



Wildlife hazards and disaster risk reduction

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ABSTRACT

This article makes a case for including wildlife and human-wildlife conflicts in both research on disasters and policies geared towards reducing the risk of disasters. It builds upon a scoping study conducted in Namibia to emphasise that wildlife hazards affect all dimensions of people's livelihoods, including physical, economic, human and natural resources, that are threatened at all time of the year, days and nights. In Namibia, the permanent and multidimensional nature of the threat makes wildlife the most significant hazard, ahead of seasonal flooding and drought. Nonetheless, wildlife hazards are absent of disaster risk reduction policies. Conversely, successful conservation policies have purposefully amplified wildlife hazards in hope of boosting associated tourism opportunities while human-wildlife conflict policies have so far focused on post-incident response and compensation. Wildlife hazards thus fall between the cracks of conservation policies, human-wildlife conflict management and disaster risk reduction.

1. Small and frequent hazards in disaster risk reduction

There is an increasing call from both scholars and practitioners for considering small and frequent hazards within disaster risk reduction (DRR) policies [6,19,22,54]. Most commonly, these policies focus on extreme and rare events, backed up by a wealth of evidence from academic research as well as data on losses collected by government agencies. In parallel, development policies concentrate on everyday hazards associated with poverty, sicknesses and violence, amongst other threats to people's wellbeing, are well documented in the academic literature and practitioners' reports.

Small and frequent hazards usually falls between the cracks, both for academic research and policy attention (Fig. 1). On both ends of the spectrum, academic research has extensively focused on large-scale disasters associate with natural hazards and people's everyday hardship associated with unsustainable livelihoods materialised by limited incomes, poor health, fragile shelter, etc. In parallel, international and government policies have primarily been designed to prevent large disasters and alleviate poverty and enhance people's wellbeing through development policies, including through economic growth as well as public health and housing programmes. Small and frequent hazards fall in neither categories and have thus received very limited attention from academic research and policy.

Nonetheless, the United Nations 2015 Global Assessment Report on Disaster Risk Reduction [5] documents 346,310 small events that have

each killed less than 30 people and destroyed less than 600 houses between 1990 and 2013 versus 3105 larger disasters for the 85 countries covered in the Desinventar database (<http://www.desinventar.net/>). Sparse evidence however suggests that the cumulated and protracted impact of these hazards, also coined silent [55], neglected [22,53] and extensive [49], are very significant for those who are affected [19,51]. These hazards often cause a ratchet effect. People most vulnerable are often caught struggling with the consequences from a particular event when the next one hits [43]. The frequent occurrence of small hazards thus results in a constant erosion of people's ability to cope and, in the end, leads to increasing vulnerability for those who already stand at the margin of society. In the long term, small and frequent hazards generate a vicious circle that further pushes those affected towards the margin of society [16].

Threats associated with wildlife are a particularly neglected type of small and frequent hazard. Attacks by wild animals, especially mammals, have indeed been excluded from both research and policies on hazards and disasters. The only noticeable exception is the Sri Lankan version of the Desinventar database that includes wild animals, especially elephant, attacks as a particular type of hazard. Wildlife constitutes a threat for people and their livelihoods. Every year, wild animals kill hundreds of people but also, and more often, damage properties and crops although the exact extent of damage is very difficult to estimate at the global scale [13,14,21,56]. Attacks by wild animals nonetheless contribute to the vicious circle of marginalisation

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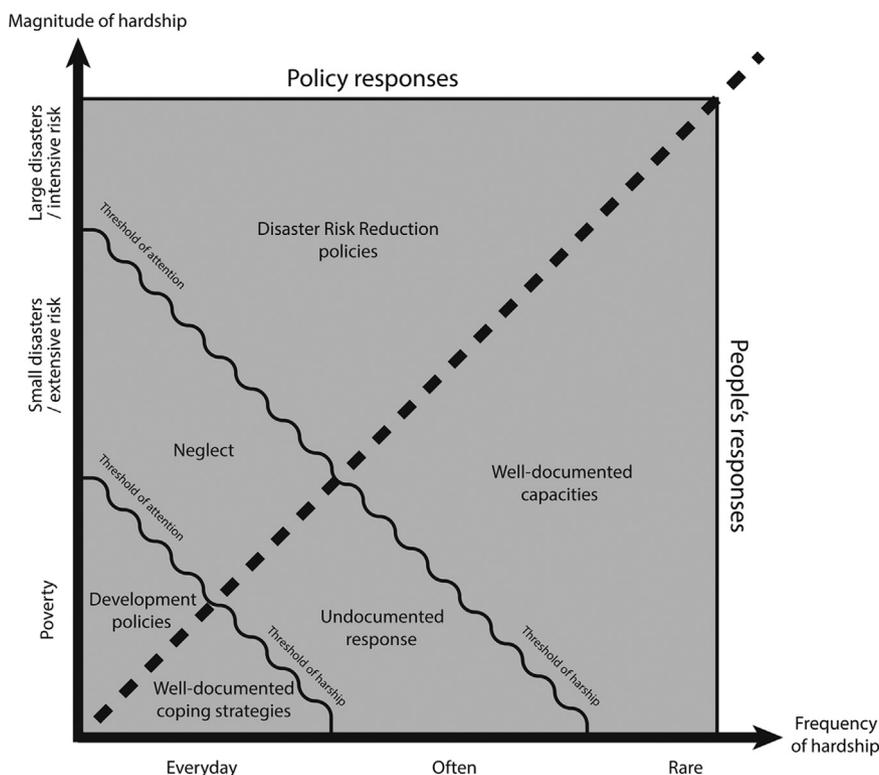


Fig. 1. The space of people's hardship and policy attention.

associated with small and frequent hazards. Wildlife incidents are reported by media and locals in many regions of the world but most prominently in South Asia and Africa where the highest concentrations of large mammals, including elephants, hippopotamus, rhinoceros, lions, tigers, leopards, hyenas, buffalos, monkeys, etc., are found. In these regions, though, wildlife is only the object of conservation and tourism policies to, on the one hand, ensure the survival and reproduction of wild animals, and, on the other hand, develop safari tourism.

