

Human–wildlife conflict and insurance

Can insurance reduce the costs of living with wildlife?

Olivia Wilson-Holt and Paul Steele

Discussion Paper

March 2019

Environmental Economics

Keywords:
Wildlife, small-scale farming,
livelihoods

About the authors

Olivia Wilson-Holt is a consultant at IIED, focusing on strengthening community voices in conservation initiatives, particularly those aimed at tackling the illegal trade in wildlife. She recently completed an MSc at Imperial College London in Conservation Science, writing her thesis in collaboration with IIED. Prior to this, Liv spent four years working for Willis Towers Watson, a global advisory, broking and solutions company.

Paul Steele is chief economist with IIED. His focus is on financing for the Sustainable Development Goals and incentives for an inclusive, green economy. He spent eight years with the United Nations Development Programme (UNDP) in Bangkok working with Ministries of Finance in Asia Pacific on climate and environment, and four years with the Department for International Development (DFID) working on poverty and environment. Email: paul.steele@iied.org

Acknowledgements

The authors wish to acknowledge comments and discussions with Dilys Roe and Cinzia Cimmino from IIED, and Ashley Brooks from WWF. Any errors are the responsibility of the authors and the views expressed are the authors' own and do not necessarily represent those of these individuals.

Join the debate

Project information is available online and outputs will be made available as the project progress. Visit <https://www.iied.org/livelihoods-insurance-elephants-life-kenya-sri-lanka>.

Produced by IIED's Shaping Sustainable Markets group

The Shaping Sustainable Markets group works to make sure that local and global markets are fair and can help poor people and nature to thrive. Our research focuses on the mechanisms, structures and policies that lead to sustainable and inclusive economies. Our strength is in finding locally appropriate solutions to complex global and national problems.

Published by IIED, March 2019

Olivia Wilson-Holt and Paul Steele. 2019. *Human-wildlife conflict and insurance. Can insurance reduce the costs of living with wildlife?* IIED Discussion Paper. IIED, London.

<http://pubs.iied.org/16648IIED>

ISBN 978-1-78431-666-2

Printed on recycled paper with vegetable-based inks.

International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
www.iied.org

 @iied

 www.facebook.com/theIIED

Download more publications at <http://pubs.iied.org>

IIED is a charity registered in England, Charity No.800066 and in Scotland, OSCR Reg No.SC039864 and a company limited by guarantee registered in England No.2188452.

Developing solutions for human–wildlife conflict is an urgent conservation priority. This threat to coexistence between humans and animals is particularly serious in developing countries, where population growth significantly impacts traditional wildlife ranges. Tried and tested approaches to conflict resolution include schemes to financially offset affected individuals for their loss. To succeed, these schemes need to ensure cost-effective verification, fair and timely payments, incentives for damage prevention and financial sustainability. This paper reviews how existing wildlife insurance programmes and agricultural microinsurance schemes have addressed these challenges.

Contents

Summary	4
1. What are the characteristics of a successful insurance-based scheme to offset human-wildlife conflict costs?	6
2. Is microinsurance a potential way forward for human-wildlife conflict resolution?	15
3. Join the discussion	21
Notes	23
Glossary of terms	25

Summary

Reducing human–wildlife conflict (HWC) is key to coexistence between humans and animals and countries have implemented reactive measures including financially offsetting the costs of crop raiding and livestock predation. In sub-Saharan Africa and to some extent Asia a large portion of the workforce depends on agriculture, but with increasing overlap of human settlements and wildlife ranges a solution needs to be found to growing HWC. In response, countries have initiated financial mitigation methods to increase local tolerance for wild species. These methods are aimed at reducing retaliatory killings which result from losses suffered by communities living in close proximity to wildlife. Some HWC schemes provide government-funded compensation to affected individuals, whilst other schemes focus on private sector, insurance-based payments. The latter is the focus here.

There are also lessons to be learned from insurance for agricultural losses from weather-related events as microinsurance becomes more developed across sub-Saharan Africa and Asia. Increasing numbers of innovative schemes are starting up that are focused on providing enhanced protection to climate-related weather perils for smallholders across the African continent, as well as in Asia. Collectively, these schemes have reached over one million individuals with many already seeing benefits in improved resilience.

The effectiveness of insurance for HWC is context specific, but there are four general challenges to the success of such schemes:

- Cost-effective insurance administration
- Timely and fair insurance payments
- Incentives for damage prevention
- Financial sustainability of premium payments

This report reviews the lessons that can be learnt in addressing these challenges from existing HWC insurance schemes and weather-related agricultural microinsurance schemes.

Some initiatives have failed to increase tolerance and have further alienated local communities, with late and inadequate payments. Yet others have been able to reduce animosity towards wildlife and promote environmental stewardship amongst communities who have begun to benefit from the presence of wildlife.

Cost-effective insurance administration includes low-cost premium collection and verification of claims, the costs of which can be reduced by comprehensive data. Low-cost premium collection requires an efficient apparatus to collect insurance payments. Cost-effective claim verification depends on insurance pricing based on actuarial calculations of the risk of certain events occurring which then need to be verified. Microinsurance schemes favour index-based insurance because a whole region can be covered rather than individual plots, reducing operational and administrative costs of cover and verification. However, index-based insurance requires at least 10 years of rainfall or crop yield data from previous periods to build up a historical picture against which claims can be verified. For verifying insurance schemes for HWC, this would mean accessing historical livestock depredation and crop raiding patterns, which is likely to be difficult to collate.

Timely and fair payments can be supported by accurate data, actuarial analysis and technology with claimants kept updated through mobile SMS. One of the key criteria for successful insurance schemes is adequate payments made within short time periods. Some schemes, such as those in Austria and Greece, which pay within a few months have succeeded in this, but schemes in China and Sri Lanka are much slower. Timely payments can be achieved by agricultural microinsurance through index-based insurance whereby payment is immediately triggered when a weather threshold is reached, but this is not possible with HWC. But HWC insurance can learn from developments in microinsurance technology where farmers and companies communicate on mobile SMS. HWC insurance also needs to address the considerable variations in fair payments with amounts paid ranging from 100% of damages in Canada, Greece and Canada to less than 10% in Sri Lanka.

Linking payments to damage prevention is needed to address moral hazard, where an insured individual exposes a scheme to a greater risk due to a lack of care. Research suggests that damage prevention clauses, when enforced, can reduce fraudulent activity, such as where farmers overclaim for losses, and moral hazard, where property is deliberately left unprotected. This is based on the idea that individuals will be incentivised to adopt effective safeguarding measures in order to avoid a rise in premium fees from an increase in risk exposure.¹ This can be addressed by performance-based incentives as long as these are properly enforced. A number of schemes, including in India and Canada, provide one-off payments to individuals for damage prevention.

Financial sustainability of premium payments is perhaps the biggest challenge and limits the involvement of commercial insurance companies. Schemes are constrained from developing an approach that is financially viable to all parties. Most individuals who are affected by HWC cannot afford the premiums required by commercial insurers to make a scheme financially worthwhile. Studies show that schemes have struggled to find a solution that is mutually beneficial, particularly as local participation is strongly linked to costs of involvement. A further problem is that many communities believe it is the state's responsibility to cover losses associated with HWC, meaning they disagree with paying a premium in the first place.

