section 3), there is still the challenge of raising conservation funds in the first place. Attitudes toward who is responsible for conservation funding differ around the world. In the United States, state wildlife management agencies depended on a “user-pay” funding model (e.g., hunting licences and entry fees) for conservation finance.¹ In most of the tiger range, people’s attitudes toward where the funding should come from tend to be focused on government and donor funding sources. Just as tigers are seen as the domain of governments and donors (see previous section), so is the belief that these bodies should fund conservation.² In Malaysia, for example, a survey of dwellers in the capital, a regional town and rural areas with high tiger and other wildlife density found over 96 per cent of all those asked considered the Malaysian Federal government’s Department of Wildlife and National Parks responsible for funding conservation of tigers and elephants, along with some funding from conservation NGOs.³ Direct funding from individuals to conservation is high in many “Western” countries with high wealth and poor biodiversity; WWF-UK for example raised £42.2 million (about US\$55 million) from individual membership fees and donations in 2019-2020.⁴ Although large-scale philanthropic giving is known in the tiger range,⁵ there is no information in terms of large-scale citizen funding for conservation activities. This type of funding could provide a huge boost to conservation finance but would need a major change in attitude toward who is responsible for conservation.

The so-called green investment market is growing. Until recently mainly the preserve of small companies and initiatives, it is increasingly being integrated within the mainstream. Calculating its size remains challenging; it depends on what is defined as “green” and how much it is deemed to be worth, both issues with multiple shades of opinion. One analysis of 3,000 globally listed companies with exposure to the green economy estimates a market cap of a US\$4 trillion investment opportunity, some 5 per cent of the total listed equity market.⁶ An estimate for the global green economy in 2016 suggested a figure of US\$7.87 trillion.⁷ The total value of the green bonds market, first launched a decade ago, has reached US\$500 billion.⁸ However, it should be noted that the bulk of this investment is in renewable energy and some recycling technologies, rather than environmental protection which still tends to lag behind in terms of attracting investment from conventional business sources.



Finally, it is worth mentioning that there are an increasing number of high-level initiatives which look at options to diversify funding for conservation. Seven countries with tigers, Bhutan, China, Indonesia, India, Thailand, Malaysia and Nepal, and nine of the 13 tiger range countries (adding Cambodia and Viet Nam to the previous list) are working with BIOFIN, the UN's biodiversity finance initiative, which supports the development of comprehensive Biodiversity Finance Plans, drawing on the initiative's experience of over 150 different finance solutions.⁹ Given that BIOFIN is only working in 41 countries worldwide to date, this concentration of BIOFIN in tiger range countries is an opportunity to both develop and coordinate sustainable finance responses. It also potentially offers an opportunity to reduce the reliance on government funding which poses a major challenge for tiger conservation at present. Governments in many countries are reducing funds for conservation at the same time as expanding protected areas and identifying OECMs (see section 2), forcing managers of such sites to look for alternative funding models. We do not have room here for a review of all the finance solutions available, but some particularly relevant models are explored below. Payments for Ecosystem Services (PES) schemes, for example, are increasingly popular, particularly in regard to water and carbon, although they are still more talked about than implemented. Other options, including "carnivore credits", "tiger bonds" and large-scale trust funds are all being developed around the world and provide examples for protected areas to draw on.

5.1 PAYMENTS TO ENCOURAGE COEXISTENCE

Two types of strategy are discussed here. A fairly new concept is the "payment to encourage coexistence", rather than to compensate local communities for HTC, where communities are rewarded for conservation success. Impact bonds are also based on conservation success, however species related bonds are a very new concept.

Conservation payments should link funding to conservation outcomes rather than mitigating for losses linked to conservation. "Payments to encourage coexistence" has been suggested as a collective term for approaches that include compensation and insurance schemes (discussed in section 4), revenue sharing mechanisms and various forms of direct payments linked to conservation success.¹⁰ The latter, payments linked to conservation success, are determined by agreed conservation success, such as sightings of species (or species prey) by observation or in camera traps (see case study 8). This provides a concrete incentive for local communities to conserve. However, like most incentive schemes it is challenging to implement, both to agree and measure quantifiable targets and to ensure equality of payments. Many of the schemes developed to date around the world have worked with individual farmers (often ranchers with large land holdings). If implemented across the tiger range, payment systems would likely need to be established at village level (see examples from Africa in case study 8), as research suggests those who perceive themselves being treated unequally in payment schemes are less committed to conservation.¹¹

Payments to encourage coexistence are particularly well suited to conservation corridors. The importance of conservation corridors to the expansion of the tiger range and genetic viability of existing populations has been stressed in the previous sections. Encouraging coexistence through incentives for conservation have been introduced around the world in areas with HWC (case study 8) and similar concepts could be developed in tiger range countries.

CASE STUDY 8: PAYMENTS TO ENCOURAGE COEXISTENCE, EXPERIENCES FROM AROUND THE WORLD

Introduction

Tolerance of wild animals is widely considered to be a determining factor in successful carnivore conservation, where coexistence between local populations and predators is the ultimate goal. Conservation interventions to increase this tolerance are moving from compensating losses, which does little to improve local perceptions and attitudes toward wildlife conservation or long-term management practice, to incentivizing tolerance through programmes which aim to engage those impacted by wildlife in conservation initiatives.¹² The six mini-case studies below highlight examples from around the world where incentives have been a successful response to conflict. The section ends with a short overview of lessons learned from these initiatives for tiger landscapes.

Community-based wild cat conservation in New River Region (Belize)

A sudden increase in calf predation by two jaguars (*Panthera onca*) in an area of savannah, forest and farmland in northern Belize, resulted in a landowner-imposed bounty on wild cats and the retaliatory killing of two jaguars. The underlying causes of this conflict included socio-economic pressures, a lack of awareness of sustainable resource management and a limited appreciation for wildlife conservation. The response was to develop an incentive programme that encouraged landowners to value the presence of wild cats on their property.

A pilot study was implemented using camera traps to engage landowners in wild-cat conservation.¹³ Starting in 2010, 13 landowners from small-scale vegetable farmers to large farming and ranching operations took part. Fourteen camera stations were set up and local landowners taught how to operate the cameras, switch memory cards and change batteries. Landowners delivered the memory cards to the field station twice a month to receive payment for capturing images of wild cats (e.g., jaguar, puma (*Puma concolor*), ocelot (*Leopardus pardalis*), jaguarundi (*Puma yagouaroundi*) and margay (*Leopardus weidii*)). Each image was worth US\$125, repeat individuals US\$50 and mammal prey US\$5.¹⁴

The camera traps were in place for 57 days and at the end of that period six of the 13 landowners had received payouts that together amounted to US\$2,025 for wild cats. Mean pay-out was US\$337.50 per landowner, this is a significant amount in Belize, where average daily income is US\$10, rising to about US\$15 in the project region.¹⁵ During the pilot project period, no jaguars were killed and the bounty on cats was lifted. The project then moved to a second phase including 18 landowners.

A follow-up attitudinal survey of 112 households in 2013, found that tolerance toward wild cats was higher for those who had seen cats on their land and among camera-trap programme participants (although it was noted that those who agreed to participate in the programme may already be more tolerant to wild cats than those who did not). The survey authors concluded, however, that monetary payments alone are unlikely to affect attitudes and behaviours toward carnivores, and that payment programmes should be enhanced with non-monetary incentives leveraging social norms and targeting specific groups with information about risks and benefits associated with carnivores.¹⁶ Beyond its economic impacts, the programme has offered participants a direct, tangible conservation experience through checking the camera traps, which may increase their appreciation of nature and thus their tolerance of cats.¹⁷ The programme also detected more jaguars than were previously thought to use the area and, contrary to local belief, showed that wild cats did not frequent areas with high livestock activity, but instead followed wild prey in areas of lower disturbance.¹⁸

Living with felines in Mexico

The Northern Jaguar Project (NJP) was established in 2003, and, with other conservation organizations, set up a jaguar reserve in Sonora, Mexico. Aware of potential community impacts, NJP formed an alliance with local ranchers, and the Viviendo con Felinos™ (Living with Felines) programme was founded in 2007. Aided by northern Mexico's land tenure where private owners have large landholdings, the programme provides incentives for landowners whose ranches border the jaguar reserve. Motion-triggered cameras are strategically placed on ranches and monitored monthly by reserve staff. The project started with 17,800 ha across 10 ranches and has grown to 18,600 ha across 18 ranches and has a growing waiting list. The programme is evaluating various strategies for expansion, to allow for more properties to be involved.