The present scoping study draws upon evidence from Namibia. In 2016 alone, 4624 wildlife incidents associated with a wide range of animals have been recorded in the country. During that year, wild animals have killed nine people and 930 heads of livestock according to the Namibian Association of Community-Based Natural Resources Management Support Organisations (NASCO). This study shows that, despite their significant, multi-dimensional and persistent nature, wildlife constitutes a representative example of neglected hazard for those affected. Neglect is obvious with regards to wildlife risk reduction that neither falls under human-wildlife conflict (HWC) management, largely focused on compensating losses, nor DRR that is designed to address large and rare events that are of lesser concern to those who are affected. This scoping study ultimately aims to make a case for including wildlife and human-wildlife conflicts in both research on disasters and policies geared towards reducing the risk of disasters.

The upcoming section of this paper provides an overview of wildlife hazards and associated impacts for people and their livelihoods. The subsequent two sections focus on Namibia, its wildlife and associated hazards. Sections 5 and 6 explore how decades of conservation and tourism policies have led to increasing hazards that have not been considered in DRR policies. Section 7 reflects on the reasons why wildlife constitutes an exemplary case of neglected hazard. Finally, Section 8 makes a case for integrating wildlife risk reduction within broader DRR policies and practices in Namibia but also elsewhere in the world.

2. Understanding and reducing wildlife hazards

Threats posed by wildlife have long been a significant concern for conservation studies and policies. In the field of conservation wildlife hazards have been approached through the lens of so-called Human-Wildlife Conflicts (HWC). Conflicts between humans and animals are indeed increasingly becoming a serious threat, not only due to its possible impact on human livelihoods, but the survival of certain endangered species are at stake. A plethora of research in this space shows that HWC is on the rise globally [11,13,23].

Dominant research on HWC, over the past few decades, mirrors disaster scholarship. Most studies have focused on wildlife as well as its negative impact on people and societies. Particular focus has been put on direct damage to humans and property, loss of livelihoods, reduced human tolerance to certain species, reduced recreational opportunities, damage to crops and impacts on livestock, attacks on humans and the possibility of disease transmission between animals and humans [9,56]. Extensive research has been conducted on the behaviour of animals as much as physical and climate science have explored the dynamics of natural hazards to understand the scope of disasters. In parallel, behavioural studies have emphasised the importance of risk perception in understanding people's response to wildlife hazards and HWC [11,24], thus paralleling studies on natural and other hazards [7,44]. People's response to both natural and wildlife hazards is seen through the angle of their prior experience of such hazards, including their frequency and magnitude, that is expected to shape people's perception of the risk and hence people's behaviour.

In line with such understanding of HWC, conservation policies geared towards protecting people from wildlife as well as wildlife from people's retribution have long drawn upon technocratic initiatives [9,56]. These include clearly separating the territories of both people and wildlife through protected areas and fencing, sterilisation or controlled killing of problem animals, wildlife behaviour control (through physical devices and repulsive chemicals), awareness campaigns to raise people's risk perception, people's settlement relocation as well as

insurance and compensation schemes [11]. Such technocratic and hazard-based approaches to wildlife hazards are similar to dominant DRR policies concerned with natural and other hazards [20,54]. This approach to wildlife hazards further follows an approach where the scope of response and policy attention depends on the intensity of conflict, mirroring DRR policies focusing on extreme hazards at the detriment of small-scale events.

Broader understanding of HWC have however emerged back in the 1970s and 1980s to capture the complex nature of both wildlife hazards and people's everyday lives and livelihoods that are affected by wild animals [21,56]. Factors of aggravating HWC are increasingly viewed through the lens of social and political processes that lead to changing livelihoods and governance. For example, land privatisation leads to the erosion of traditional collective strategy to cope with wildlife hazards whilst increasing access to education and urban employment progressively draw both men and youth away from their traditional role of guarding crops and cattle against wildlife hazards [26]. Traditional coping strategies have also been frequently affected by resettlement programmes conducted as part of conservation policies and the delineation of protected areas [31]. This political ecology interpretation of HWC and wildlife hazards mirrors a similar evolution in the understanding of disasters that shaped up in the 1970s and 1980s [20,39]. In both the cases of wildlife and natural hazards greater emphasis is now being given to structural political, social, cultural and economic drivers over the isolated threats associated with nature.

A number of researchers and alternative policy advocates have, henceforth, put forward the importance of co-existence between wildlife and people thus pushing for a more holistic approach to HWC management and mitigation [14,56]. Initiatives fostering co-existence between wildlife and people have largely relied on so-called 'community-based' or participatory initiatives to better consider the needs and priorities of those affected by wildlife hazards [21,35,48]. These approaches encourage transfer of decision-making power towards local people whose lives and livelihoods are at stake and who usually have a very fine understanding of their environment and associate threats. For the same reasons, a similar and progressive shift towards participatory or 'community-based' approaches to disaster risk reduction has been observed over the past 30 years [10]. A significant difference with participatory approaches to DRR, though, is that in the case of HWC people are not allowed to eliminate the hazard under pain of being arrested and imprisoned. The conservation imperative thus makes wildlife risk reduction a unique case within the broad portfolio of DRR. It is certainly a constant challenge that has contributed to the separation of HWC management and mitigation from DRR.