Financial sustainability of insurance schemes for HWC depends on the level of administrative costs being charged and penetration of insurance markets as a result of consumer awareness campaigns. Insurance schemes have more success in North America and Europe as they require fewer administrative inputs from smallholders throughout the process from coverage to claims. Across Africa and Asia, however, small-scale farmers are more likely to be affected by financial and administrative costs. The insurance market is well-established in North America and Europe and the average individual is able to afford cover to protect their business. Historically, there has been little insurance penetration into sub-Saharan Africa and parts of Asia, leading to a lack of trust, although this is slowly changing as smallholders begin to be made aware of the benefits from new initiatives through consumer campaigns and other efforts. Microinsurance schemes have succeeded by using a wide variety of intermediaries to deliver products and services on behalf of an insurance company, bringing about stronger consumer trust and expanding reach in markets with little historical insurance penetration.

Financial sustainability for HWC requires partnerships with other sectors and players to make premiums more affordable and co-financing from the beneficiaries of wildlife, such as tourists. Linking payments with tourism activities administered through an NGO is a clever way to finance schemes as well as promote wildlife stewardship amongst communities, and this approach has been tried in Pakistan with some success. Research shows that tourists are generally willing to pay a local subsidy to visit a particular area, especially for rare and endangered species, and partnerships between local governments, NGOs and tourism agencies have been recommended.¹ In Canada private insurance covering damage from wild animals is widespread, but farmers can also receive compensation from the respective state or province,

which requires little more than damage verification and is both prompt and sufficient.

Financial sustainability of premium payments can also be enhanced by making them mandatory or bundling insurance services with other products. Bundled products are easier to sell in places where consumers have no prior knowledge of insurance and possibly lack trust in schemes as a result. Bundling therefore provides an extra incentive, such as receiving credit alongside insurance, or through other inputs such as fertilisers. Ideally, each stakeholder should benefit from this added value. Mandatory insurance for HWC for farmers, as in the case of Greece, can be a way to increase the consumer base, lower the risk and thus reduce premium costs.

Community insurance schemes are often the most successful schemes at overcoming the fourfold challenges that insurance markets face for HWC. Schemes have succeeded where the local community was involved in decision-making and subsequent design of the programme. In general, community-based approaches have managed to overcome issues of moral hazard and low opt-in rates.

There are considerable lessons to be learned from existing initiatives aimed at offsetting costs of HWC as well as agricultural microinsurance schemes. Understanding where, why and how success has been achieved is key to designing an effective solution that will allow communities to coexist with, and tolerate, the wildlife on their doorstep.

What are the characteristics of a successful insurance-based scheme to offset HWC costs?

1

Globally, few insurance-based initiatives have been implemented to help resolve HWC with the majority in developed countries. Studies show that there are patterns to success and failure and that overall consumer support is achieved when schemes are perceived as fair. This section identifies the lessons learned from a review of past and present insurance-based schemes that have been designed to offset costs for individuals affected by HWC.

1.1 Overview of insurance for human-wildlife conflict

Global incidents of HWC are rising year-on-year despite various reduction techniques adopted.² Preventative actions include lethal killings, translocations and barriers such as fences or trenches. Reactive actions are usually associated with financial mitigation, usually in the form of compensation but also insurance-based schemes:³

- Compensation schemes reimburse individuals for a loss without their financial input and are usually government funded.
- Insurance-based schemes work like a traditional insurance product by requiring a premium to be paid in order for an individual to receive payment for a pre-defined loss under a certain set of conditions. They may be linked to some private sector insurance entity.

The purpose of financial mitigation is to increase local tolerance for wild species by offsetting the costs of damage in a fair and equitable manner, reducing retaliatory killings.²

There are questions surrounding the effectiveness of financial mitigation in HWC resolution, and its success depends on the context. Concerns about financial mitigation include its ability to adequately compensate for damages, increased bureaucracy for local communities, and the prioritisation of wild species over human populations.³ In some cases, insurance schemes were not able to increase tolerance of a species because the damage suffered by livestock owners was barely covered by payments. Another issue is that initiatives are often implemented with no input from the locals they are intended to help, resulting in mistrust and low opt-in rates.⁴ Also, moral hazard, where an individual does not take actions to protect their property, exposing a scheme to a greater loss, as well as fraudulent activity can be problematic for financial sustainability.⁵ It has been suggested that farmers in developing nations are less likely commit fraud, but there is debate around this and perverse incentives do exist.⁶

There are limited examples of commercial insurance involvement in schemes specifically focused on HWC. One reason for this is that local farmers are often unwilling to pay for insurance for something they believe should be covered by the state.⁷ Costs of participation are also a major barrier, with local farmers reluctant to opt in to insurance schemes because they risk losing money in the form of premiums for events that are not certain to occur.⁸ As smallholders usually cannot afford high premiums, it is difficult to find a solution that is mutually beneficial, and therefore difficult to find insurance companies able to insure against damage for a reasonable price.⁹ This was the case during the development of the original Human Animal Conflict Self Insurance Scheme in Namibia, and similarly it has been suggested that this was a factor in the low participation of farmers in an Italian scheme⁷ discussed in Table 1 below.

Despite obstacles, there are initiatives that have managed to overcome these issues and are generating benefits to the individuals they serve using an insurance-based approach. For example, schemes in North America that compensate against predation by wolves have been found to have reduced animosity towards the species.⁴ Similarly, increases in populations of snow leopards in both Pakistan and India have been attributed to factors such as community participation, collaboration with NGOs and partnerships with ecotourism activities. This is largely because the communities in these cases support what they perceive to be a fair approach.⁹ As these examples highlight, insurance-based initiatives are an essential mechanism in HWC management strategies and can generate positive outcomes when implemented effectively. In particular, HWC insurance schemes can facilitate behaviour change, a critical component of success. The underlying principle of HWC-focused insurance is this ability to bring together a group of personally invested individuals whose behaviour is linked back to the investment. So, whilst not all schemes have achieved results as promising as those in Pakistan and India, they still provide important insights and lessons for the development of future schemes to mitigate HWC losses for local communities.

1.2 Specifics of human-wildlife insurance schemes

This section reviews past and present insurance-based schemes that have been designed to financially offset costs of HWC, from which we can learn lessons for the development of future schemes.

We conducted a web-based search and analysed

schemes that were similar to traditional insurance services, for example, where a premium is paid, or the scheme is delivered through an insurance company. Only compensation schemes relevant to insurance have been considered here.

Table 1 shows past and current insurance-based schemes to financially offset costs of HWC. The schemes are in developed and developing countries.

The developing country schemes are from Namibia, India, Pakistan and Sri Lanka, and the developed-country schemes are from Canada, Austria, Italy, Greece and Russia.

There tend to be more developed-country schemes as insurance markets are more extensive in these countries, and the risks and costs associated with HWC are much lower.