Participating ranches sign an annual contract outlining reward amounts: 5,000 pesos (about US\$250) for an image of a living jaguar, 1,500 (about US\$75) for ocelot, etc. Ranchers only receive one reward per day per species and there is a monthly cap of 20,000 pesos (just under US\$1,000) per rancher. Ranchers are also not allowed to hunt, trap or kill any wildlife species on their properties, including jaguar prey. Programme funding comes largely from individual donors and private foundations, and the project counts on non-financial support from the local municipality.¹⁹ The programme has received positive assessment from landowners. NJP also supports other coexistence and development initiatives such as building corrals, installing water tanks and setting up eco-camps for students.²⁰ Thirteen years of camera trap data (2000 to 2012) have shown stable populations of jaguars.²¹

Wild Sky, USA

Collaboration between American Prairie Reserve (APR) and ranchers living in Montana is connecting fragmented public lands through the strategic purchase of private lands and working with neighbouring farmers in conservation actions. Participating ranchers voluntarily commit to conservation focused ranching practices including wildlife-friendly fencing, preserving sage-grouse breeding areas and not killing carnivores. When ranchers implement these actions (verified by a third party), they are paid a premium of 1 US cent per pound weight on annual calf sales, which can exceed US\$10,000 annually. The more practices a rancher commits to in their annual contract, the more they are rewarded. The programme also has a bonus camera trap reward initiative which pays for sighting of species per camera trap per day; payments range from US\$500 for a grizzly bear (*Ursus arctos horribilis*) and wolf (*Canis lupus*) to US\$25 for a coyote (*Canis latrans*) and red fox (*Vulpes vulpes fulva*). Confirmed wolf, grizzly bear or fox dens receive a one-time incentive payment of US\$1,000. The maximum annual bonus pay-out is US\$6,000 per ranch per contract year. The programme is funded by beef companies, individual donors and grants.

Ranchers have positively received the Wild Sky initiative which has helped overcome the historical rancher and conservationist divide. One challenge with the camera trap programme has been the labour-intensive task of servicing cameras and sorting through thousands of images. Wild Sky now uses a system called Wildlife Insights to manage images and satellite imagery, drones, sound sensors, fence monitors and so forth are all being tested to help streamline efforts to measure conservation progress across the ranches.²²

Lion Landscapes, Tanzania

Ruaha National Park is the largest protected area in East Africa, covering over 2 million ha, and is part of the 4.5 million ha Rungwa-Kizigo-Muhesi ecosystem, which includes several Game Reserves, a Wildlife Management Area and village land. Both predators and pastoralists move across this area to access resources. There are 35 different ethnic groups in the area.²³ The Ruaha Carnivore Project initiated a community camera trapping programme to create greater links between community benefits and the presence of wildlife in the area.^{24,25}

In 2015, a pilot programme was set up initially with four villages. In each village, two community camera trap officers were selected by the community and were trained and employed by the project in camera trapping and were then managed by the village. Those selected were typically ex-poachers as they had knowledge of wildlife presence. Location of traps, the species reward system (see below) and project management were all decided by the villages collaboratively and documented to ensure transparency.²⁶ Every image of a wild animal captured

generates a certain number of points based on conflict risk and species conservation status (e.g., dikdik = 1,000pts, lion = 15,000pts, African wild dog = 20,000pts).²⁷

Once engaged in the project, four villages are grouped together to compete for wildlife points.²⁸ Every quarter these villages come together in the winning village, i.e., the village that has amassed the most points, to hold a celebration known locally as a “*sherehe*” and the benefits are distributed.²⁹ Because the project needed to be able to set a budget, and seek funding, it was decided to set the total awarded benefits at US\$5,000 per group of four villages. The winning village receives US\$2,000 worth of community benefits (split between healthcare, vet medicines, and education – the top local priorities). The second place village gets US\$1,500, third US\$1,000 and fourth US\$500.³⁰ The images captured are also used in community outreach and education to show villagers the wildlife on their land.³¹

The camera trapping programme has been successful in two ways: (i) it has provided data on the wildlife populations present on village land and (ii) has engaged the community and generated conservation impact.³² This success has been recognized by local government, village leaders and park authorities as making a real impact on local development and conservation (i.e., limiting poisoning, traditional hunts/bushmeat snaring and setting aside areas for wildlife).³³ By 2021, the programme was operating in 12 villages adjacent to Ruaha National Park.³⁴ There are now more community-led conservation efforts, such as putting bans on lion and elephant hunting and fining young men if they go on traditional lion hunts.³⁵ The goal is to expand the programme to all 22 villages south of Ruaha Park and to implement it elsewhere in Tanzania and beyond.³⁶

Wildlife Credits, Namibia

The Wildlife Credits scheme in Namibia, started in the Wuparo Conservancy, one of three conservancies which lies between the Mudumu and Nkasa Rupara National Parks in the northeastern tongue of Namibia.³⁷ Drought has resulted in heightened conflict between lions and communal farmers in Namibia. The Wildlife Credits system is a response to this crisis, aiming to introduce a value-added mechanism to promote human-wildlife coexistence.

Conservancies are voluntary associations defined legally as groups of bona fide land-occupiers practising co-operative management based on sustainable use, conservation and resource sharing.³⁸ The credits programme aims for wildlife to be viewed as a valuable global good, and that this value is increasing as wildlife declines globally. It therefore 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”. The Namibian National Wildlife Credits Fund (NNWCF) has been set up to receive funding for the scheme, to oversee

the verification of conservation performance and to make payments, according to agreed contracts, to registered Wildlife Credits schemes. The NNWCF is administered by the Community Conservation Fund of Namibia (CCFN), which is a legal non-profit entity with an independent board.³⁹ Contributions to the CCFN have come from a wide range of organizations including the KfW Development Bank, Distell Namibia, WWF, the Lion Recovery Fund and many others. Conservation performance is measured through sightings and breeding success of iconic species like the lion (*Panthera leo*) and elephant (*Loxodonta africana*). Credits are generated by lodges that participate in the programme and who pay a fixed amount for each species sighting during game drives. Contractual agreements are developed at the national level for funding disbursement and funds are then used by the conservancies for reducing HWC, offsetting damage claims, improving wildlife monitoring and research, and to increase tolerance of wildlife on communal lands.⁴⁰

Wuparo Conservancy, which was originally a floodplain but is now a mosaic landscape of woodland and grassland, was badly impacted by drought and increasing HWC.⁴¹ In 2013, lions killed 135 cattle and 17 lions were shot in retaliation.⁴² The initial Wildlife Credits scheme was set up in Wuparo in 2016 with the Nkasa Lupala Lodge making payments to the Conservancy for lion sightings. These funds were paid to the local Wildlife Credit account and were matched by the national Wildlife Credits fund for a combined total of N\$51,425 (about US\$3,550). The conservancy used these funds to construct six lion-proof kraals for their farmers.⁴³ The scheme has expanded and now also involves the Sobbe, Tsiseb, #Khoadi// Hôas and //Huab community conservancies.⁴⁴ Wildlife Credits have also been applied to the protection of a key elephant corridor in the Zambezi Region of Namibia. Distell Namibia and Amarula, a liquor synonymous with African elephants, formed a partnership with Wildlife Credits and the Sobbe Conservancy.⁴⁵ Distell invested N\$130,000 (nearly US\$9,000) into the national Wildlife Credits fund to pay the Conservancy for successfully protecting the corridor which runs through their land. This payment was based on independently verified data on the protection of the corridor, confirmed through satellite imagery, and camera trap evidence of wild animals using the corridor. SMART (box 22) data was also used to record animal sightings. The conservancy used the funds to install electricity poles and transformers in six villages, benefiting over 1,000 conservancy members.⁴⁶

Swedish Conservation Performance Payment Scheme

Lynx (*Lynx lynx*) and wolverine (*Gulo gulo*) are both endangered in Sweden with main threats including habitat loss and illegal hunting. Conservation payments based on the successful reproduction of both species have been established with 51 Indigenous Sámi reindeer herding communities in the boreal region of northern Sweden.⁴⁷ Sami herders lose on average 20 per cent of their reindeer stocks to carnivore attacks each year, conservation performance payments reward conservation, but are intended to cover losses in reindeer production resulting from depredation or disturbance.⁴⁸