Such disconnect between DRR and conservation policies, despite similar theoretical underpinning and obvious similarities in objectives, undermines the efficiency and sustainability of all initiatives. Therefore, the subsequent sections make a case for a broader understanding of wildlife hazards and their impacts on people's lives and livelihoods from the lens of disaster studies so that DRR policies be more encompassing, including of conservation policies. The section to follow will introduce Namibia as a particular case study due to the various protected areas in the country having a history of collecting data on HWC and their subsequent losses. It thus provides a unique laboratory for the investigation of this phenomena.

3. A focus on Namibia

Namibia is situated on the west coast of Southern Africa, and shares borders with South Africa (to the South), Angola (to the North) and Botswana, Zambia, Zimbabwe (to the East and North East). In spite of its geographical extent (824,292 km²), Namibia is sparsely populated with a population of only 2,324,388 and an average population density of only two people per square kilometers.

Namibia is faced with a diverse hazards profile. The primary natural hazards (in terms of impact and regularity) include flooding, droughts,

forest and wildfires and human and animal disease outbreaks. Of these hazards, droughts and floods have the most impact on local people [12]. With Namibia having an arid (in the Southern and Western regions) to semi-arid climate (Northern and Eastern regions), drought is a common occurrence in the country, affecting people and the livelihoods they depend on [5]. In contrast to drought, flooding is also a major problem for some regions in Namibia. The north-eastern regions of Zambezi, Kavango West and Kavango East are most at risk of annual flooding during the rainy season that last from February to June, whilst regions such as Oshikoto, Ohangwena, Oshana and Omusati that lie within the Cuvelai-Etosha Basin also have high flood risks [1]. Wild- and forest fires also present a significant risk to people of Namibia with an estimated three to seven million hectares of land being burnt between July and October every year [12]. Human and animal disease outbreaks are also identified within Namibia's National Disaster Management plan as primary hazards. Specifically, in the case of human disease outbreaks HIV AIDS, Cholera, Malaria and Tuberculosis are having major impacts on the country and household levels. Animal disease outbreaks are especially disastrous in terms of livelihoods as many poorer households depend on livestock for subsistence and income.

The main institutional instrument for DRR in Namibia is the Disaster Risk Management Act of 2012 [40,41]. This law advocates for greater investment in DRR for improved capacity for early warning, disaster risk assessments, monitoring and information dissemination on phenomena and activities that trigger disasters. It attributes key responsibilities to the Office of the Prime Minister that has the overall responsibility for the coordination of DRR. The Office of the Prime Minister is however supported by the National Disaster Risk Management Committee (NDRMC), which is a national multi-stakeholder platform responsible for DRM in Namibia. Regional Disaster Risk Management Committees (RDRMCs) and Local Authority Disaster Risk Management Committees (LADRMCs) have to support and implement, respectively, a framework for DRR tailor made for each local municipality. At the very local level, Constituency of Disaster Risk Management Committees (CDRMCs) coordinate DRR activities aimed at settlements within each constituency. It provides for an integrated and coordinated DRR approach that focuses on preventing or reducing disaster risk, mitigating the severity of disasters, rapid and effective disaster response, emergency preparedness and post-disaster recovery. It also facilitates the involvement of private sector, non-governmental organisation and volunteers in DRR as well as partnerships between organs of state and the private sector, non-governmental organisation and local people.

Unlike human and animal disease outbreaks, wildlife is not explicitly included in the priorities of the Disaster Risk Management Act of 2012. Nonetheless, the country hosts a very diverse and potentially harmful cohort of wild animals, especially mammals, many of which are endemic to the country. These include elephants, lions, leopards, cheetahs, rhinoceros, hippopotamus, buffalos, hyenas, zebras, monkeys and crocodiles. These are spread across the country with most regions being populated by a range of different species. Such diversity is a major resource for the country, as there is a heavy reliance on safaris and trophy hunting to sustain its national economy as well as people's livelihoods. Wildlife is therefore highly valued and protected within national parks and smaller conservation areas called conservancies.

This scoping study draws upon both secondary and primary data. Secondary data include the wildlife database of NASCO. This database compiles information collected at the scale of each and every conservancy in the country by local rangers using event books [46,47]. Data included in these very comprehensive records cover the number of human-wildlife incidents and the type of damage but also poaching incidents, predator and rare species sightings, animal introduction and mortality, as well as the nature of the local vegetation and rainfall. Human-wildlife incidents and their impact are reported by affected people to the rangers.

The study also relies upon scoping field work conducted in the

Kasika and Impalila conservancies in March 2017. Both conservancies are located at the easternmost tip of the Caprivi Strip at the border with Botswana, Zambia and Zimbabwe. Kasika Conservancy's land area is 147 km² while Impalila is a bit smaller with 73 km². Both Impalila and Kasika are nested on the left bank of the Chobe River which is a major tourist destination for wildlife safaris. The 2000 local people of Impalila and 1130 people of Kasika, as of 2011, have been benefiting from government and NGO projects towards rural development and wildlife management [36,38].

Semi-structured interviews were conducted in English with six local people, one conservancy ranger, one police officer, one school teacher as well as staff from the main NGO supporting the conservancies and the head of the Kavango Zambezi Transfrontier Conservation Area Secretariat. Interviews with local stakeholders were geared towards understanding the impact of wildlife hazards on people and their livelihood as well as deciphering the strategies they developed to deal with the threat of wild animals. Interviews with staff of the NGO rather focused on the support provided by the organisation in reducing the risk associated with wildlife as well as concurrent conservation strategies. A one-hour focus group was eventually conducted with four members of the Impalila Conservancy Management Committee, respectively the chairperson, the treasurer (also a fish guard), a ranger and a guide, to better understand the incident reporting process as well as the compensation scheme set up by the government for crop, livestock and infrastructure damage.