Table 1: Insurance-based schemes

COUNTRY WHERE INITIATIVE IS TAKING PLACE	WHAT DOES THE SCHEME COVER?	IS THE SCHEME CURRENTLY ACTIVE?	DETAILS
Namibia	Livestock loss, damage to crops and human death or injury	Yes	Namibia implemented the Human Animal Conflict Self Insurance Scheme (HACSIS) in 2003. The scheme was termed 'self-insurance' because the community-based organisations (CBOs) contributed directly to the payouts. ¹⁰ In 2010 the scheme merged into the Human Wildlife Self Reliance Scheme. Under this scheme payments are made to cover livestock losses and damage to crops as well as human death or injury. Payments are intended to partially offset any loss to the person affected. The scheme does not apply to private land and there are several other conditions to payment, such as the requirement of preventative measures for protecting livestock and crops. The payments are not intended as compensation. The Namibian government is currently in the process of developing a human–wildlife conflict insurance scheme that will provide payments on death or injury caused by wild animals as well as offsetting costs of livestock predation. Funds will be paid to either a professional insurance company or a specific HWC fund. Once the insurance scheme is operational it will replace the Human Wildlife Self Reliance Scheme. ¹¹
Canada	Livestock loss and crop damage	Yes	Canada administers crop damage and livestock predation compensation via the provincial agricultural service or insurance corporations (eg the Saskatchewan Crop Insurance Corporation). Each province compensates producers for damage to crops or livestock caused by wildlife. Producers do not need to pay a premium to receive compensation. Corporations also usually offer compensation to allow producers to prevent damage to their stock. Producers can also take out private insurance for crops and livestock.

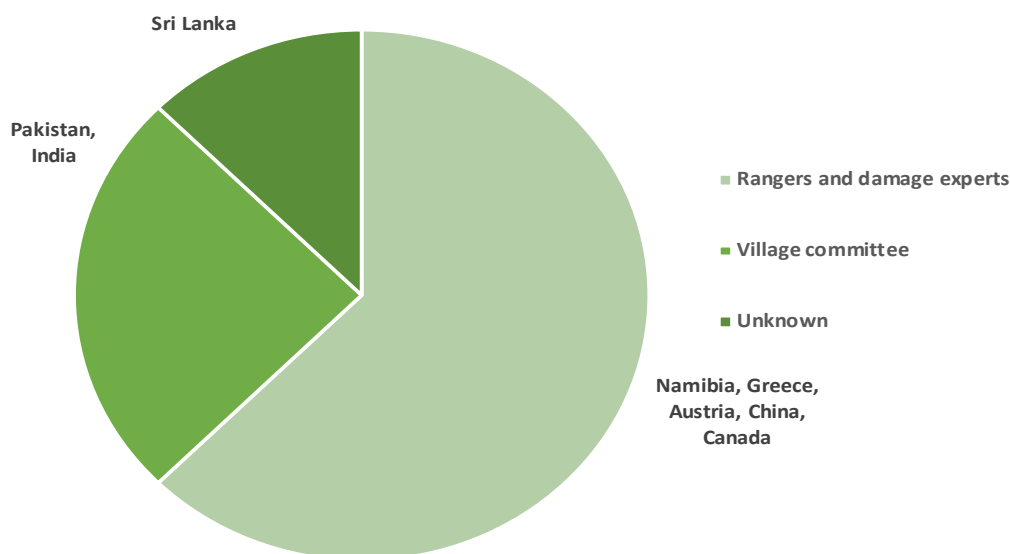
China	Crop and rubber plantation damage	Yes	The authorities in China's Yunnan province introduced an insurance scheme in 2009 to mitigate the effects of human–elephant conflict. Funding from the government is devolved to the Xishuangbanna prefecture and is used to pay the premiums to the Yunnan branch of the China Pacific Property Insurance Company to cover damage in Xishuangbanna, which is home to around 200 wild elephants. ¹ An insurance programme is also thought to exist covering compensation for damage to property from wildlife in the Simao district. ⁸
Pakistan	Livestock loss	Yes	Project Snow Leopard, initiated in 1998 by Shafqat Hussain, was set up with the purpose of conserving the snow leopard by reducing retaliatory killings by local farmers due to livestock predation. Farmers pay premiums into an insurance fund and are fully compensated in the event of a loss. The fund is co-financed through ecotourism activities. ¹³
Austria	Livestock loss	Yes	Payment schemes covering damage from wild animals (bears and wolves) vary across Austria but are usually financed via hunters' associations, who pay the premium to insurance companies. ¹⁴
Greece	Livestock loss or crop damage	Yes	Compensation for damage from wild animals is administered through the Greek Agricultural Insurance Organisation (ELGA). Insurance is compulsory for Greek farmers and livestock raisers. ELGA is self-financed through premiums, commercial transactions and, on rare occasions, the Greek government. ¹⁴
India	Livestock loss	Yes	An insurance programme for livestock depredation from snow leopards was set up in 2002 in Himachal Pradesh. Villagers contribute each month to the insurance fund and receive payouts for livestock killed as well as compensation for damage prevention. ¹⁵
Sri Lanka	Crop damage, human death or injury and property damage	No	The Department of Wildlife and Conservation implemented a compensation scheme in partnership with the Sri Lankan Insurance Cooperation to mitigate economic loss from elephants among local farmers. ⁵ This scheme is no longer active.
Italy	Livestock loss	No	In 2005 the regional administration introduced an insurance scheme to cover damage from wolves but was disbanded in 2013. A study found that the scheme failed to increase tolerance for wolves amongst farmers and it did not mitigate conflict over how best to conserve the species. ⁷
Russia	Livestock loss	No	Although commercial insurance is available in Russia it is very rarely used by local farmers. ¹⁶ In 1999 a farmers' fund was created where membership fees acted as insurance premiums, however a lack of interest and increasing depredation rates ran the programme into bankruptcy. The scheme failed because: 1) the concept of purchasing insurance was new to Russians and hence farmers were unwilling to opt in; 2) there was a lack of advertising; 3) the risk of depredation was too low for many farmers to consider the scheme financially worthwhile. ¹⁶

These schemes shown in Table 2 are administered by a number of different agencies ranging from national-level ministries (Namibia), to local government (Canada) and local village committees (Pakistan). A number are administered by insurance companies including in Austria, Greece and China.

Table 2: Body responsible for managing each scheme

PAKISTAN	Village committee and Project Snow Leopard staff
NAMIBIA	The Ministry of the Environment and Tourism monitors the scheme. It is overseen by a ministerial review panel as well as conservancy representatives
GREECE	Greek Agricultural Insurance Organisation
INDIA	The village council nominated a committee of four villagers with guidance from the Nature Conservation Foundation
AUSTRIA	Insurance company with guidance from WWF
CHINA	China Pacific Property Insurance Company
CANADA	Provincial agricultural service or insurance corporation
SRI LANKA	The Department of Wildlife and Conservation

Figure 1: Individual, group or organisation responsible for verifying damage from wild animals



1.3 Lessons learnt from insurance for HWC

The effectiveness of insurance for HWC is context specific, but there are four general challenges to the success of such schemes:

- Cost effective insurance administration
- Timely and fair insurance payments
- Incentives for damage prevention
- Financial sustainability of premium payments

This section reviews what we can learn from existing schemes to overcome these four challenges.