The programme, which began in 2002, pays herders for documented wolverine and lynx reproduction, which requires comprehensive monitoring of carnivore populations.⁴⁹ The level of payment is determined according to the cost of the damage that each lynx or wolverine offspring is expected to cause throughout their lifetime.⁵⁰ In 2007, payments were 200,000 SEK (about US\$21,000) per wolverine and lynx cub, with 18 million SEK (nearly US\$2 million) paid out annually.⁵¹ Payments are made irrespective of livestock losses.⁵² Additional payments can be made for sighting lone wolverines (SEK 70,000, about US\$7,500) and lynx (SEK 35,000, US\$3,700). The payments are made to the Sámi villages as a common pool resource to be distributed as they see fit.⁵³ The villages choose how payments should be distributed via a weighted voting system based on herd size where 100 reindeer equal one vote.⁵⁴ The payments are financed publicly by the Swedish government and managed by the Swedish Environmental Agency.⁵⁵

Monitoring of the carnivore populations is a complex process, taking place primarily during the snowy season and involving a trained representative from the Sámi village and a representative from the managing agency to verify results.⁵⁶ Both lynx and wolverine populations have increased and it is thought that this is at least in part due to the scheme. The results of the programme have, however, taken time to assess as wolverine females have a low reproductive rate and do not reproduce until they are between 3-5 years old.⁵⁷ A key success factor in the scheme has been improved relationships between officials and the Sámi community. However, challenges still remain around what are perceived to be onerous monitoring requirements and insufficient payment levels.⁵⁸ Although the payments for successful offspring are now viewed as a significant source of income for many Sámi villages, villagers complain that the payment rates for the scheme have not been adjusted in the last 10 years, however the cost of monitoring, including fuel for snowmobiles, etc., has increased by over 50 per cent.⁵⁹

Key lessons for tiger landscapes

Each scheme described here had the same basic idea, to incentivize successful species conservation rather than compensate for the losses from conservation. Implementers of such schemes across the tiger range could consider:

1. Community-based schemes in terms of decision-making, management and distribution of payments;
2. National level wildlife credit schemes set up by multiple partners with multiple funding options to pay for the scheme;
3. Realistic and transparent payment schemes;
4. Payments linked specifically to both successful reproduction (mainly within conservation areas) and use of wildlife corridors (outside of conservation areas);
5. Local capacity building on conservation management tasks such as camera trapping and monitoring;
6. Independent verification of data linked to payments;
7. Payments used to support other coexistence strategies (including management of HTC, education, etc.).

When aiming to implement the lessons above, it is important to recognize that the human population density in most tiger landscapes will be significantly greater than those in the case study sites above. As such, better identifying the human population thresholds that are workable for meaningful benefit distribution and local support of such payment schemes in tiger countries should be prioritized in the near term – particularly given that this information would be useful for identifying those areas (e.g., boundaries within a tiger corridor) where such initiatives might be most effective.

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Impact bonds form a strategic alliance between investors and donors to increase the chances of conservation success. Although linked to traditional donor financing, impact bonds shift the risks to an investor who, if the project is successful, gets a modest return on their investment. A large donor agency identifies a conservation project and stores existing funds for its financing. A private investor pays their own money into the project on an annual basis for an agreed period – say a decade – and *if the project meets its targets* – the original donor pays the investor back their money plus a modest interest. The donor therefore spends slightly more than they would as a straight investment, to cover the interest, but only pays if the project is successful. The investor gets a slightly lower return than many other forms of investment but has the satisfaction of supporting a worthwhile project. The investor therefore also has a direct interest in ensuring success and following the development of the project, with the possibility of stopping investment at any time if they are unsatisfied with progress over time, thus removing the costs of monitoring from the donor agency and adding a new driver for effectiveness. The only species focused impact bond developed to date is for rhinos and is still too recent to really evaluate the effectiveness of this type of financing.⁶⁰ However, one of the major challenges of setting up the rhino bonds was having a suitably robust monitoring system in place to assess targets being met. Tigers already have such a system in place through CA|TS (see box 24) and its dedicated CA|TS Log software, which could be used to monitor targets set around reaching the CA|TS standards and criteria.⁶¹

Box 24: Conservation Assured | Tiger Standards

CA|TS is an accreditation process in which participating areas need to demonstrate their management achievements. CA|TS has a hierarchical structure: seven “pillars” covering different management issues, 17 elements, subdivided into standards, for which criteria have been laid down (e.g., management actions required). CA|TS is thus a blueprint for good management across tiger conservation sites, covering varied geographical, cultural and ecological needs. The standards and an explanation of how CA|TS works is laid out in the CA|TS Manual, and a dedicated CA|TS-Log software has been developed for undertaking the assessment. Areas taking part in CA|TS are initially “CA|TS Registered” (standards not yet attained) and become “CA|TS Approved” when evidence prepared at the site, using CA|TS-Log and subject to expert review, confirms compliance with the CA|TS standards.

128 tiger conservation sites from seven countries are currently (March 2022) registered with CA|TS. CA|TS Registered and Approved sites cover 25 per cent of tiger range but include about 75 per cent of the global tiger population. To date, 24 sites have been CA|TS Approved, which signifies they have reached the globally agreed standards of management for wild tigers or are in the final stages of approval.⁶²



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5.2 PAYMENTS FOR ECOSYSTEM SERVICE

Payment for Ecosystem Service (PES) schemes are based on the principle that a government, company or individual gaining benefit from a particular ecosystem service pays the person or group managing that service (in practice managing the ecosystem that produces the service) a regular fee for its maintenance. PES was developed and is still best known for water services, whereby managers of an ecosystem that is producing water – for example a tropical moist rainforest – receive payment for maintaining the forest in a healthy state and thus maintaining the water flow.⁶³ It is not yet clear whether PES will become a major source of conservation finance, or a more limited, voluntary approach.

Box 25: Carbon projects funding tiger conservation

The Bikin Tiger Carbon Project in the Russian Far East aims to conserve 3 million ha of Korean pine forest, in three protected areas (Land of the Leopard, Bikin National Park and Sredneussuriisky Wildlife Refuge) and three ecological corridors in Khabarovsk Province. The four-year project is a collaboration between Germany and Russia, supported by a Presidential Order banning the logging of Korean pine. Forest protection prevents emissions of an estimated 130,000 tonnes of CO₂ annually.⁶⁴ Income is generated through carbon credits under the Verified Carbon Standard.⁶⁵

PES linked to carbon sequestration and storage has potential for funding conservation in tiger landscapes.

Protected and conserved areas could play a key role in securing carbon,⁶⁶ through Reducing Emissions from Deforestation and Degradation (REDD+) schemes (see box 26). Carbon accounting methodologies, like the Gold Standard and Verified Carbon Standard, have made it possible to assess emission reductions more accurately.⁶⁷ REDD+ strategies also have the possibility to include strong community participation and equitable benefit-sharing.⁶⁸ Carbon pricing is widely variable however, with prices fluctuating from less than US\$1/gigaton of carbon dioxide equivalent (GtCO₂e) to a maximum of US\$139/GtCO₂e.⁶⁹ The two most successful options for PES, water funds and carbon offset schemes, are both likely to expand in the future with high-level commitments to see them used more widely. Both are easiest to apply in closed-canopy forests, which along with peat soils are the largest terrestrial carbon stores; both found in the places most commonly used by tigers.⁷⁰ Analysis in Sumatra, for example, found that tiger habitat overlapped significantly with areas of high carbon content in forests and peatlands.⁷¹ Some tiger reserves are already using REDD+ or equivalent schemes, including in the Russian Far East (see box 25).

PES projects need to consider social as well as environmental outcomes.

The PES philosophy is predicated on the assumption that all the people with rights over the area of land in question are prepared to collaborate, and that someone is prepared to pay for the services provided. Neither assumptions are in truth easy to achieve.⁷² In some cases, uptake of PES can create or enlarge existing splits and disparities within communities, fragmenting the landscape and reducing effectiveness.⁷³ Some commentators criticize the whole concept of applying PES retrospectively in places where local communities have been dispossessed of land in favour of conservation.⁷⁴ Assessment of PES schemes therefore needs to consider both social and ecological outcomes. Analysis in an African protected area found that PES was effective in improving conservation outcomes, but that other strategies could do the same at a lower cost. Where PES showed a strong advantage was in changing local attitudes toward conservation, thus moving toward a more collaborative approach and increasing the sustainability of the protected area.⁷⁵ Research in Cambodia found PES hard to enact under conditions of weak governance, but also found community-led initiatives to be stronger than top-down approaches, albeit slower to get started.⁷⁶

Tigers could be incorporated as an indicator of impacts on biodiversity in PES schemes.