4. Wildlife hazards and their impacts in Namibia

Between 2001 and 2015, the NASCO database has recorded 65,567 incidents related to wildlife in the 82 conservancies of Namibia. 56,209 of these incidents have affected livestock and 219 have led to deaths or injuries of local people. 25,788 wildlife incidents have also caused crop damage. In the meantime, the CRED-EMDAT database has only recorded 21 larger events for the whole country. These are associated with floods, droughts, epidemics and transport accidents that have killed 627 and affected 2.8 million people. Twenty four percent of the wildlife incidents recorded between 2001 and 2015 have been associated with elephants, 18% with hyenas, 12% with jackals and 10% with cheetahs. All other animals together constitute only 36% of the incidents (Fig. 2).

These data show that the cumulated impact of large events is overall more significant than that of wildlife incidents. However, these larger disasters are rare and localised events while wild animals constitute a permanent threat for the whole population of Namibia. All the

conservancies of the country have indeed recorded wildlife incidents between 2001 and 2015. A closer look at the data for the Kasika and Impalila conservancies, where field work has been conducted, further shows that wildlife incidents occur throughout the year, with the main peak during the second half of the rainy season (February and March) and a second peak at the end of the dry season (October and November) (Fig. 3).

People indeed face different hazards at different times of the year. In Kasika and Impalila, respondents emphasised that hippopotamus are particularly dangerous between September and December but also in March-April. Elephants get closer to human settlements in search of food at the end of the rainy season, from March to April, and eventually in search of water during the dry season, in August and September. Although the cause of isolated incidents, hungry buffalo can attack people during the day throughout the year, especially when they have been injured by lions and hence unable to follow their herd as recently experienced by the people of Kasika. On the other hand, hippopotamus only approach settlements at night in search of food and usually remain within a defined territory. Lions are another night hazard for cattle. Crocodiles are also a threat for the fishermen of Kasika and Impalila at night while both are fishing, especially between December and January and, eventually, between June and July, when fish are abundant in the Chobe River. Overall, crocodiles are the cause of 37% of the incidents while hippopotamus and elephants are the second and third cause of incidents with 28% and 19%, respectively (Fig. 4). Other animal encounters make up 16% of the incidents.

These animals affect people's lives and livelihoods in different ways. In Kasika and Impalila, respondents stress that elephants eat and trample crops, damage infrastructure and injure or kill people. Buffaloes, and hippopotamus are a hazard for both people and crops while hyenas, leopards and lions threaten livestock. Zebras feed on crops but crocodiles only attack people. Herbivores target crops when they are near harvest stage, for example, in March and April for maize and sorghum but also in August and September when there is a second cropping. In total, in Kasika and Impalila, 55% of the incidents reported in the NASCO database have been related to crop damage. Livestock is also regularly affected (39% of the incidents) while physical injuries and death are less frequent (2% of the incidents).

Ultimately, respondents point out that it is all dimensions of their livelihoods, including physical, economic, human and natural resources, that are threatened at all time of the year, days and nights. The permanent and multidimensional nature of the threat makes wildlife

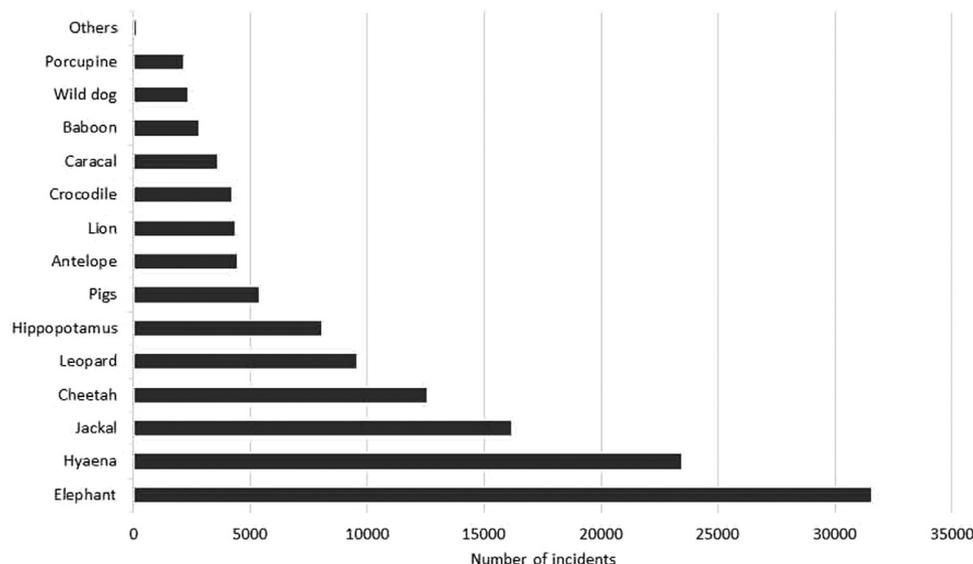


Fig. 2. Number of human-wildlife incidents per animal for Namibia between 2001 and 2015 (data from the Namibian Association of Community-Based Natural Resources Management Support Organisations).