1.3.1 Claim verification requires effective institutional arrangements

Verifying claims can be costly and require expert analysis. The most common method of verification across schemes is to appoint a ranger or a damage expert to assess the loss. In several countries there are multiple layers of administration that verification must pass through in order for claims to be processed, resulting in delays and subsequent mistrust amongst communities. However, in Canada, verification and payment is delivered through the same company, which streamlines the process. Similarly, in Pakistan, verification is locally managed by a village insurance committee, which both verifies damage and approves payment to affected individuals. Community members actively participate in the entire process and any problems can be dealt with swiftly.¹³

1.3.2 Payments must be fair and timely

A review of 138 unique compensation schemes found that most payments are inadequate and take a long time to be made,³ and other studies conclude that local dissatisfaction of schemes is often due to a payment-related factor including low payments as shown in Table 3.

Table 3: Payment individuals affected by HWC can expect to receive in proportion to their loss

ITALY	The insurance paid out 70% of the market value for depredated livestock and 30% of the market value for missing livestock
PAKISTAN	Compensation is based on the average value of livestock. Claims that exceed the claimant's accumulated premium account are paid for by a second fund from ecotourism activities
NAMIBIA	Fixed amounts depending on death/damage, ranging from 250 to 100,000 Namibian dollars
GREECE	100% of the value for bear damage and 80% for wolf damage
INDIA	Up to 100% of value of livestock, although varies on total claims
AUSTRIA	Compensation is paid on an individual basis but should reflect market value
CHINA	The actual amount is not specified but it is suggested that payment barely covers the cost of damage and that reimbursement is only at a fraction of market price ¹²
CANADA	Varies, usually 80-100% of claim, less if damage is probable but not verified
SRI LANKA	Compensation was capped at Rs. 50,000 for loss of life of the head of household, Rs. 35,000 for other male adults and less for injury or damage to stock. However, payments were found to be less than 8% of actual loss suffered ⁵

Timeliness of payments varied from being quick in Austria and Greece but slow in China and Sri Lanka.

Figure 2: Are payments made on time?

✓	Between one and two months in Australia and Greece
✗	Long delays were found in China and Sri Lanka ^{12,5}
?	The status of payment is unknown in Pakistan, Namibia and India

Problems arose in Sri Lanka because less than 8% of losses were being covered by compensation. The scheme also suffered from long delays and inconsistencies, such as no payment for the death of women household members.⁵ Quick verification and timely payments are necessary to ensure local resentment of wild species does not increase, as this limits positive conservation outcomes.⁹ Success in fact appears to be dependent on adequate payments, with research showing that villagers are much more likely to opt in to programmes that fully compensate them for their loss, and/or for future losses, because it is unfair to bear the costs alone.⁴ A great example is Project Snow Leopard which has used innovative financial design to ensure that claims are truly reflective of loss suffered and the result is an almost universal participation rate and effective conservation of an endangered species.⁹

One suggested reason for inadequate payments is that neither premiums nor payments are calculated using appropriate metrics. A study of the Chinese insurance scheme suggests that a fair system will require a mechanism for the continual monitoring, reporting and analysis of HWC data.¹ Very little data capture exists outside of verification and claims processes, and insurance is rarely calculated as a result of this information. What is needed is comprehensive data on HWC, such as hotspots and community behaviour, collated over time, that can be analysed to look at trends and better inform associated costs. For example, the same study highlights that in the future, premium calculations will need to use actuarial data on food availability, population numbers and crop accessibility. In addition, net present value figures could be used to more accurately estimate the cost of losing livestock or crops, including their future profitability.¹ Similar conclusions suggest that HWC data and subsequent actuarial analysis are necessary to develop a successful insurance-based programme, particularly as depredation rates are prone to fluctuation.¹⁷

1.3.3 Incentives are needed for damage prevention and to avoid moral hazard

The most common recommendation for future programme design was to make payments conditional on damage prevention measures³ as shown in figure 3. A key reason for success in India’s Himalayan snow leopard programme has been the implementation of a reward programme for anti-predatory measures to protect livestock.¹⁵ This has led to better safeguarding actions, fewer attacks and an increased sense of responsibility and environmental stewardship. Other studies conclude that performance-based approaches can lessen the likelihood of ‘free riders’ and lead to more successful outcomes,^{17,8} but also stress that such activities must be enforced.⁹

For example, research found that despite payments in Italy being conditional upon preventative measures, this did not lead to action amongst farmers, suggesting that implementation was not adequately enforced.⁷ A similar situation was found in Greece.¹⁴ Without enforcement, it is likely that livestock and crop losses will continue at a rate that still encourages pre-emptive killings, which is possibly why the Canadian schemes provide a one-off payment to help farmers’ implement more effective safeguarding measures.⁸

Figure 3: Damage prevention conditions of coverage and payment under each scheme

No payment without reasonable behaviour to adopt preventative measures. Countries: Italy, Pakistan, Greece, Canada
No cover for national parks and no payment without reasonable behaviour to adopt preventative measures. Country: Namibia
No payment without safeguarding wildlife from retaliatory action or without reasonable behaviour to adopt preventative measures. Country: India
No cover for injury/death of female humans or for perennial crops Country: Sri Lanka
No conditions but damage must be at least probable Country: Austria

1.3.4 Financial sustainability of premium payments can be achieved by strong partnerships and collaboration with external beneficiaries of wildlife

One of the challenges of HWC insurance is that affected farmers cannot afford the premiums, so there is a need to reach out to alternative partners to co-finance schemes as highlighted in table 4.

Figure 4: Has the scheme achieved financial stability?

✓	?
Pakistan - Project Snow Leopard claims to have overcome problems of previous insurance schemes by relying on community participation and an innovative financial design ⁹ meaning that unless depredation of livestock increases massively claims should be covered by the ecotourism fund	Greece – Unknown
Namibia - funding from trophy hunting concessions and external donors	China - Unconfirmed. The insurance scheme was financially unstable. The insurance company lost money in 2010 and 2011 because funding for elephant conflict within the HWC budget was not high enough to cover all subsequent claims ¹²
India - alongside premiums, funding from NGOs and development of both local handicraft markets and a potential wildlife tourism partnership	Sri Lanka - Unknown
Austria - premiums from hunting associations	
Canada – government sponsored	

Table 4 The organisation or individual(s) responsible for funding, and how premiums are priced

ITALY	80% of premiums were paid from regional funds, 10% by a private agricultural consortium and 10% from the livestock owner
PAKISTAN	Local farmers pay premiums depending on the quantity of livestock they own, and the remaining funds are paid for by profits from trekking expeditions that focus on the snow leopard. The premium rate is 1% of a goat's current market value. Premiums are also determined by historical loss rates ¹⁷
NAMIBIA	In conservancies, a proportion of trophy hunting quotas are set aside to pay for livestock and crop damage. Outside of conservancies, funds are from trophy hunting concessions on state land. Donor funding to the government also contributes to payments
GREECE	Insurance is compulsory, and premiums are paid for by Greek farmers and livestock raisers
INDIA	Villagers pay premiums to the insurance fund on a monthly basis
AUSTRIA	The hunters' associations pay the premiums. 50% of membership fees are used to pay premiums to private insurance companies that financially cover the compensation of game species, including bears
CHINA	The Xishuangbanna prefecture receives a wildlife mitigation budget from the central government. This money is used to pay the premium to the insurance company
CANADA	Government sponsored — no premium is required, compensation is direct on application and verification
SRI LANKA	Government sponsored (Department of Wildlife and Conservation)

Financial sustainability ultimately requires extensive knowledge of HWC trends such as incident rates and intensity, as this data informs the level of finance or participation needed to fund a scheme.