Because of their high profile and iconic status, tigers are also well placed to attract funding into PES schemes. All PES schemes need monitoring systems⁷⁷ that seek to capture both the efficacy of the environmental service being marketed and the wider conservation and environmental benefits of the scheme. Tigers could therefore be incorporated as an indicator of impacts on biodiversity.

Box 26: REDD+ schemes⁷⁸

REDD+ has the potential to supply significant, recurring funds for people to manage land to mitigate climate change. The UN Framework Convention on Climate Change (UNFCCC) defines REDD+ as: “*reducing emissions from deforestation and forest degradation in developing countries, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries*”.⁷⁹ After an initial focus just on restoration, REDD+ has been expanded to include “conservation” of forests, thus opening up options for national parks, conservancies, wilderness areas, wildlife reserves, buffer zones and conservation corridors.

A well-designed REDD+ scheme can pay to secure forests, thus also supporting biodiversity and many other ecosystem services. A proportion of the funding supports livelihoods of local people, thus increasing their incentive to manage forests sustainably. REDD+ is ideal for places where there are few financing options, such as remote conservancies, African miombo areas with tsetse fly infestations, remote tundra forests or areas with security concerns. Successful projects already run in African savannah,⁸⁰ temperate forests and tundra, including tiger reserves in Russia.⁸¹

Today, there are five “eligible activities” in REDD+

1. Reducing emissions from deforestation
2. Reducing emissions from forest degradation
3. Conservation of forest carbon stocks
4. Sustainable management of forests
5. Enhancement of forest carbon stocks.

There are also five main steps – but note that there also usually needs to be a national framework in place before funds are available:

1. Select and agree an area of forest for a long-term legal agreement for conservation

Implies identification, estimate of carbon stored or to be captured through forest restoration, understanding of implications, negotiation with all relevant stakeholders.

2. Design project activities and validate project approach and estimated carbon reductions using third party auditor

Project approach and activities must be validated against internationally recognized standards by a third-party auditor, who will need to be paid.

3. Get a verified certification body to confirm carbon stored or captured and assess management effectiveness

To achieve this, the management will already need to be in place, which may imply additional expenses.

4. Sell the forest carbon credit to government or business

This assumes you can find a buyer – well-planned schemes identify a potential buyer before going through steps 1-3. If the credit is to be used as an offset, a commercial buyer is needed, if the credit is to be used for national accounting, an agreement with national government will be required.

5. Offset revenue is invested back into forest management and community support

Effective management needs to continue, and monitoring must ensure carbon is really being stored or captured – if not payments will cease.

Although some voluntary REDD+ are schemes supported by governments, the private sector and donors, there is still uncertainty about how a global REDD+ scheme will work and be financed within the current Paris Agreement of the UNFCCC. Many protected area managers have been nervous of committing the time and energy into an evolving process. Yet there are plenty of good examples from which to draw lessons. Key steps forward include a major emphasis on capacity building within institutions involved in managing protected and conserved areas, a strengthening of safeguarding activities to ensure that local communities see genuine benefits, and greater outreach to potential investors.



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REFERENCES AND NOTES

- 1 Henderson, C.D., Riley, S.J., Pomeranz, E.F. and Kramer, D.B. 2021. Stakeholder Support for Wildlife Conservation Funding Policies. *Frontiers in Conservation Science* 2. DOI: 10.3389/fcosc.2021.767413
- 2 MacLean, M. 2015. *Creating Mechanisms for Conservation Finance in Southeast Asia. Financial Innovations Lab® Report*. Milken Institute. Retrieved from: <https://milkeninstitute.org/sites/default/files/reports-pdf/Creating%20Mechanisms%20for%20Conservation%20Finance%20in%20Southeast%20Asia.pdf>
- 3 Tan, A.S.L., de la Torre, J.A., Wong, E.P., Thuppil, V. and Campos-Arceiz, A. 2020. Factors affecting urban and rural tolerance towards conflict-prone endangered megafauna in Peninsular Malaysia. *Global Ecology and Conservation* 23: e01179. DOI: 10.1016/j.gecco.2020.e01179
- 4 https://www.wwf.org.uk/sites/default/files/2021-01/WWF_UK_Annual_Report_and_Financial_Statements_2019-20.pdf (accessed 8 March 2022).
- 5 For example, <https://philanthropynewsdigest.org/news/chinese-philanthropist-to-commit-1.5-billion-to-conservation> (accessed 8 March 2022).
- 6 FTSE Russel. 2020. Investing in the green economy – sizing the opportunity. *FTSE Russel*, 16 December 2020. Retrieved from: <https://www.ftserussell.com/research/investing-green-economy-sizing-opportunity> (accessed 7 January 2022).
- 7 Georgeson, L. and Maslin, M. 2019. \$7.87 trillion: the global green economy, by region, revenue, jobs, productivity. *Energypost.eu*, 22 October 2019. Retrieved from: <https://energypost.eu/7-87tn-the-global-green-economy-by-region-revenue-jobs-productivity/> (accessed 7 January 2022).
- 8 Green Economy Coalition. 2020. *The Global Transition to Green and Fair Economies: 10 Years In*. Global Green Economy Barometer 2020.
- 9 <https://www.biofin.org/> (accessed 17 March 2022).
- 10 Dickman, A.J., Macdonald, E.A. and 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 United States of America* 108: 13937-13944. DOI: 10.1073/pnas.1012972108
- 11 Loft, L., Gehrig, S., Salk, C. and Rommel, J. 2020. Fair payments for effective environmental conservation. *Proceedings of the National Academy of Sciences* 117: 14094-14101. DOI: 10.1073/pnas.1919783117
- 12 Briggs, V. and Mazzotti, F. 2014. Camera Trapping Wild Cats with Landowners in Northern Belize. *Caribbean Naturalist* 17: 1-13. Retrieved from: <https://crodoc.ifas.ufl.edu/publications/articles/briggsmazzotti2014.pdf>
- 13 *Ibid*
- 14 *Ibid*
- 15 *Ibid*
- 16 Harvey, R.G., Briggs-Gonzalez, V. and Mazzotti, F.J. 2017. Conservation payments in a social context: determinants of tolerance and behavioural intentions towards wild cats in northern Belize. *Oryx* 51: 730-741. DOI: 10.1017/S0030605316000545
- 17 *Ibid*
- 18 Briggs, V. and Mazzotti, F. 2014. *Op cit*
- 19 Huggins, L., Hansen, O. and Naftel, H. 2021. *Cameras for Conservation: Direct Compensation as Motivation for Living with Wildlife*. Center for Growth and Opportunity at Utah State University, Utah, USA. Retrieved from: <https://www.thecgo.org/wp-content/uploads/2021/02/Cameras-for-Conservation-2.pdf>
- 20 *Ibid*
- 21 Gutiérrez-González, C.E., Gómez-Ramírez, M.A., López-González, C.A. and Doherty Jr, P.F. 2015. Are Private Reserves Effective for Jaguar Conservation? *PLOS ONE* 10: e0137541. DOI: 10.1371/journal.pone.0137541
- 22 Huggins, L., Hansen, O. and Naftel, H. 2021. *Op cit*
- 23 <https://www.ruahacarnivoreproject.com/home/the-ruaha-landscape-2/> (accessed 2 March 2022).