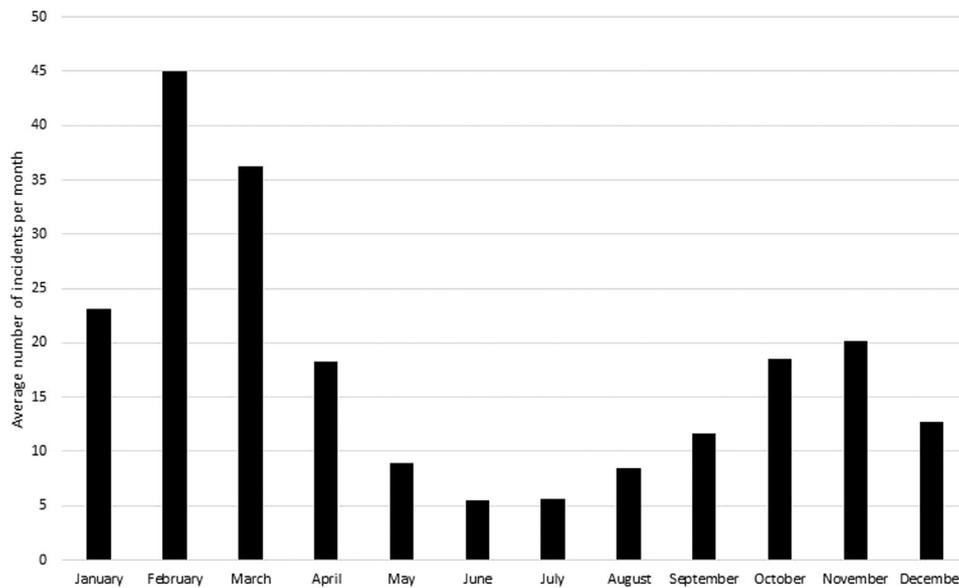


Fig. 3. Average number of human-wildlife incidents per month recorded for Kasika and Impalila conservancies between 2001 and 2015 (data from the Namibian Association of Community-Based Natural Resources Management Support Organisations).

the most significant hazard, ahead of flooding and drought, for all people interviewed as part of this study. Wildlife hazards are particularly significant because they directly and constantly affect food security in a way characteristic of the ratchet effect discussed in the introduction of this paper. Wild animals may indeed revisit areas at the time crops mature without providing enough space for farmers to recover from a previous loss, forcing people into a poverty trap. Wildlife hazards thus contribute to further marginalising people who already stand at the margin of society because they struggle to sustain their everyday needs due to limited and unsecure access to resources that compose their livelihoods.

5. Increasing wildlife hazards, tourism opportunities and the conservation imperative

The significance of wildlife hazards amidst the Namibian hazardscape is thus growing. Whilst the occurrence of flooding, drought and other ‘conventional’ natural hazards has been pretty stable over the

past decades the number of potentially harmful animals has been increasing. In many places throughout Namibia reported human-wildlife incidents is consequently on the rise. In Kasika, the number of events has been stable over the past few years but in Impalila, the yearly number of human-wildlife incidents has been multiplied by three since 2001 to peak at almost 180 events in 2015 (Fig. 5). Ironically, one of the main drivers of such increase in hazards, along with an improving monitoring and recording system [46,47], is the widely acclaimed success of conservation policies [23,45]. NASCO itself indeed suggests that ‘recorded incidents of human-wildlife conflict (HWC) have increased due to the increase in wildlife populations’ [37].

When describing Namibian conservation policies, the World Wildlife Fund (WWF) speaks of the ‘the greatest wildlife recovery story ever told’ [57]. Over the past two decades, the number of large wild animals has increased significantly. In the sole Caprivi region, where Kasika and Impalila are located the number of elephants is estimated to have more than doubled between 1984 and 2004, increasing from 6846 to 16,397. Similarly, the number of hippopotamus for the same region is said to

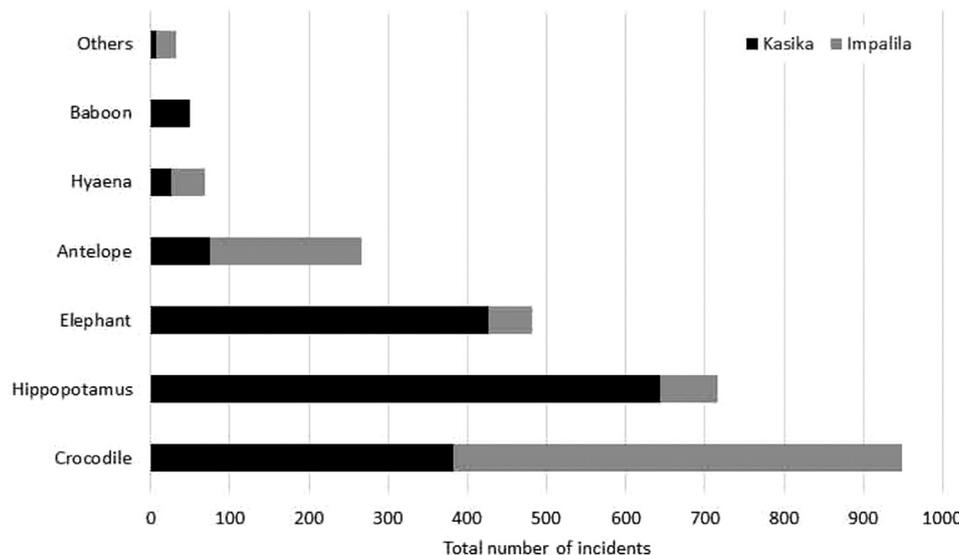


Fig. 4. Total number of human-wildlife incidents per animal recorded for Kasika and Impalila conservancies between 2001 and 2015 (data from the Namibian Association of Community-Based Natural Resources Management Support Organisations).