Sustainability of insurance payment can be achieved by co-financing from the beneficiaries from wildlife, such as tourism. The success of Project Snow Leopard in Pakistan has largely been attributed to the innovative ecotourism fund because it provides a dual financing mechanism. Local farmers see a benefit from

the continued existence of the snow leopard because the profits earned from related tourism activities fund a considerable portion of payments made in the event of a loss.¹³ It is acknowledged that an insurance scheme alone would not benefit the snow leopard as villagers would not be motivated to conserve the species. It is only through the ecotourism fund that villagers are both incentivised to protect the species and also adequately compensated for any resulting losses.¹³

The involvement of the tourism sector has been recommended elsewhere. A study looking at willingness-to-pay in the Chinese tourism market in Xishuangbanna and focusing on the Asian elephant found that 90.5% of tourists would be willing to contribute directly to a fund supporting the insurance initiative already in operation there.¹ Given that the main reason for dissatisfaction with the current initiative is inadequate compensation, the involvement of the tourism sector could contribute significantly to increasing tolerance of wild elephants. It was also found that public willingness-to-pay contributions in Sri Lanka, particularly from urban dwellers with a conservation agenda, could cover total costs of future insurance schemes.⁵

Another recommendation from the study in China is an insurance scheme based on a partnership between government, local people and tourists, which the authors of the study suggest could bring about a fairer system of premiums and resulting payments, spreading risk in a more even way.¹ In areas where tourism is unlikely to generate the necessary funds, they recommend a novel approach of using subsidies granted by big plantation companies to smallholders via corporate social responsibility programmes.¹

The scheme in India, implemented in partnership with the Snow Leopard Trust and the Nature Conservation Foundation has also achieved success based on collaboration.¹⁵ Such a scheme is encouraging and could be implemented elsewhere in the country.¹⁸ For example, a study into conflict in a nature reserve in southern India acknowledges that splitting premiums between interested parties, villagers, the Forest Department and NGOs could be beneficial.¹⁸

1.4 Conclusion: Community-based schemes are key to success

Research suggests that the insurance scheme in Italy had low appeal because livestock owners were not consulted while the scheme was being designed, which resulted in dissatisfaction with many of the conditions.⁷ Studies overwhelmingly recommend community-based approaches, such as the two snow leopard initiatives in Pakistan and India, where

local participation is achieved by establishing village councils and committees to oversee management. Having a voice in decision making and implementation has led to both trust in the system and enhanced tolerance for snow leopards amongst local villagers. As a result, numbers of the species have increased.^{13,5} Research also suggested that approaches initiated by communities might face fewer barriers to implementation because they require no input or funding from government officials.⁸

In addition, research tells us that community-based schemes where villagers pay a portion of the premium are less likely to suffer from fraudulent activity, because instead of cheating the government they would be cheating their neighbours.¹⁷ In Pakistan, previous compensation schemes had failed because farmers were inclined to cheat the system.¹³ The scheme was able to overcome these problems by focusing on community participation and financial design where payment was dependent on the conservation of the snow leopard via the second ecotourism fund. In opting in to programmes, villagers are bearing a portion of the risk, which could lessen incidents of moral hazard because instead of taking no measures to safeguard their property, villagers are encouraged to take action to protect livestock and crops.⁹

The importance of the locals benefitting from the continued presence of a wild species cannot be underestimated. For some farmers, dissatisfaction with initiatives lies in their belief that wild species are the responsibility of the state and they should not have to pay a premium to recover compensation.¹⁶ Without communities seeing a benefit, tolerance is unlikely to increase, and perceived fairness of the initiative will be low. This is one of the key reasons why the scheme in Pakistan was developed based on co-financing from ecotourism activities; because villagers know that without the their common-pool resource, i.e. the snow leopard, tourism will drop and consequently they will not be compensated in the event of a loss.¹³

Is microinsurance a potential
way forward for HWC
resolution?

2

Microinsurance initiatives are covering agricultural losses from climate-related weather risks. Could this provide potential solutions to help individuals losing crops and livestock to wild animals? This section discusses the increasing agricultural microinsurance market using specific examples of initiatives that are making a difference in Africa and Asia.

2.1 Overview of agricultural microinsurance

Microinsurance has grown significantly in the past decade, fuelled by the increasing vulnerability of people across the world to the effects of climate change. One area of microinsurance that has particularly developed is agriculture. Globally, over 70% of all food consumed originates from smallholder farms. The World Bank has estimated that more than 65% of sub-Saharan Africa’s workforce comes from the agriculture industry and a slightly lower proportion in Asia, with the majority of farmers working at a subsistence level.¹⁹ However, insurance penetration remains low across Africa and even in rural Asia.

Despite this, an increasing number of agricultural microinsurance initiatives have been designed to combat the effects of climate change-related weather events on crops and livestock belonging to smallholders. The majority of these only cover damage to crops, although livestock insurance is becoming increasingly common given incidents of drought across Africa and Asia. In terms of insured perils, these are nearly always weather related, such as excess rain, drought and storms, although occasionally disease is included. It is however unlikely that schemes will cover losses from other causes such as HWC.

Unlike traditional insurance, the majority of agricultural insurance products are index-based rather than indemnity-based, with this method growing significantly in recent years. Index-based insurance reimburses the value of an index, as opposed to a measurable loss and can be categorised as area yield index insurance or indirect index insurance.²⁰ Area yield index insurance covers many farmers within a stated region and payments are made based on losses against a reference yield. This means multiple perils can be insured against, although typically schemes are limited to damage from weather events. Indirect index insurance is based on losses from defined weather events, such as rainfall or drought, and as such they are reliant on weather stations or

satellite imagery.²⁰

A main drawback to implementing index-based insurance schemes is that the experts who design the pricing mechanisms rely on access to historical yield and weather data, which is not always available. Overall, uptake of these schemes is still low compared to more traditional insurance and many are still being piloted. However, there are some major advantages that make index-based insurance suitable for smallholders. A key benefit is that moral hazard, where property is deliberately left vulnerable to loss, is eliminated because the insured individual or body is unable to influence the loss, resulting in a higher level of trust between consumer and insurer.²¹ Premiums are also much lower than if based on indemnity insurance because rather than pricing individual losses, calculations are based on entire areas of farmland, reducing administrative and operational costs.

2.2 Specific examples of agricultural microinsurance

Table 5 Shows examples of innovative agricultural microinsurance schemes covering losses to crops and/or livestock from weather-related perils. These schemes were chosen for analysis because, like HWC resolution initiatives, they target both smallholders in Africa and Asia as well as losses to crops and livestock.

Most schemes insure against weather-related perils for crop losses only, usually drought, excess rain and storms. However, some schemes also cover livestock death caused by drought and a few also provide separate livestock insurance for risks such as disease, although this is a lot less common.