- 24 FAO and IUCN SSC HWCTF. 2022. *Co-developing a community camera trapping programme to deliver benefits of living with wildlife*. FAO, Rome, Italy. Retrieved from: <https://www.fao.org/3/cb8759en/cb8759en.pdf>
- 25 *Ibid*
- 26 *Ibid*
- 27 <http://www.ruahacarnivoreproject.com/benefits/community-camera-trapping/> (accessed 25 March 2022).
- 28 FAO and IUCN SSC HWCTF. 2022. *Op cit*
- 29 *Ibid*
- 30 *Ibid*
- 31 <http://www.ruahacarnivoreproject.com/benefits/community-camera-trapping/> (accessed 25 March 2022).
- 32 FAO and IUCN SSC HWCTF. 2022. *Op cit*
- 33 <http://www.ruahacarnivoreproject.com/benefits/community-camera-trapping/> (accessed 25 March 2022).
- 34 FAO and IUCN SSC HWCTF. 2022. *Op cit*
- 35 <http://www.ruahacarnivoreproject.com/benefits/community-camera-trapping/> (accessed 25 March 2022).
- 36 *Ibid*
- 37 <https://www.nacso.org.na/conservancies/wuparo> accessed 25 March 2022).
- 38 Jones, B. 2014. Namibia: case study. In: S. Stolton, K.H. Redford and N. Dudley (eds.), *The Futures of Privately Protected Areas*, pp. 84-86. IUCN, Gland, Switzerland. Retrieved from: <https://portals.iucn.org/library/sites/library/files/documents/PATRS-001.pdf>
- 39 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.
- 40 <https://wildlifecredits.com/how-we-work> (accessed 25 March 2022).
- 41 <https://www.nacso.org.na/conservancies/wuparo> (accessed 25 March 2022).
- 42 <https://conservationnamibia.com/articles/cnam2020-wildlife-credits.php> (accessed 25 March 2022).
- 43 <https://conservationnamibia.com/articles/cnam2020-wildlife-credits.php> (accessed 25 March 2022)
- 44 Gross, E., Jayasinghe, N., Brooks, A., Polet, G., Wadhwa, R. and Hilderink-Koopmans, F. 2021. *Op cit*
- 45 <https://www.nacso.org.na/conservancies/sobbe> (accessed 25 March 2022).
- 46 https://conservationnamibia.com/articles/cn2021-wildlife-corridors.php?fbclid=IwAR33dCoBUXELfagHyIBARoMxoQsJ_Pk132y5B_tDL3dWRkBFfVYk-7f_Iw (accessed 25 March 2022).
- 47 https://ec.europa.eu/environment/nature/rbaps/fiche/conservation-performance-payments-sweden_en.htm (accessed 25 March 2022).
- 48 *Ibid*
- 49 *Ibid*
- 50 *Ibid*
- 51 Persson, J., Rauset, G.R. and Chapron, G. 2015. Paying for an Endangered Predator Leads to Population Recovery: Paying for predator conservation. *Conservation Letters* 8: 345-350. DOI: 10.1111/conl.12171
- 52 Persson, J., Rauset, G.R. and Chapron, G. 2015. *Op cit*
- 53 https://ec.europa.eu/environment/nature/rbaps/fiche/conservation-performance-payments-sweden_en.htm (accessed 25 March 2022).
- 54 Zabel, A., Bostedt, G. and Engel, S. 2014. Performance Payments for Groups: The Case of Carnivore Conservation in Northern Sweden. *Environmental & Resource Economics* 59: 613-631. DOI: 10.1007/s10640-013-9752-x
- 55 https://ec.europa.eu/environment/nature/rbaps/fiche/conservation-performance-payments-sweden_en.htm (accessed 25 March 2022).
- 56 *Ibid*
- 57 Persson, J., Rauset, G.R. and Chapron, G. 2015. *Op cit*
- 58 https://ec.europa.eu/environment/nature/rbaps/fiche/conservation-performance-payments-sweden_en.htm (accessed 25 March 2022).
- 59 *Ibid*
- 60 <http://rhinoimpact.com/> (accessed 17 March 2022).
- 61 Conservation Assured. 2022. *The CA|TS Report: Looking back, looking forward 10 years of Conservation Assured | Tiger Standards*. Conservation Assured, Singapore. Retrieved from: https://wwfeu.awsassets.panda.org/downloads/cats_report_2022.pdf
- 62 Conservation Assured. 2022. *Op cit*
- 63 Dudley, N. and Stolton, S. (eds) 2003. *Running Pure: The importance of forest protected areas to drinking water*. WWF International and the World Bank, Gland, Switzerland and Washington DC. Retrieved from: https://portals.iucn.org/library/sites/library/files/documents/arborvitae_running_pure.pdf
- 64 <https://wwf.ru/en/resources/news/lesa/oao-terneyles-i-wwf-rossii-sokhranyaya-tsenny-lesa-sokhranyaem-klimat-planety/> (accessed 7 January 2022).
- 65 BMU. 2017. *Bikin Project and Korean Pine Carbon Storage Project: Results of the Russian-German Cooperation in the Russian Far East*. Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety of Germany, Germany. Retrieved from: https://amurinfocenter.org/upload/iblock/05f/CedarProject_En.pdf
- 66 Scharlemann, J.P.W., Kapos, V., Campbell, A., Lysenko, I., Burgess, N.D., Hansen, M.C. et al. 2010. Securing tropical forest carbon: the contribution of protected areas to REDD. *Oryx* 44: 352-357. DOI: 10.1017/S0030605310000542
- 67 van der Gaast, W., Sikkema, R. and Vohrer, M. 2018. The contribution of forest carbon credit projects to addressing the climate change challenge. *Climate Policy* 18: 42-48. DOI: 10.1080/14693062.2016.1242056
- 68 Sena, K. 2015. Carbon credit schemes and Indigenous peoples in Kenya: A commentary. *Arizona Journal of International & Comparative Law* 32: 257-276. Retrieved from: <http://arizonajournal.org/wp-content/uploads/2015/10/11-Sena.pdf>
- 69 World Bank and Ecofys. 2018. *State and Trends of Carbon Pricing 2018*. World Bank, Washington, DC. DOI: 10.1596/978-1-4648-1292-7
- 70 Fahey, T.J., Woodbury, P.B., Battles, J.J., Goodale, C.L., Hamburg, S.P., Ollinger, S.V. et al. 2010. Forest carbon storage: ecology, management, and policy. *Frontiers in Ecology and the Environment* 8: 245-252. DOI: 10.1890/080169
- 71 Bhagabati, N.K., Ricketts, T., Sulistyawan, T.B.S., Conte, M., Ennaanay, D., Hadian, O. et al. 2014. Ecosystem services reinforce Sumatran tiger conservation in land use plans. *Biological Conservation* 169: 147-156. DOI: 10.1016/j.biocon.2013.11.010
- 72 <https://news.mongabay.com/2021/09/indonesia-terminates-agreement-with-norway-on-1b-redd-scheme/> (accessed 9 March 2022).
- 73 Corbera, E., Costedoat, S., Ezzine-de-Blas, D. and Hecken, G.V. 2020. Troubled Encounters: Payments for Ecosystem Services in Chiapas, Mexico. *Development and Change* 51: 167-195. DOI: 10.1111/dech.12540.
- 74 Menon, A. and Rai, N.D. 2019. The mismeasure of nature: the political ecology of economic valuation of Tiger Reserves in India. *Journal of Political Ecology* 26: 652-665. DOI: 10.2458/261.23194
- 75 Martin, A., Gross-Camp, N., Kebede, B. and McGuire, S. 2014. Measuring effectiveness, efficiency and equity in an experimental payments for ecosystem services trial. *Global Environmental Change* 28: 216-226. DOI: 10.1016/j.gloenvcha.2014.07.003.
- 76 Clements, T., John, A., Nielsen, K., An, D., Tan, S. and Milner-Gulland, E.J. 2010. Payments for biodiversity conservation in the context of weak institutions: Comparison of three programs from Cambodia. *Ecological Economics* 69: 1283-1291. DOI: 10.1016/j.ecolecon.2009.11.010
- 77 DEFRA. 2013. *Payments for Ecosystem Services: A best practice guide*. Department for Environment Food and Rural Affairs, London. Page 69. Retrieved from: <https://www.cbd.int/financial/pes/unitedkingdom-bestpractice.pdf>
- 78 Equilibrium Research. 2021. *Using REDD+ Funds to Support Protected and Conserved Areas in Lion Landscapes*. UK. Retrieved from: http://www.equilibriumresearch.com/upload/document/USING_REDD_TO_SUPPORT_PAs.pdf
- 79 <https://unfccc.int/topics/land-use/workstreams/redd/what-is-redd>
- 80 Stolton, S. and Dudley, N. 2019. *The New Lion Economy. Unlocking the value of lions and their landscapes*. Equilibrium Research, Bristol, UK. Retrieved from: https://assets.takeshape.io/eec0d9cd-dc81-4ba8-ac20-50da147f43d2/dev/f85e4e35-7c08-4346-b246-4abc04a14f23/THE_NEW_LION_ECONOMY_WEB.pdf
- 81 Stolton, S., Timmins, H. and Dudley, N. 2021. *Making Money Local: Can Protected Areas Deliver Both Economic Benefits and Conservation Objectives?* Technical Series 97, Secretariat of the Convention on Biological Diversity, Montreal. Retrieved from: <https://www.cbd.int/doc/publications/cbd-ts-97-en.pdf>

6. EPILOGUE: 2022 - THE YEAR OF THE TIGER



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When taken as a whole, the preceding sections of this report illustrate a diverse and complex set of factors that will need to be considered by those who will take up the challenge of ensuring that both humans and tigers can thrive in shared landscapes over the coming decades. It also points to the fact that the relationship between humans and tigers requires comprehensive and proactive approaches which are absent at this point. On the one hand, the case studies and good practices highlighted in *Living with Tigers* illustrates how much is possible in this area. On the other, it makes clear that many elements of those approaches are specific to culture and context; it is no easy matter to simply replicate a successful approach across the entirety of the tiger range. Recognizing this, one shortcoming that calls out for immediate attention is the lack of existing channels for substantive community input into the design of such human-tiger coexistence policies going forward. Policymakers would do well to view doing so as a prerequisite for successful interventions in this area.

