

## Article

# Subsistence Farmers' Understanding of the Effects of Indirect Impacts of Human Wildlife Conflict on Their Psychosocial Well-Being in Bhutan

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**Abstract:** Indirect impacts of Human Wildlife Conflict (HWC) are largely ignored, poorly understood, and scantily reported in the literature on HWC. Subsistence farmers in the Himalayan kingdom of Bhutan experience an increasing intensification of HWC impacts. Working across four districts representing different geographic regions of the country, we explored the perceived indirect impacts of HWC and how they affect the well-being and happiness of subsistence farmers using qualitative interviews ( $n = 48$ ) and focus group discussions ( $n = 8$ ). We conducted a qualitative thematic analysis. Based on respondent's explanations, we coded the data according to effect of indirect impacts on human, social, financial, physical, natural, and psychological capitals. Mental distress, constant worries about food insecurity, fears for physical safety, frustration of movement restriction due to fear of being attack by wildlife, feelings of economic insecurity and anger over loss of crop and livestock due to wild predators affect the psychological health and well-being of research participants. Vulnerabilities related to gender and wealth status further deepen the effect of indirect impacts. Policies designed to address HWC should incorporate an understanding of the effects of indirect impacts of HWC and should focus on female-headed and poor households to reduce the negative effects of wildlife impacts.

**Keywords:** Human Wildlife Conflict; psychological impact; social impact; adaptations; Bhutan



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## 1. Introduction

Subsistence farmers are impacted by Human Wildlife Conflicts (HWC) not only economically, and physically [1], but also psychologically, typically through a direct chain of causation [2,3]. Ogra [4] defined indirect HWC impacts as “costs characterized as uncompensated, temporally delayed, psychological or social in nature”. Indirect impacts have emotional consequences [5] and are described as a highly stressful experience that provokes strong reactions such as fear, worry, frustration, anxiety, depression, and lowers physical health [2,3]. The chronic stress resulting from constant emotional pressures causes psychological distress [6,7] impairing subsistence farmers' overall well-being and quality of life [2,5].

Despite the recognition of the serious implications of indirect impacts of HWC on psychological well being, there are not many studies [2,3,5,8–13] that could support arguments for management options for such impacts. Previous studies of livelihoods and of the effects of stresses and disasters, in particular HWC impacts, on livelihood capitals, have not considered the role of psychological capital (PsyCap) in human well-being theory. Luthans et al. [14] described PsyCap “as an individual's positive psychological state of development that is characterized by: self-efficacy; optimism; hope; and resiliency”. These are believed to affect constructs indirectly related to human performance such as stress, anxiety, and human well-being [15]. Building on the past studies [3,5,9,12], this research aims to fill this knowledge gap that exists especially in a subsistence context such as the

one in Bhutan where previous HWC studies have focused solely on the direct costs and impacts of HWC.

Like in many Asian and African countries, incidences of HWC are widespread in many parts of Bhutan [16,17]. They are seen by many as a threat to food security, human well-being and happiness of the rural population and to the success of conservation itself. In a country that embeds the philosophy of gross national happiness (GNH) at the center of all its policy objectives, HWC remains a major challenge because of the strong nature conservation policy and the acute dependence on agricultural farming as the main livelihood sources [18,19].

The concept of GNH originated in the 1970s with the Fourth King of Bhutan stating: “GNH is more important than Gross National Product (GNP)” [20]. GNH is value-based and seeks to balance the needs of the body and the mind, as well as material well-being and the spiritual, emotional and cultural needs of the society [21]. GNH framework has four pillars and nine domains (Table 1). These domains constitute the different elements of GNH and as such a holistic measure of human well-being and happiness. GNH domains are meant to orient people of Bhutan towards happiness, mainly by enhancing the conditions of not yet-happy people [22].

**Table 1.** GNH pillars, their domains, and the description of each domain.

Gross National Happiness Index		
4 Pillars	9 Domains	33 Indicators
Economic Development	Living standard	Assets Housing quality Per capita income
	Health	Physical health Mental health Disability Healthy days
	Education	Values Literacy Knowledge Schooling
Good Governance	Good governance	Governance performance Services Fundamental rights Political participation
Preservation of Culture	Cultural diversity and resilience	Festivals Cultural traditions Creative arts Language and dress
	Psychological well-being	Life satisfaction Positive emotions Negative emotions Spirituality
	Time use	Work Sleep and leisure
	Community vitality	Social support Safety Community relations Family
Environmental Protection	Ecological diversity and resilience	Wildlife damage Ecological issues Responsibility towards environment Urban issues

Guided by GNH philosophy, development in Bhutan is firmly built on the premise that the development pathways should be socially, economically, culturally and environmentally sustainable [23]. Biodiversity conservation and sustainable human development thus form the priority policy themes of Bhutan government. However, the twin goals of the policy appear at risk of contradiction as the trade-off comes to surface especially in the case of HWC. This provides a novel context in which to study indirect impacts of HWC.