Table 5: Agricultural microinsurance schemes

NAME	FOCUS	PRODUCT(S) COVERED	NUMBER OF INDIVIDUALS COVERED
Agriculture and Climate Risk Enterprise Ltd. (ACRE) Africa	Sub-Saharan Africa	Crops, livestock	> 1 million
Pula	Africa, Asia	Crops, livestock	> 600,000
MicroEnsure	Global	N/A – no longer providing crop cover	> 40 million
Minet	Africa	Crops	Unknown
WINnERS	Africa, south Asia	Crops	Unknown

NAME	FOCUS	PRODUCT(S) COVERED	NUMBER OF INDIVIDUALS COVERED
Global Index Insurance Facility – Guy Carpenter	Mozambique	Cotton	> 40,000
International Livestock Research Institute (ILRI)	Africa, south Asia	Livestock	Unknown
Sanasa Insurance Company	Sri Lanka	Crops, livestock	> 20,000
The R4 Rural Resilience Initiative	Sub-Saharan Africa	Crops	> 40,000

Agriculture and Climate Risk Enterprise Ltd. (ACRE) Africa²³

ACRE Africa serves as an insurance agent and surveyor in Kenya, Tanzania and Rwanda, and has developed a number of agricultural insurance products suited to a range of climate-associated risks. ACRE Africa distributes insurance through farmer aggregators, which crop and dairy farmers are able to access through a number of different channels. Both smallholders and large-scale farmers are targeted. By 2017 over one million farmers were insured against a number of different risks.

ACRE offers the following products:

- **Weather Index Covers:** using weather data such as daily rainfall from either satellites or automated weather stations, farmers can select coverage suitable to their specific needs, such as for certain growing phases only.
- **Hybrid Index and Multi-Peril Crop Insurance (MPCI) Covers:** covers farmers for a number of different risks including storms and disease. Cover is from planting to harvest.
- **Livestock Covers:** indemnity for dairy cows from accident or certain diseases. Gestation cover is also available.

These risks are underwritten by a variety of local insurance companies (UAP Insurance Kenya, CIC Insurance Group Limited, APA Insurance, Heritage Insurance, UAP Insurance Tanzania and SORAS Insurance Rwanda) and then reinsured in international markets.

A variety of crops including maize, coffee, wheat, cashews and potatoes, as well as livestock are covered for weather-related risks only. Insurance is distributed through four channels

- Seed distribution linked to a mobile network operators location service
- Agribusiness using outgrowers or contracted farmers

- Lending institutions and savings and credit cooperatives (SACCOs) providing input loans
- Medium-scale professional farmers

Pula²⁴

Pula uses technology to increase and protect the incomes and yields of smallholders worldwide, working in eight countries across Africa and Asia. They facilitated crop and livestock insurance for over 600,000 famers in Kenya, Uganda, Ethiopia, Rwanda and Malawi in 2017.

In Nigeria, Pula is using area yield index insurance, which determines the average agricultural yield for a defined area, eliminating the need for individual site visits. Pula is working alongside insurance and agribusiness partners to distribute their insurance products, which reimburse farmers in-kind for fertilisers they purchased before a poor harvest. Pula uses high-quality yield and satellite data to reduce the cost of insurance.

MicroEnsure²⁵

MicroEnsure develops microinsurance products and services aimed at low- and middle-income individuals. Risks covered range from health, accidents and political violence. They are involved in the end-to-end delivery of microinsurance, from designing products to securing markets, working with multiple financial, insurance and telecom partners.

MicroEnsure used to provide services for agricultural risks from weather damage, however this is no longer the case due to the unsustainable nature of the product. The high value of the crops plus the high rate of incidence meant insurance premiums were unaffordable to farmers. Subsidies from government/ NGOs were not sustainable for their business.

Minet²⁶

Minet is a subsidiary of international insurance broker Aon, working across Africa. Minet provides risk and human capital solutions to businesses and individuals as part of Aon's Global Network.

Products and services include crop and yield, flood, and weather insurance.

WINnERS²⁷

WINnERS is a World Bank and EU backed scheme that aims to overcome previous problems of weather index-based insurance responses to build resilience to climate change for smallholders in Africa and South Asia. Using innovative technology to predict future crop yield losses, WINnERS will distribute insurance alongside a loan, where farmers are

reimbursed when they experience low crop yields caused by weather events.

The project is initially being trialled in Tanzania and due for roll out in the rest of sub-Saharan Africa by 2020. Insurance policies will be written by African-based insurers and reinsurance passed on to international markets.

Guy Carpenter & Company, LLC²⁸

Guy Carpenter (GC) in conjunction with the Asia Risk Centre Inc. designed and initiated two weather index-based insurance pilots for agriculture in Mozambique in 2012. The insurance scheme uses a portfolio pricing model to cover a region opposed to specific plots, meaning premiums can be lowered to include more farmers. The product was implemented via an aggregator covering all members as this was more cost effective than individual solutions. Two agribusiness firms, Olam and SANAM purchase index insurance for all their cotton farmers, to cover losses from drought, low rainfall and high temperatures. Policies are sold by Hollard and EMOSE insurance companies and reinsurance is underwritten by Swiss Re.

Lessons learned from the project include the need to educate farmers as a prerequisite for improved project design and better data, particularly as the project struggled with a lack of data regarding historical exposure and crop yield and also in translating technical information to smallholders.

International Livestock Research Institute²⁹

Since 2010, International Livestock Research Institute (ILRI) and partners have implemented index-based livestock insurance (IBLI) in both Kenya and Ethiopia. The purpose of the scheme is to protect livestock owners from drought-related losses, with large- and small-scale pastoralists the target clients. The index-based insurance is designed to use satellite data on the state of the grassland (Normalized Difference Vegetation Index) in relation to livestock deaths. Insurers vary but are usually in-country, with reinsurance placed through Africa Re and Swiss Re. Policies are distributed by community leaders and cover livestock losses from drought only.

The scheme has expanded over the years, forming new partnerships, which have been important for scale. ILRI have found that reliance on adverse behaviour undertaken in the event of a drought has lessened since the implementation of insurance, providing a safety net for the most vulnerable pastoralists. Due to the remoteness of regions involved in the scheme, education and technology

have played a pivotal role in reach and in making operations more efficient.

Sanasa Insurance Company³¹

Sanasa Insurance Company is based in Colombo, Sri Lanka and operates primarily to serve as a support organisation to members of Sanasa societies and other community organisations. Sanasa launched a weather index-based insurance product in 2010 to help smallholders become more resilient to weather-related risks. Data on rainfall is obtained through the Department of Meteorology and the scheme depends on access to weather stations. Sanasa subsequently launched a product for paddy farmers in 2011 and for tea farmers in 2012. Sanasa also offers indemnity-based crop insurance as well as livestock insurance under its Agriculture Insurance programme. The societies of Sanasa distribute the insurance product and are also responsible for community education. Reinsurance is placed in Indian markets.

The R4 Rural Resilience Initiative³¹

Backed by the World Food Programme and Oxfam America, the R4 initiative operates in Ethiopia, Senegal, Malawi and Zambia with a reach of over 40,000 farmers. The purpose is to help farmers manage vulnerability to weather-related losses through a comprehensive risk management approach.