A failure to make substantial new investments in the human dimension of tiger conservation would represent a massive missed opportunity. For tigers, the lack of such frameworks to this point have almost certainly limited the scale of the tiger recovery since 2010. Where successes have occurred, local support for the species has often been critical – but such support should not be taken for granted or viewed as a constant. Community attitudes and aspirations can shift rapidly, particularly against the backdrop of fast-charging Asian economies.

Fortunately, the importance of coexistence seems to be increasingly acknowledged in tiger range countries. This includes newspaper headlines such as “*Launch programme to reduce human-tiger conflict*”¹ from the most recent National Tiger Conservation Committee meeting in Nepal, where the Nepalese Prime Minister instructed relevant agencies to develop such programmes. At the recently concluded 4th Asia Ministerial Conference on Tiger Conservation, coexistence was raised more frequently than it had been in any previous Global Tiger Initiative meeting. The speech delivered to that conference by the Kingdom of Bhutan’s Minister of Agriculture and Forests, who is also the Chairman of the Global Tiger Forum, was another such example. In addition to announcing plans for a community-based tiger conservation fund in that country, he noted that: “...long-term holistic and innovative solutions to human-tiger conflict are urgent and critical to ensure the safety of both communities and tigers, as well as the prosperity of local people...assistance should be directed not only at reducing poaching and preventing landscape alteration, but also at securing rural livelihoods and strengthening the capacity of local conservation actors...innovative solutions should be implemented on [the] ground and conservation measures must prioritize community development and local people’s prosperity. Protected environments should be regarded as engines of growth and opportunity for both tigers and humans.”²

Conservation organizations are increasingly prioritizing these issues as well. The recently formed *Coalition for Securing a Viable Future for the Tiger*, which includes many of the world’s most prominent conservation organizations, recommends that tiger range countries consider coexistence as a top priority as they negotiate the second Global Tiger Recovery Program (2023-2034). Their joint publication flags better human-tiger conflict management, an increase in community-based conservation plans, and the creation of new forums for community-government dialogues as specific elements that require attention over that period.³

Although non-governmental and intergovernmental organizations will have a supporting role to play in the development and implementation of more holistic human-tiger coexistence approaches in the coming years, it is important to recognize that success or failure will largely rest on the actions taken by tiger countries themselves.

Collectively, these countries should adopt clear, ambitious and measurable coexistence goals for their 2023-2034 plan. Those commitments could be further linked to national and international sustainable development targets. If consensus across all 13 countries that participate in the process proves difficult, the four South Asian countries may wish to forge ahead with their own coexistence strategy and goals. This is practical for a few reasons beyond the obvious fact that South Asia is where most people actually live with tigers. It is also the region that has been most successful against the original Tx2 goal of doubling wild tigers set in 2010. That means more tigers, and a pressing need for comprehensive coexistence frameworks that can protect these gains over the long term. It also demonstrates that the basics of tiger conservation are working well in these countries, which puts them in a position to tackle a new challenge of this magnitude.

The Global Tiger Initiative itself would greatly benefit from the addition of direct community input into that process. Finding a means of accomplishing this is something donor agencies and international organizations should aim to support, with the understanding that such forums could be used to engage with other intergovernmental processes as well.

Such *tiger community* inputs are needed at all governance levels however, and it can easily be argued that national and sub-national processes for securing this participation would be even more impactful. One means of accomplishing this could see local community representatives invited to participate in ongoing processes, such as national tiger committees or other species conservation decision-making bodies. The potentials of existing channels of communication between rural communities and other branches of government might also be explored before designing such forums from scratch. No matter how it is accomplished, it is crucial



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that the insights, recommendations and aspirations of these peoples be heard directly as opposed to being filtered through other agencies or organizations (where they are even considered at all). The challenge of representativeness is a key matter to consider when designing these channels of direct dialogue, but should not be used as an excuse for inaction.

Through such consultations, it is hoped that governments can design and implement new policies that significantly reduce the costs and expand the benefits that accrue to those living with tigers. This would address a matter of fundamental fairness and serve as a recognition of the critical role that local communities – who are often also Indigenous peoples – already play in maintaining this globally important species. Such a shift in approach would likely include a significant increase in investments for tiger conservation outside traditional protected areas systems. The nature of such investments should be informed by

social science expertise, which is frequently absent in current decision-making around tigers. Such investments might also facilitate processes that enable the formal recognition of community conserved areas within the tiger range.

Coexistence is poised to become a defining issue for tiger conservation in the coming decades. It is hoped that this report, in addition to providing insight to those making and implementing policies, can convey a sense of urgency around the need for new approaches and action in this area. Tiger countries, tiger conservationists, and those concerned with development and human well-being will all have roles to play in building the architecture required to accomplish this. All parties should seek to ensure that this lunar year of the tiger – and the associated renewal of the Global Tiger Recovery Program – marks a turning point, after which coexistence matters become viewed as critically important components of effective tiger conservation.



REFERENCES AND NOTES

- 1 Rastriya Samachar Samiti. 2021. 'Launch programme to reduce human-tiger conflict.' *The Himalayan Times*, 12 July 2021. Retrieved from: <https://thehimalayantimes.com/nepal/launch-programme-to-reduce-human-tiger-conflict>
- 2 4th Asia Ministerial Conference on Tiger Conservation, 19-21 January 2022, Kuala Lumpur: Summary of Sessions. Unpublished draft (March 22, 2022).
- 3 Hails, C., O'Connor, S. and Soutter, R. 2022. *Securing a Viable Future for the Tiger*. Flora and Fauna International, IUCN, Panthera, TRAFFIC, WCS and WWF, Cambridge, UK. Retrieved from: <https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Asien/Tiger-Coalition-Vision-WWF-TRAFFIC-IUCN-Panthera-WCS-Fauna-and-Flora-International.pdf>

APPENDIX 1: OECMS



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“Other effective area-based conservation measures” (OECMs) is a framework for identifying and reporting areas that are achieving the effective *in-situ* conservation of biodiversity outside of protected areas. In 2018, Parties to the CBD agreed guiding principles, common characteristics and criteria for the identification of OECMs (CBD Decision 14/8) which is defined as: *A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values.*

OECMs include three main types:

- “Ancillary conservation” – areas delivering *in-situ* conservation as a by-product of management, even though biodiversity conservation is not an objective (e.g., some military training grounds);
- “Secondary conservation” – active conservation of an area where biodiversity outcomes are only a secondary management objective (e.g., some conservation corridors);

- “Primary conservation” – areas meeting the IUCN definition of a protected area, but where the governance authority (i.e., community, Indigenous peoples’ group, religious group, private landowner or company) does not wish the area to be reported as a protected area or where the area cannot be reported as a protected area.