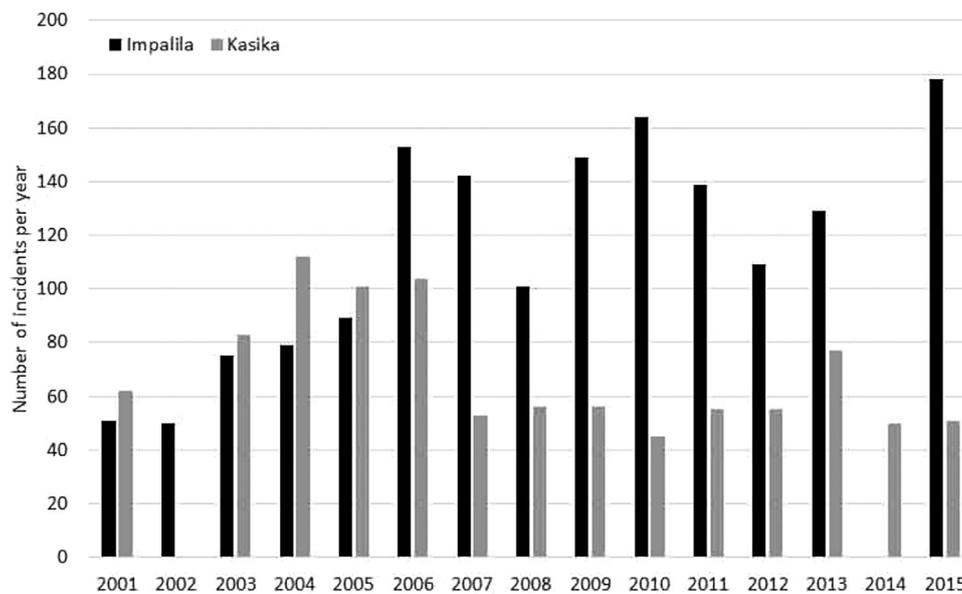


Fig. 5. Number of human-wildlife incidents recorded for Kasika and Impalila conservancies between 2001 and 2015 (data from the Namibian Association of Community-Based Natural Resources Management Support Organisations).

have increased from 184 to 1387 over the same period [29,30]. Similar observation can be made for other large mammals as well as crocodiles that all pose a threat to people's lives and livelihoods [2,3]. Such trends have been confirmed by respondents of Kasika and Impalila who, beyond reported incidents, feel they are facing increasing wildlife hazards.

In Namibia, conservation is driven by both the need to protect endangered wildlife species and a commitment to foster wildlife-related tourism. In fact, conservation and tourism have long constituted two intimately-linked government priorities with state-owned resorts being developed within protected areas. Tourism provides for around 15% of the country's Gross Domestic Product and supports the livelihoods of more than 18% of the population, much ahead of farming (~7%) and mining (~10%) [33]. As in the case of many other natural phenomena, wildlife thus constitutes a hazard and a resource at the same time. This is true in Kasika and Impalila, where respondents emphasised that locals increasingly rely on wildlife safari cruises along the Chobe River to support their daily needs. The safari cruise business generates employment for locals who work as guides or for the local luxury hotel and restaurant while others sell souvenirs.

The Nature Conservation Ordinance (4/1975) as amended by the Nature Conservation Amendment Act (5/1996) provides a legislative basis for both wildlife conservation and tourism-based local development [25,28]. Such policy has relied on pioneering Community-Based Natural Resource Management (CBNRM) programmes within conservancies [4,17]. Conservancies are areas where wildlife is protected and tourism encouraged in such a way that the two are intimately linked. As in the case of Kasika and Impalila, these conservancies are managed by local people with the support of the national government and local and international non-governmental organisations (NGOs). In total, there are currently 182 conservancies throughout the country benefiting 189,230 people or 8% of the entire population of the country.

As per the national guidelines, Kasika and Impalila conservancies draw upon an array of measures to ensure the sustainability of local natural resources, including wildlife. Focus group participants and interview respondents emphasised that these measures range from land use planning to permanent monitoring of animal population and strict control of wildlife removal, mainly through quotas and anti-poaching drives. In parallel, tourism is encouraged through safari cruises, trophy hunting and the promotion of local craft products. In Kasika, most of these initiatives are planned and implemented in partnership with the local luxury hotel while in Impalila these are driven by local members

of the conservancy with the support of some safari operators based in Kasane, located across the Chobe River in Botswana, who bring tourists to the area. An NGO based in Katima Mulilo provides financial support and technical expertise to both conservancies.

Such strict conservation initiatives significantly constraint the ability of those dealing with everyday wildlife hazards to reduce the risk for their lives and livelihoods. Unlike in neighbouring countries like Botswana, people in Namibia can kill any wild animal should it pose an immediate threat to human life and/or livestock, poultry or domestic animal. However, respondents from Kasika and Impalila point out that such killings are rare instances that have to be immediately reported and justified to the nearest office of the Ministry of Environment and Tourism, which can be a difficult task. In effect, the people of Kasika and Impalila most often rely on a range of small-scale strategies that include making noise with drums or tins, bonfire, shooting guns in the air or flashing lights to scare animals away, setting up multiple fences (made of wires, spiky branches, trunks, etc.) and/or scarecrows to protect farmlands, and set fire to home-made chilli bombs amongst other improvised techniques. The local NGO partner of Kasika and Impalila conservancies is also introducing flashing solar-powered LED lights that are expected to repel elephants. However, respondents from both conservancies stress that these are often effective on the short-term but animals eventually get used to them or find their way over/around them. Thus, they are less useful on the longer term. In addition, these techniques require frequent repairs (fences) and/or constant supply (bullets, chillies) that prove costly, including for the environment, if not unaffordable for many poor and vulnerable farmers of Kasika and Impalila.