Farmers are compensated via weather index insurance when weather-related losses occur. The entire value chain is designed to create resilience and is individually adapted for the specific context of each country and their community needs. In-country partners are used for insurance placement, for example in Senegal insurance is written by the National Agricultural Insurance Company of Senegal (CNAAS), with a 50% subsidy from the Government.

2.3. What can be learnt from agricultural microinsurance schemes?

There are similarities in the design of agricultural microinsurance initiatives and these characteristics could be usefully applied to the design of an insurance-based HWC resolution scheme. There are four main challenges for HWC insurance:

- Cost effective insurance administration
- Timely and fair insurance payments
- Incentives for damage prevention
- Financial sustainability of premium payments

This section reviews what we can learn from existing microinsurance schemes to overcome these four challenges.

2.3.1 Verification of claims is made easier by premiums calculated using index-based insurance

There are a number of different reasons for this, but most importantly index-based insurance usually results in lower premiums because it removes the need to visit and price individual plots during calculations and in subsequent damage verification, simplifying the process for smallholders. It is not a perfect solution as index-based insurance is reliant on the availability of comprehensive weather data, which can be difficult to acquire.

Schemes have also cited struggles with access to historical data, an essential component in developing index-based insurance products. Collecting and analysing at least 10 years-worth of rainfall or yield data can be time consuming and often records have not been kept or are inadequate, leading to complications in calculating insurance premiums and prices.

Also, continued access to relevant data can be problematic. Sanasa has had issues with scaling up operations due to a lack of weather stations, which are needed to accurately assess rainfall. There are solutions, such as using satellite data. However this has the potential to make operations more expensive. Overall, initiatives need to consistently evolve the ways they generate data and in turn how they use it to inform pricing.

2.3.2 Fair and timely payments have been increased by technology

Technology has the potential to make operations much more efficient, playing an important role in the ability of consumers to access products. Currently, most schemes rely on face-to-face communications, however some are beginning to harness the use of mobile technology to engage with farmers throughout the entire process either on the phone or via SMS. Farmers can be kept up-to-date on issues such as claims as well as receive weather information and other advisory services directly to their mobile.

2.3.3 Incentives for damage prevention

Index-based insurance premiums have no need for incentives, as moral hazard is effectively removed because the pay-out is based on an average loss

across multiple entities. This means the insured does not need to be monitored for failing to safeguard their crops against damage. Insured perils, such as rainfall, cannot be affected by any party and so damage is easy to verify.²¹

2.3.4 Financial sustainability is strengthened through reinsurance, context specific solutions, partnerships and bundling

The insurance in most schemes is initially placed through local, in-country insurance companies. The majority of schemes are then reinsured in international markets via global reinsurance companies.

Some initiatives have created country-specific solutions rather than rolling out the same product design for all consumers. R4 for example have based their design on the community needs specific to each country, whilst ACRE Africa found that their scheme has benefitted from forming new partnerships in each country, allowing them to overcome differing regulatory environments.

Educating both farmers as well as those involved in delivery channels is essential to improving product design through better data and increased consumer input. Education has also been found to help with both sales and in expanding markets and consequently reach. Using locally based experts to deliver education campaigns can also be beneficial in building trust between farmers and those running the scheme.

Many schemes found that new partnerships were essential in building scale and penetrating the market further. From government input to local farmers, multi-stakeholder approaches that include public and private sector pillars are needed if schemes want to extend their reach.

Another benefit that several new initiatives have taken advantage of is to bundle agricultural insurance services with other products. This can help achieve better social outcomes and allow schemes to penetrate more widely into the market.²² Proponents of bundling insurance argue that standalone products are difficult to sell in new markets where consumers lack awareness and trust. Bundling solves this by providing a solution that adds value to the farmer rather than simply providing insurance.

There are many ways to bundle insurance products together with other services. Two common methods are credit bundling, where farmers receive credit as well as insurance, and input bundling, where insurance is bundled with inputs such as fertilisers or seeds.²² The key proposition is that all stakeholders,

i.e. the insurer, the distribution channel and the farmer, should benefit and gain value. Care must be taken therefore when designing initiatives because if one stakeholder in the chain does not see a value then it becomes commercially unviable. Overall, there is promise of expansion and there are several examples of schemes that have produced successful outcomes in strengthening farmers' resilience toward weather-related events.

Most schemes use a variety of different delivery channels which distribute insurance products to farmers, rather than farmers purchasing directly from providers. These are often in the form of farmer aggregators (e.g. ACRE), societies (e.g. Sanasa), or agribusiness channels who purchase insurance to cover all their farmers. Often, the distributor pays the premiums, rather than the farmers themselves.

2.4 Conclusion: refinement is needed but there are proven benefits to local farmers

Collectively, over one million people are covered by these particular schemes and all cite improvements to consumers. Although many schemes are in their infancy, they are already making an impact. The International Livestock Research Institute, for example, states that those households covered by their index-based livestock insurance have reduced their dependence on livestock sales and meal reduction as coping strategies due to losses. The R4 initiative has furthermore improved productivity for female farmers in Ethiopia and enhanced resilience to weather events in Senegal and Malawi.

Join the discussion

3

Understanding why insurance-based initiatives implemented to resolve HWC have succeeded and failed is crucial to the development of future schemes. Looking at agricultural microinsurance schemes also provides insight into how best to design a solution that works for all stakeholders.

This paper has looked at the four main challenges for HWC insurance and asks what we can learn from existing schemes.

Insights show that effective solutions are likely to be context specific. To achieve coexistence through financial mitigation, next steps are to put these lessons learned into practice and design an initiative that works for people and wildlife.

- *Cost-effective insurance administration:* Historical and site-specific data on HWC needs to be improved (which will lead to better informed actuarial analysis), whilst microinsurance is developing its use of technology through mobiles and SMS. **How can collection of premium payments and verification of claims be improved for HWC insurance through increased HWC monitoring and reporting, actuarial analysis, technology and other approaches?**
- *Timely and fair insurance payments:* Many existing HWC insurance schemes have suffered from lengthy delays. Quick verification and timely payment are needed to ensure success as shown by Pakistan's snow leopard insurance scheme with almost universal participation rates. **How can timely and fair payments be achieved in insurance for HWC?**
- *Providing incentives for damage prevention and avoiding moral hazard:* Canada's human wildlife insurance scheme provides a one-off payment to help farmers implement effective safeguarding measures. **How can payments be linked to damage prevention and properly enforced for HWC insurance?**
- *Financial sustainability of premium payments:* This is perhaps the biggest challenge of all. Some of the most successful schemes such as the snow leopard scheme in Pakistan are linked to an innovative ecotourism fund. Many microinsurance schemes succeed by reinsurance through international markets. Microinsurance schemes have also shown that consumer education and product bundling is vital to increase uptake and hence financial sustainability. **How can financial sustainability for HWC insurance payments be increased through, for example, tourism, other public private partnerships, consumer education and bundling of insurance products?**

Notes

1. Chen, S, Yi, Z, Campos-Arceiz, A, Chen, M and Webb, T (2013) Developing a spatially-explicit, sustainable and risk-based insurance scheme to mitigate human-wildlife conflict. *Biological Conservation* 168, 31-39