Some potential land management areas which are likely to become OECMs include:

Ancillary conservation

- Sacred natural sites with high biodiversity values that are conserved in the long term for their associations with one or more faith groups;¹
- Military lands and waters, or portions of military lands that are managed for the purpose of defence, do not have a secondary objective of biodiversity conservation, but achieve the effective conservation of biodiversity in the long term.²

Secondary conservation

- Territories and areas managed by Indigenous peoples and/or local communities (e.g., ICCAs) to maintain natural or near-natural ecosystems, with low levels of use of natural resources practised on a sustainable basis and in a way that does not degrade the area's biodiversity;³
- Traditional management systems that maintain high levels of associated biodiversity, these could include certain agricultural or forest management systems that maintain native species and their habitat;⁴
- Military lands and waters, or portions of military lands and waters that are primarily managed for the purpose of defence, but with specific secondary objectives focused on the conservation of biodiversity;⁵
- Watersheds or other areas managed primarily for water resource management that result in the *in-situ* conservation of biodiversity, this can include, for example, water meadows, riverine forest, coastal forests, wetlands, streams, upland catchments, or other areas managed for long-term soil and slope stabilization, flood mitigation or other ecosystem services;
- Hunting reserves that maintain natural habitats and other flora and fauna as well as viable populations of hunted and non-hunted native species;
- Areas successfully restored from degraded or threatened ecosystems to provide important ecosystem services, but which also contribute to effective biodiversity conservation;
- Areas that contribute to conservation because of their role in connecting protected areas and other areas of particular importance for the conservation of biodiversity, thereby contributing to the long-term viability of larger ecosystems.⁶

Primary conservation

- Territories or areas governed by Indigenous peoples, local communities or private entities with a primary and explicit conservation objective, delivering *in-situ* biodiversity conservation, but where the governing body wishes the areas to be recognized and reported as OECMs, rather than as protected areas;
- Areas that include Key Biodiversity Areas,⁷ managed in ways that deliver long-term *in-situ* conservation of biodiversity through, for example, regulation or other effective approaches;
- Some permanently set-aside areas of a managed forest, such as old-growth, primary or other high-biodiversity value forests, which are protected from both forestry and non-forestry threats;
- Some natural areas managed by universities for biological research.

REFERENCES AND NOTES

- 1 Matallana-Tobón, C., Santamaría, M., Areiza Tapias, A., Solano C. and Galán S. 2018. Rethinking nature conservation in Colombia: a case study of other effective area-based conservation measures. *PARKS* 24: 89-98. DOI: 10.2305/IUCN.CH.2018.PARKS-24-SICLM.en
- 2 Douglas Ripley, J. and Leslie, M. 1997. Conserving biodiversity on military lands. *Federal Facilities Environmental Journal* 8: 93-105. DOI: 10.1002/ffej.3330080210
- 3 Jonas, H., Lee, E., Jonas, H., Matallana-Tobon, C., Wright, K., Nelson, F. et al. 2017. Will 'other effective area-based conservation measures' increase recognition and support for ICCAs? *PARKS* 23: 63-78. DOI: 10.2305/IUCN.CH.2017.PARKS-23-2HDJ.en
- 4 Eghenter, C. 2018. Indigenous effective area-based conservation measures: conservation practices among the Dayak Kenyah of North Kalimantan. *PARKS* 24: 69-78. DOI: 10.2305/IUCN.CH.2018.PARKS-24-SICE.en
- 5 Douglas Ripley, J.D. and Leslie, M. 1997. Op cit.
- 6 Waithaka, J. and Warigia Njoroge, G. 2018. The role of potential OECMs in safeguarding space for nature in Kenya: A case study of wildlife conservancies. *PARKS* 24: 99-106. DOI: 10.2305/IUCN.CH.2018.PARKS-24-SIJMW.en
- 7 IUCN. 2016. *A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0*. First edition. IUCN, Gland, Switzerland. Retrieved from: <https://portals.iucn.org/library/sites/library/files/documents/2016-048.pdf>

APPENDIX 2: RECOMMENDATIONS

The *Living with Tigers* report highlights many approaches that can be utilized to improve the well-being of those people who live with tigers, while also increasing essential local support for tiger conservation objectives. A non-comprehensive list of recommendations derived from the findings of the report are included here. These are categorized according to the chapter headings of the report, although many will be cross-applicable. They are primarily directed at policymakers, but many will be equally relevant to non-governmental organizations aiming to improve the community dimensions of large carnivore conservation work.

CHAPTER 1: PEOPLE AND TIGERS IN THE FUTURE ASIA

Take steps to better link tiger conservation to sustainable development plans and processes: the next Global Tiger Recovery Program (GTRP) and any new National Tiger Action Plans (NTAPs) should be aligned with commitments and goals endorsed at the international and national levels. Of note, this would include those under the Sustainable Development Goals, Indigenous rights, and the biodiversity and climate regimes (i.e., Convention on Biological Diversity and UNFCCC).

Shift from reactive to proactive policy-making in the area of coexistence: this should entail, among other approaches:

- **Modelling the impacts of climate change on both humans and tigers.** This will provide clarity as to where new coexistence approaches will be most needed in the future, and in assessing where limited financial and technical resources could be best allocated (e.g., support for new community conserved tiger areas or tiger corridors based on projected human and tiger landscape presence).
- **Balancing the needs of tigers and communities at the earliest stages of infrastructure planning.** When major infrastructure projects (e.g., roads, rail, powerlines, dams) are being considered in tiger landscapes, both tiger conservation experts and local communities should be substantially engaged, especially on the routing or placement of that infrastructure. If possible, both groups should also be consulted during the creation of national infrastructure master plans as they pertain to tiger landscapes. Consultations of this kind can be beneficial toward preventing costly delays from later legal challenges, or the need for expensive conservation or human safety mitigation measures.
- **Assessing economic and demographic trends to identify landscapes suitable for new coexistence programmes or policies.** For example, areas with declining human population densities and economic opportunities could be targeted for tiger corridor restoration programmes that provide jobs or otherwise stimulate the local economy.

CHAPTER 2: INTEGRATING COMMUNITIES INTO TIGER CONSERVATION PLANNING AND POLICY

Utilize extensive social science expertise in tiger conservation planning: directly employ or otherwise secure social science expertise and inputs (e.g., through formal relationships with academic institutions). This is important as the use of biological and ecological data alone leaves out important inputs that can inform better policies or interventions.

Build relationships with other government agencies mandated to support local communities in tiger landscapes: this might include ministries or agencies for rural development, agriculture, social development, social services, community issues, employment, Indigenous matters, economic development, or similar. As a vehicle to accomplish this, tiger countries should establish national tiger committees chaired by the head of government. These have proven highly effective where they exist, and produced the convening power generally required to bring diverse government agencies together to accomplish common goals.

Ensure community inputs and co-development at all stages of policy or project formation and delivery: this is a general rule that should be broadly observed, and efforts to enhance decision-making and governance powers for local peoples should be prioritized.

Commit to long-term partnerships with communities from the outset: trust can be seriously eroded when governments or organizations withdraw from a partnership, regardless of the justification (e.g., budget constraints, etc.).

Ensure adequate time for outreach prior to initiating a coexistence project: this period is critical for building relationships with local communities and properly understanding local preferences and aspirations so they might be adequately integrated into the final design.

Gather feedback from community members throughout the life of a project: this should be accomplished through multiple modes of assessment (e.g., community meetings *and* confidential surveys).

Maintain methodological consistency when collecting data pertinent to communities and tiger coexistence: adopt guidelines to keep such methodologies (e.g., survey format) consistent over time, geography and governance level. Doing so will greatly enhance the comparative value and utility of such efforts.

Prioritize transparency in partnerships with communities: this includes realistic expectation setting, openness in reporting on progress, and clarity regarding how community provided efforts or information will be used. It is critical to fairly acknowledge all community contributions, and quickly communicate mistakes or setbacks rather than attempting to conceal them.

Prioritize important tiger landscapes to trial new models: this might include assessing the potentials for various areas to be identified as coexistence corridors or OECMs governed by Indigenous peoples and/or local communities.

Avoid narrow conceptions of community interest: this requires accounting for differential impacts within communities when developing coexistence approaches with those groups or their representatives. Gender-related impacts should be a paramount consideration, given that past research reveals a propensity for more tiger costs and fewer tiger benefits to accrue to women. Steps should also be taken to incentivize equal gender representation on any community-based bodies established for the purpose of engaging in such policies or projects.

Gather inputs from all segments of a community: work to create the conditions under which all segments of a community can give honest inputs (e.g., youth, elders, all genders, the economically vulnerable, etc.). This might require outreach in locations where segments of a community will feel comfortable speaking (e.g., schools, women-only meetings, etc.).

Help create forums that allow communities in tiger landscapes to directly input into national and international policymaking: even if direct engagement with various communities will be the predominant approach, it is important to support the establishment of bodies where community representatives living in tiger landscapes can come together to discuss and suggest policy at higher governance levels (i.e., sub-national, national or regional). For instance, the Global Tiger Initiative process would benefit from adding a body that enabled communities to speak on these issues in their own voice.

Seize opportunities to formalize and expand existing community governance models in tiger landscapes: such models – which include community conserved areas – can expand the geography for tiger conservation beyond traditional protected area systems, while at the same time contributing to globally agreed biodiversity and development goals.