In Kasika and Impalila, as well as elsewhere in Namibia, wildlife thus constitutes a unique case of everyday hazard that has been purposefully amplified, rather than prevented, in hope of boosting associated tourism opportunities and preserve biodiversity, two legitimate and laudable goals. Unlike in many other countries that deal with widespread wildlife hazard, however, the Namibian government as well as NGOs partners have recognised the negative effects of wildlife on people's lives and livelihoods.

6. Between the cracks of human-wildlife conflict management and disaster risk reduction

The National Policy on Human-Wildlife Conflict Management of 2009 supports conservancies, relevant local authorities and private

entities in developing and implementing appropriate HWC management and mitigation plans [32].

As discussed by focus group participants and interview respondents, Kasika and Impalila conservancy plans, developed in partnership with the local NGO partner, draw upon a compensation scheme for households who suffer losses from wildlife. Compensation depends on people's self-reporting of incidents and providing of evidence (e.g. carcass, damaged crops) to their conservancy executive committee through the local rangers who validate the claim – the same data collection system that inform the NASCO database. If their claim is approved after a long administrative process of up to three months households receive NAD1500.00 (~USD130.00) per head of cattle lost or NAD800.00 per hectare of affected farmland. Physical harm is usually not compensated while the death of an individual can only be tackled by providing a funeral allowance. The conservancy plans further bank on incomes generated by tourism activities to offset the adverse impact of wildlife on crops, livestock and infrastructure.

Although widely and appropriately praised, the Namibian HWC management policy and the local conservancy plans, including in Kasika and Impalila, show significant shortcomings when seen from a DRR perspective. First, profits from tourism-related activities are primarily invested at the conservancy level rather than towards an offset of individual household's losses for the entire villages [25,34]. For example, the people of Kasika and Impalila who are not directly partaking in the activities of the conservancies are therefore excluded from such subsidies. Similarly, fishermen fall through the cracks as it is virtually impossible for them to prove the loss of nets and other implements that occurs at night. Yet, as discussed previously, crocodiles are the main threat in Kasika and Impalila. Furthermore, most households who suffer losses from wildlife elsewhere throughout the country do not benefit from any the foregoing initiatives because their settlement do not belong to any conservancy, including in the vicinity of Kasika and Impalila, although they suffer from the overall increase in the number of wild animals [28,34]. Ultimately, the National Policy on Human-Wildlife Conflict Management as well as the local conservancy plans, such as in Kasika and Impalila, are very much focused on response and relief rather than reducing the risk of incident, i.e. disaster, in the first place.

Reducing disaster risk usually requires to prevent hazards, mitigate vulnerability and enhance people's capacities all together. In the case of wildlife, preventing hazards is challenging given the current momentum for conservation policies and parallel tourism opportunities. In Kasika and Impalila, there is no DRR plans designed after the recommendations of the Namibian Disaster Risk Management Act No. 10 of 2012. Should there be any plan in these localities it is still unlikely that such plan would consider wildlife as a hazard alongside floods and droughts. As is the case in most other DRR laws worldwide, the Namibian Disaster Risk Management Act No. 10 of 2012 indeed addresses natural and anthropogenic hazards in the broadest of terms [41]. No special mention is made of individual hazards within the Namibian context. However, s.14(3)(f) mentions the exposure of different localities to 'specific hazards'. The law, however, is silent on what exactly is meant by 'specific hazards'. One can deduce that such specific hazards relate to any hazardous occurrence in any given location. Therefore, the case can be made that the Act does not exclude wildlife in any way. It is thus up to those conducting the disaster risk assessments to determine 'specific hazards' such as wildlife.

Similarly the National Policy on Human-Wildlife Conflict Management of 2009 discussed in the previous paragraph does not consider wildlife as a hazard, neither does it consider HWC to be/become a disaster. This is also supported by the lack of data aggregation on national level in terms of HWC as disaster risk. The National Policy on Human-Wildlife Conflict Management makes provision for the management of HWC to promote biodiversity conservation and human development through tourism. In line with international thinking, human development must take into consideration any event which

could impede sustainable advancement efforts. The management of wildlife as a hazard can thus be assumed in the mentioned policy.

In parallel, s.13 of the Disaster Risk Management Act makes provision for the establishment of the Namibia Vulnerability Assessment Committee. The composition of this Committee includes a representative from the Ministry of Environment and Tourism who is responsible for the implementation of the National Policy on Human-Wildlife Conflict Management. The Committee is responsible for the assessment of disaster risk indicators 'to assess factors that influence vulnerability such as livelihoods and means of survival for communities in Namibia' (see s.13(2)(b)). As acknowledged by respondents from Kasika and Impalila, wildlife has a direct and profound impact on their ability to thrive and survive.

On perusal of the Namibian policies and laws and observation of local practices in Kasika and Impalila conservancies, it becomes clear that these statutory and legal instruments do not, in any manner, impede the ability of the various national government agencies as well as local stakeholders to address HWC on the principles of development and conservation of biodiversity, neither on the basis of DRR. However, the fact that wildlife is not specifically mentioned nor overtly included as a specific hazard in regional and local vulnerability assessments, impedes practical management of this neglected hazard and proactive reduction of people's vulnerability as much as strengthening of their capacities.

Ultimately, in Namibia as elsewhere in the world, wildlife risk reduction falls between the cracks of HWC management and DRR. On the one hand, addressing the root causes of wildlife risk is, by nature, in conflict with the very principles of HWC management policies driven by principles of conservation. On the other hand, they fall under the radar of DRR that, in Namibia, including in the Caprivi region where Kasika and Impalila are located, focuses on larger and less frequent events such as flood and drought [15,40,42].