2. Morrison, K, Victurine, R and Mishra C (2009) Lessons Learned, Opportunities and Innovations in Human Wildlife Conflict Compensation and Insurance Schemes. http://s3.amazonaws.com/WCSResources/file_20110518_073825_CaseStudy_HumanWildlifeConflictCompensationAndInsurance_pCv.pdf

3. Ravenelle, J and Nyhus, P (2017) Global patterns and trends in human-wildlife conflict compensation. *Conservation Biology* 31(6), 1247-1256

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

5. Bandara, R and Tisdell, C (2003) *Wildlife Damage, Insurance/Compensation for Farmers and Conservation: Sri Lankan Elephants as a Case. Working Paper on Economics, Ecology and the Environment, University of Queensland*

6. 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(3), 305-319

7. Marino, A, Braschi, C, Ricci, S, Salvatori, V and Ciucci P (2016) Ex post and insurance-based compensation fail to increase tolerance for wolves in semi-agricultural landscapes of central Italy. *European Journal of Wildlife Research* 62, 227-240

8. Pettigrew, M, Xie, Y, Kang, A, Rao, M, Goodrich, J, Liu, T and Berger, J (2012) Human-carnivore conflict in China: A review of current approaches with recommendations for improved management. *Integrative Zoology* 7, 210-226

9. Nyhus, P, Osofsky, S, Ferraro, P, Madden, F and Fischer, H (2005) Bearing the costs of human-wildlife conflict: The challenges of compensation schemes. In: Woodroffe, R, Thirgood, S and Rabinowitz, A (eds). *People and wildlife: Conflict or coexistence?* Cambridge University Press, Cambridge

10. Bowen-Jones, E (2012) *Tackling Human-wildlife Conflict: A prerequisite for linking conservation and poverty alleviation.* IIED: London. <http://pubs.iied.org/pdfs/G03725.pdf>

11. Republic of Namibia, Ministry of Environment and Tourism. Revised national policy on human-wildlife conflict management 2018-2027. <http://www.the-eis.com/data/literature/National%20Policy%20on%20Human%20Wildlife%20Conflict%20Management%20%20Revised%202018.pdf>

12. Chen, Y, Marino, J, Chen, Y, Tao, Q, Sullivan, C, Shi, K and Macdonald, D (2016) Predicting hotspots of human-elephant conflict to inform mitigation strategies in Xishuangbanna, Southwest China. *PLoS ONE* 11(9), 1-15

13. Hussain, S (2000) Protecting the Snow Leopard and Enhancing Farmers' Livelihoods. *Mountain Research and Development* 20(3), 226-231

14. Fourli, M (1999) Compensation for damage caused by bears and wolves in the European Union. Experiences from LIFE-Nature Projects. *European Commission* 1-72

15. Mishra, C, Allen, P, McCarthy, T, Madhusudan, M, Bayarjargal, A and Prins, H (2003) The Role of Incentive Programs in Conserving the Snow Leopard. *Conservation Biology* 17(6), 1512-1520

16. Miquelle, D, Nikolaev, I, Goodrich, J, Litvinov, B, Smirnov, E and Suvorov, E (2005) Searching for the Co-Existence Recipe: A Case Study of Conflicts Between People and Tigers in The Russian Far East. In: Woodroffe, R, Thirgood, S and Rabinowitz, A (eds). *People and wildlife: Conflict or coexistence?* Cambridge University Press, Cambridge

17. Nyhus, P, Fisher, H, Osofsky, S and Madden, F (2003) Taking the bite out of wildlife damage: The challenges of wildlife compensation schemes. *Conservation in Practice* 4(2), 37-41
18. Madhusudan, M (2003) Living amidst large wildlife: Livestock and crop depredation by large mammals in the interior villages of Bhadra Tiger Reserve, south India. *Environmental Management* 31(4), 466-475
19. International Labour Organization and International Finance Corporation, When and How Should Agricultural Insurance Be Subsidized? Issues and Good Practices. http://www.impactinsurance.org/sites/default/files/MP48_0.pdf
20. Sandmark, T, Debar, J and Tatin-Jaleran, C (2013) The emergence and development of agriculture microinsurance. *MicroInsurance Network*. https://microinsurancenetwork.org/sites/default/files/MICRO_NetworkBrochure_agriculturedeflow_page1on1.pdf
21. Iturrioz, R (2009) Agricultural Insurance. The World Bank. http://siteresources.worldbank.org/FINANCIALSECTOR/Resources/Primer12_Agricultural_Insurance.pdf
22. Mukherjee, P, Pandey, M and Prashad, P (2017) Bundling to make agricultural insurance work. International Labour Organisation. <http://www.impactinsurance.org/sites/default/files/MP47.pdf>
23. Agriculture and Climate Risk Enterprise Ltd. (ACRE) Africa <http://acreafrica.com/>
24. Pula <https://www.pula-advisors.com/>
25. MicroEnsure <https://microensure.com/>
26. Minet <https://www.minet.com/group/home>
27. WINnERS <http://www.winners-project.org/>
28. Guy Carpenter & Company, LLC <http://www.impactinsurance.org/practitioner-lessons/giif/guy-carpenter>
29. International Livestock Research Institute <https://ibli.ilri.org/index/>
30. Sanasa Insurance Company <http://www.impactinsurance.org/practitioner-lessons/sanasa>
31. The R4 Rural Resilience initiative <https://docs.wfp.org/api/documents/e4caf70dd102456ab48d88b9964d72cf/download/?ga=2.146388530.705835355.1539703584-2007567793.1539703584>

Glossary of terms

Actuarial analysis	A form of asset to liability analysis used by insurers to ensure they have sufficient funds to pay all claims.
Aggregator (insurance)	A company that negotiates with insurers on behalf of a group of consumers.
Indemnity-based insurance	A form of insurance with an agreement between two parties in which one party (insurer) agrees to pay for potential loss or damage caused by the other party (insured) in return for a premium paid by the insured to the insurer.
Index-based insurance	A form of insurance used to protect against shared risks, such as weather events. Payment is based on external indicators which trigger payments to all insureds within a geographically defined space. Index-based insurance can be categorised as area yield index insurance or indirect index insurance.
Microinsurance	A type of insurance designed for low-income households, usually in developing countries with non-existent or inefficient insurance markets.
Moral hazard	Moral hazard occurs when an insured person does not take effective care to guard against risk, exposing an insurer to a greater potential loss.
Net present value	The difference between the present value of cash inflows and the present value of cash outflows over a period of time.
Peril	A named cause of loss covered by an insurance contract.

Developing solutions for human–wildlife conflict is an urgent conservation priority. This threat to coexistence between humans and animals is particularly serious in developing countries, where population growth significantly impacts traditional wildlife ranges. Tried and tested approaches to conflict resolution include schemes to financially offset affected individuals for their loss. To succeed, these schemes need to ensure cost effective verification, fair and timely payments, incentives for damage prevention and financial sustainability. This paper reviews how existing wildlife insurance programmes and agricultural microinsurance schemes have addressed these challenges.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in the decision-making arenas that



International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055



Funded by The Darwin Initiative



Knowledge
Products