CHAPTER 3: ENSURING THAT BENEFITS FLOW TO COMMUNITIES LIVING WITH TIGERS

Fairly value the ecosystem services provided by areas that have tiger populations: this would include an accounting of the large percentage of that value that is utilized by people living outside of tiger landscapes. Such assessments will provide critical context toward the design of new benefit schemes that support communities who live in and maintain tiger ecosystems.

Consider the full range of direct and indirect benefits available for a given tiger community: these will vary

considerably based on the priorities identified by different communities. Revenue sharing, preferential employment, low interest loans, preferential market access and public works are just a few of the many possible benefit types.

Employ local people in the design and delivery of human-tiger coexistence programmes: this is important not only as a tangible benefit from coexistence, but also to empower local voices that can explain and advocate for the value of such efforts within their communities. In accomplishing this, efforts should be made to remove structural or educational barriers that often limit the hiring of rural peoples to public sector positions.

Structure programmes and benefits for the broader community: benefits that accrue to a narrow range of community stakeholders are unlikely to be viewed as fair or legitimate and may do more harm than good (e.g., lower social cohesion, increase negative views of government, lower tolerance for tigers, etc.).

Facilitate new initiatives between the private sector and communities: enterprises working in tiger landscapes will often be owned or managed by outside interests who have minimal engagement with local communities. Government agencies (and in some cases non-governmental organizations) can do much to bridge divides between these two groups and facilitate new partnerships that provide mutual benefit.

Formalize local authority in law wherever possible: this is both an acknowledgement that local people are usually the best stewards of their lands, and a practical step to close the large gap that exists between *de facto* versus legal control of land in many tiger landscapes. In many places, this would reduce community frustrations that their relationship with tigers and biodiversity is being dictated by outsiders. Furthermore, it would provide tenurial security, by removing uncertainty around the legal status of land, which can be a major impediment to conservation efforts, investment and development.

Recognize that the devolution of legal control to communities is not an endpoint: relevant authorities should also work with those communities to develop the skills, expertise and capacities they will require to successfully realize the rights and responsibilities that come with increased control over lands and biodiversity.

Provide start-up funds where possible: many of the structures needed for effective local management will require some government support at the outset. Programmes that can provide such support should be introduced.

CHAPTER 4: MANAGING HUMAN-TIGER CONFLICT: A PREREQUISITE FOR FUTURE COEXISTENCE

Recognize the social and psychological elements of conflict: policymakers should understand that human-tiger conflict (HTC) is a complex social issue impacted by a wide variety of factors (e.g., inter-group dynamics, underlying historical grievances, faith etc.). Furthermore, it is important to account for the fact that tiger presence also leads to physiological costs (e.g., increased stress) for many members of a community.

Move beyond piecemeal approaches to addressing HTC: integrated and holistic strategies for addressing HTC (factoring in the multitude of benefits and challenges) can provide opportunities for more sustainable management. Programmes constructed around a narrow understanding of conflict as only losses to life and property will bias toward a limited set of solutions, frame the issues in entirely negative terms, and forestall consideration of potentially productive paths forward. This, in turn, can lead to inefficient outcomes.

Be aware that local perceptions of HTC vary greatly due to cultural or social differences: understanding these differences is key to tailoring a response to a given community.

Find the right balance with the approach to conflict situations and management: in some communities, authorities or conservation organizations might unintentionally lower local tolerance to tigers by promoting the idea that there is a serious conflict problem that needs to be solved through external intervention. Conversely, ignoring a problematic conflict environment can build resentment toward both government agencies and tigers. The right intervention will depend on the perceptions and needs of individual communities, meaning that any inflexible approaches would be inherently flawed.

Incentivize preventative approaches: rather than relying on compensation for damages alone, aim to provide funds or other incentives for the installation of preventative measures appropriate to local conditions. For tigers, this is particularly important in relation to livestock management and animal husbandry practices – with the possibility that good practices be made prerequisite for certain compensation payments where doing so would not lead to unfair outcomes. Officials can support the introduction of the Safe Systems Approach as an integrated approach in tiger landscapes to improve preventative measure adoption by local communities.

Work with communities to discuss zoning options that would limit conflict in areas with very high tiger densities: this should assess options that would see certain economic activities (e.g., livestock grazing, resource extraction, etc.) limited in the most essential tiger habitats

in exchange for incentives or support toward identifying and shifting such activities to suitable nearby areas.

Provide funding for research on the effectiveness of various tiger deterrents: at this time, there is insufficient evidence to guide policy on tiger deterrents (e.g., which approaches should be scaled up). Given that many suggested approaches would be incredibly cost-effective, it is important to better understand their actual potential.

Prioritize support for those most vulnerable to the impacts of conflict: recognize that the negative impacts of tiger interactions often fall disproportionately on the poor and develop policies and programmes that benefit those most impacted.

Adequately investigate cases of retaliatory killings of tigers: in such instances, it is important to thoroughly investigate the factors and conditions that prompted the retaliatory incident and adjust policies to reflect any shortcomings or local grievances revealed through those investigations.

Properly utilize tiger incident data to better predict and reduce future risks to humans: at minimum, the data collection should include location, the geographic and ecological characteristics of that location, and the date and time when HTC occurred. Previous research suggests certain spatial and temporal conditions can be predictive of future attacks on people or livestock, so it is critical that such information is collected for modelling purposes. Importantly, the findings of this work need to be shared with affected or at-risk communities living with tigers.

Tiger prey recovery should also be seen as a human-welfare priority: evidence indicates that declines in tiger prey can increase the likelihood of negative tiger interactions, particularly attacks on livestock. At the same time, it is important also to be mindful of other possible impacts of such prey recovery efforts, particularly damage to crops.

Guarantee a rapid response to tiger incidents: several models for rapid response team function have emerged in recent years in tiger range countries, yet a huge proportion of tiger landscapes still lack such units. It is suggested that authorities prioritize implementing such models, or partnering with conservation organizations to expand successful rapid response teams that may already be operating. Local people should be preferentially trained and hired to work on such teams.

Remove delays and bureaucratic hurdles in compensation: these make communities less likely to make use of such programmes, and more likely to retaliate against tigers after negative encounters.

Periodically assess the effectiveness of translocation and lethal control guidelines for tigers: such approaches may be under- or over-utilized when properly assessed against local community interests.

Push for the adoption of standardized reporting on conflict incidents at the national and regional levels: such incidents might be harmonized then tracked through the Global Tiger Initiative process, for example.

Better monitor tiger populations outside core forest habitats: the full extent of tiger presence in human dominated, economic landscapes and their use of corridors is not well understood at this time. Closely tracking tiger populations in partnership with those living with the species will allow for better management of the potential threats and benefits associated with their presence. Doing this effectively will often require new partnerships with other sectors active outside protected areas (e.g., agriculture, businesses, etc.).

CHAPTER 5: SUSTAINABLE FINANCING OPTIONS

Incentivize tiger conservation and tiger community investment from new segments of society: at this time, tiger range countries have marginal domestic private sector and individual donor investment in species recovery. Given the growing concentration of wealth of tiger range countries, governments and conservation partners should take efforts to engage and facilitate investments from these sources – recognizing that such investments can expand the funds available for co-benefits approaches targeting both communities and tigers.

Develop policies and programmes that deliver community benefits dependent on tiger conservation outcomes: such approaches are increasingly common, can broadly motivate, and provide an excellent alternative to existing programmes aimed solely at mitigating losses. Such programmes could be particularly valuable in key tiger landscapes falling outside protected area systems. These approaches could be based entirely on verified sightings of tigers within defined areas – although different indicators could be jointly defined by the funding entity and the participating communities.

Adopt tigers as an indicator for success in other financing approaches: the use of tigers as indicators should be fully explored in payment for ecosystem services and REDD+ schemes, as well as other innovative approaches such as impact bonds.

Ensure tiger conservation outcome-based benefits accrue broadly: this is necessary given that human populations are dense across most tiger landscapes. As such, benefits should be directed toward widely shared resources (e.g., hospitals, schools, etc.) or allocated by local bodies that can distribute benefits in a manner decided by the community at large.

Utilize non-governmental organizations as a bridge between communities and government agencies in tiger range countries: conservation organizations are well placed to facilitate those dialogues and speed up such efforts to introduce sustainable financing models.



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WWF, 28 rue Mauverney, 1196 Gland, Switzerland. Tel. +41 22 364 9111
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