The aim of this study was to explore and understand how indirect impacts of HWC affect PsyCap as conceptualized in Figure 1 and thus human well-being and happiness, the central tenet of GNH philosophy. In doing so, our research advances our understanding of the pathways of indirect impacts and their cumulative effects on psychological PsyCap of subsistence farmers in landscapes impacted by HWC. This is also the first research to show how indirect impacts of HWC affect Bhutan's unique GNH framework.

The following research questions guided the analysis:

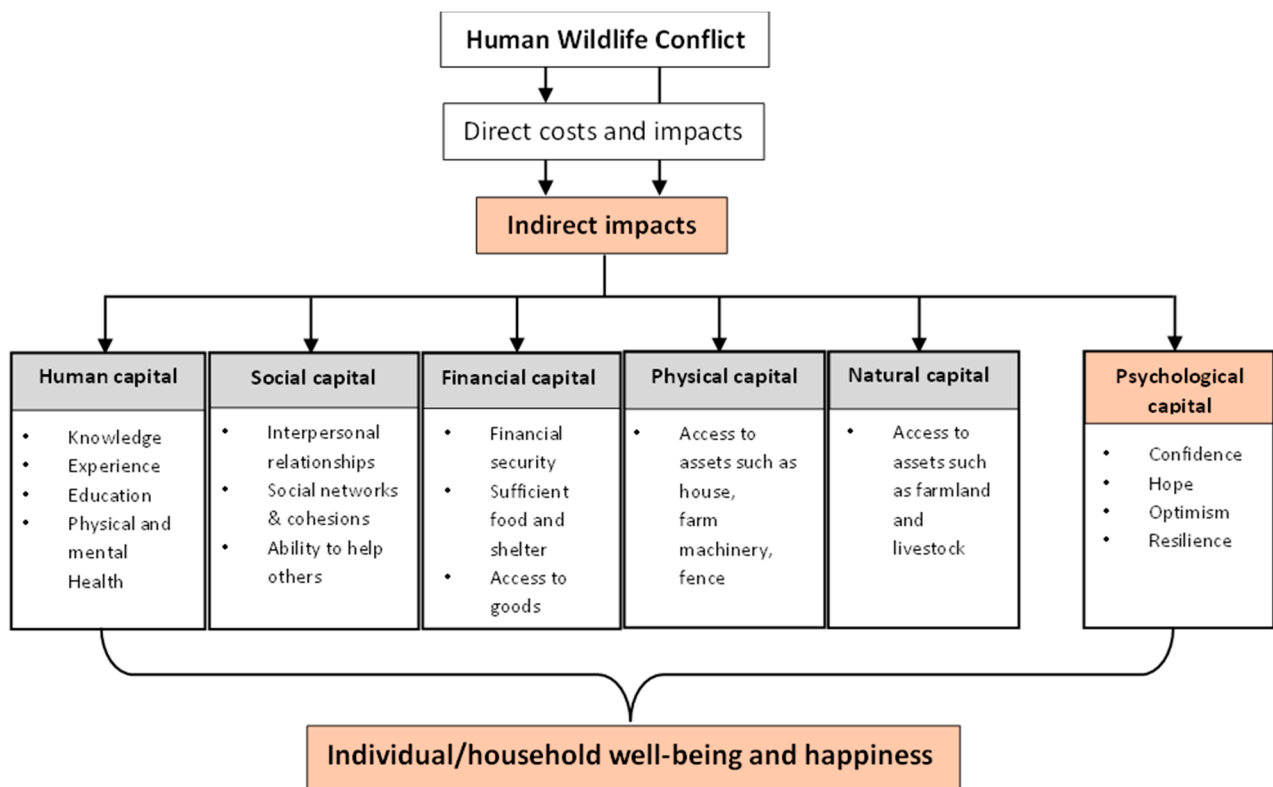
1. What types of indirect impacts of HWC exist in rural Bhutan and how do these impacts affect PsyCap?
2. How do these effects on PsyCap vary between gender and wealth groups?

### 1.1. Conceptual Framing—Human Well-Being

As a field at the interface of sustainable human development and biodiversity conservation, HWC mitigation studies can benefit greatly from an in-depth understanding and application of the concept of human well-being and happiness. While the very survival and well-being of humanity depends on the quality and functioning of the ecosystems [24], and implicitly on biodiversity [25,26], successfully conserving wildlife while simultaneously enhancing human well-being and happiness has proven to be difficult [27] especially in regions where subsistence farmers pursue their livelihoods in a context of high and endangered biodiversity [10]. To formulate policy actions that conserve biodiversity while at the same time enhancing human well-being and happiness [28] requires an in-depth understanding of the interplay between human well-being, happiness and the impacts of HWC.