7. Wildlife hazards, neglected disasters and the research and policy gap

This scoping study, based on evidence from Kasika and Impalila conservancies in Namibia, suggests that wildlife constitutes an exemplary case of neglected hazard that, nonetheless, has a very significant cumulative impact for those affected. Neglect is particularly evident with wildlife risk reduction, falling between the cracks of HWC management and DRR. This is true in Namibia, including in Kasika and Impalila, but also elsewhere in the world.

Neglect here stems from a complex web of reasons. First is the uttermost priority given to conservation. Conservation is required for genuine reasons that reflect the need for protecting endangered species as well as for boosting tourism incomes. Kasika and Impalila provide an excellent case of such priority. As a consequence, footages of poaching and rare animal species provide for much more powerful and appealing story lines for the media, especially international, than the small patches of crops of a poor farmer damaged by a herd of elephants. Wildlife hazard is in fact a unique case of hazard for which, in most countries, you can be jailed for fulling removing the threat, thus raising complex issues around accountability for DRR.

Wildlife hazards are also neglected in policy because they are poorly understood in the first place. There, in fact, does not seem to be any single study available that has looked at wildlife as a DRR issue rather than a conservation and, by extension, HWC – a field dominated by biologists and ecologists [11,48,56]. Much remains to be researched to fully appraise the scope, in time, space and society, of impact of wildlife hazards in their diversity as well as the vulnerabilities and capacities of those who are affected. A better comprehension of the riskscape is a definite prerequisite to eventually provide tangible and useful evidence to inform both DRR and conservation / HWC management policies.

Neglect further results from the very nature of wildlife hazards. The impact of these hardly matches the criteria of any of the databases

recording disasters around the world nor the conditions for international organisations, e.g. United Nations agencies or the International Federation of the Red Cross and Red Crescent Societies, to raise awareness and call for international assistance [27]. As shown in the case of Kasika and Impalila, and Namibia at large, wildlife hazards are small-scale, diffuse in space and permanent threats. They are hence much more difficult to capture in policy and plan for in practice than discrete, large and rare events such as seasonal flooding. Furthermore, their most dramatic effect has to be considered through their repetition in time and the ratchet effect they entail for those who are affected on a recurrent basis. This is a dimension of hazards and disasters which is generally poorly addressed in DRR policies and practices, not only for wildlife but for all types of hazards.

Indeed, DRR policies still often rely on technocratic institutional frameworks that consider disasters as battlefields to be tackled with military strategies [18,20]. Such strategies and their associated top-down chains of command offer little space to address small and recurrent everyday hazards [53], including wildlife. Should these everyday concerns fall beyond the scope of other sectoral development policies such as public health and poverty alleviation, then there is in fact no policy space to cover hazards such as wildlife hazards (Fig. 1). Even in countries, such as Namibia, where the dominant top-down framework considers local initiatives and provides some room for crafting context specific DRR plans these are often not consistent in space, across localities, and very much depends on the leadership of local DRR officers rather than the institutional structure per se.

Such complex and diverse set of reasons for wildlife hazards to be neglected should nonetheless not prevent to foster wildlife risk reduction within broader DRR policies and practices.

8. Challenges and opportunities of wildlife risk reduction

A growing body of research emphasises the ability of smaller or neglected hazards to erode the wellbeing of people at-risk [6,8,19]. This case study of Kasika and Impalila conservancies verifies this phenomena for wildlife hazards in Namibia. Despite the significant impact of wildlife hazards on people and their livelihoods, wildlife is yet too often neglected by DRR initiatives in Namibia as well as elsewhere in the world. Rightfully one can further argue that any policy or law cannot list or allow an infinite amount of hazards, and certain hazards needs to be considered as a whole. However, even the classification of hazards by the UNISDR [50,52] does not adequately make provision for smaller hazards such as wildlife [54].

This is particularly true when the hazard is potentially a major source of incomes as in the case of wildlife and tourism. Other local level development issues such as peri-urban creep and changes in land use patterns due to a changing climate further pose increasing opportunities for HWCs. For example, climate change has a profound impacts not only on hydro-meteorological hazards but also on wildlife movement and its subsequent interaction with humans. However, as with all other hazards, wildlife needs to be understood in terms of its ability to be both an asset and a threat. It therefore stands to reason that wildlife, as a hazard, should be addressed in an integrated manner with all other threats. In practice the cumulative impact of wildlife hazards on people's lives and livelihoods ranks with some of the top 'mainstream' hazards. Wildlife therefore needs to find a place in the hazard/disaster dialogue between all stakeholders of DRR.

Ultimately, this would entail reconciling HWC management and DRR policies. Both people and wildlife would benefit from such an integrated approach. All threats to people's lives and livelihoods, including seasonal or rarer natural hazards as well as more frequent wild animal attacks, would be considered from a preventive perspective. In parallel, HWC management, as much as the broader conservation policies and practices that traditionally focus on response and compensation, would be enhanced by fully embracing the risk reduction perspective that underpins DRR. Reducing the risk of HWC, rather than just

managing incidents, means aiming for less conflicts in the first place. Such a paradigm shift seems essential to address the root causes of HWCs as much as it was required to tackle the underlying drivers of disasters when the field moved from 'disaster management' to DRR. In this perspective, further research is required to better understand the root causes of HWCs, especially from the viewpoint of people's vulnerability and capacities, as well as to tailor DRR policies to fully embrace the complexity and unique nature of wildlife hazards.

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