The concept of human well-being is important for policy makers and researchers [29] to determine if human well-being has enhanced over time, particularly in developing countries [30] where majority of the people live with less than 1 dollar/day [31,32]. According to Brown et al. [33], "the concept of well-being has roots in research on social indicators, quality of life, and multidimensional conceptions of poverty". According to Prescott-Allen, (2001), the Human well-being indicators for measuring the quality of life included health, population in balanced with the environment, household wealth, national wealth, knowledge, cultural, spiritual growth and self-expression, freedom and open decision-making process. The concept is thus broad and contested, without a universally acceptable definition [33,34] and difficult to observe or measure directly [30]. Often terms such as life satisfaction, happiness, quality of life, welfare, living standard, prosperity, needs fulfillment, empowerment, human development and well-being are used interchangeably [30,33] thus defining the concept precisely is difficult [35]. However, reflecting on Alkire's [36] concerns pertaining to the importance of defining the concept and its dimensions clearly to provide a secure epistemological and empirical footing before measuring it", in this study, we defined human well-being as human experience that includes basic materials for good life, sound physical and mental health, dense and conducive social relations, community cohesion, freedom of choice and actions, and income and food security in a state of 'optimal psychological functioning' [3,37] within a natural system where stock yield of valuable goods and services flow into the future [38].

Measuring this broad and encompassing concept of human well-being is difficult as it cannot be measured independently [35]. In this study, we have integrated the traditionally considered livelihood capitals [39] with PsyCap [40] and used them as constituents of human well-being as conceptualized in Figure 1. Then, guided by the concept of social impact assessment (SIA) [41], the effects of indirect impacts of HWC on the contemporary livelihood capitals were explored following the hedonic well-being principles [42]. SIA comprises identification, analysis, and evaluation of the social impacts resulting from a particular event (e.g., HWC) while social impact is defined as "a significant improvement or deterioration in people's well-being or a significant change in an aspect of community concern" [43].



**Figure 1.** Conceptual illustration of the possible pathways of how indirect impacts of HWC can be affecting different contemporary livelihood capitals (well-being constituents) adapted from [40] and modified.

As a key aspect of human well-being, maximizing happiness is a priority objective of every government [34]. In Bhutan, the importance of happiness has been recognized as early as 1729 and was formally written into legal code, which stated that “if the Government cannot create happiness for its people, there is no purpose for Government to exist” [22]. Happiness in Bhutan is therefore a major priority and has been formally enshrined in the constitution of the Kingdom that specifies “The State shall strive to promote those conditions that will enable the pursuit of Gross National Happiness” [21]. Human well-being and happiness are believed to be shaped by the specific cultural, geographical and historical context, and determined by socioeconomic processes [25]. In Bhutan, the measure of GNH is multidimensional with 33 indicators and 124 variables that relate to the nine domains [34] where happiness is referred to as people being able to pursue well-being in sustainable ways with enabling conditions being in place [21].

In this study, the definition of sustainable livelihood provided by Chambers & Conway [44] was adopted, which states “A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long-term”. Livelihood capitals are the vital household asset base that helps households to earn and diversify their livelihoods [39]. Assessment of livelihood capitals remains at the core of sustainable livelihood analysis frameworks [45] which advance our understanding of the way people live their lives and enables us to identify practical strategies to enhance their lives based on their views and interests [46]. Livelihood capitals are interlinked [47] and the effect of indirect impacts of HWC on one capital can impair other capitals and increase overall impact.

### 1.2. Livelihood Capitals

Human capital has been defined in various ways by different authors [48]. In this study, 'human capital' refers to "the aggregation of the innate abilities, knowledge, and skills that individuals acquire and develop throughout their lifetime" as defined by [49] with good physical and mental health and capability [45].

Social capital is increasingly recognized as a dominant paradigm in the quest for social and economic development [50] with its structural, cognitive and relational dimensions significantly contributing to sustainability of economic development. The definition of social capital given by Claridge [51] has been adopted, which states, 'social capital is aspects of social context (the "social" bit) that have productive benefits (the "capital" bit). It includes the store of solidarity or goodwill between people and groups of people. You could think of it like a 'favour bank', although this only encapsulates part of social capital. Another simple explanation is as helpfulness behaviours resulting from feelings of gratitude, respect, and friendship". More importantly social capital contributes positively to well-being and quality of life [52] with social interaction as key factor in development and implementation of any developmental initiatives [53]. Similarly, social capital and social support have been shown to have important positive impacts on the health of female heads of households [54].

'Financial capital' is any economic resource, measured in terms of money with the core indicators of income and the expenditure [55]. In this study, we consider 'physical capital' as the tangible man-made basic infrastructure that subsistence people use to support production (e.g., fence in crop farming or livestock shed to protect animals from wild predator) and the 'natural capital' can be defined as stocks of natural resources which include arable land and livestock as critical natural assets for food security. Indirect impacts of HWC may be affecting these contemporary livelihood capitals as conceptualized in Figure 1.

## 2. Research Methodology and the Context

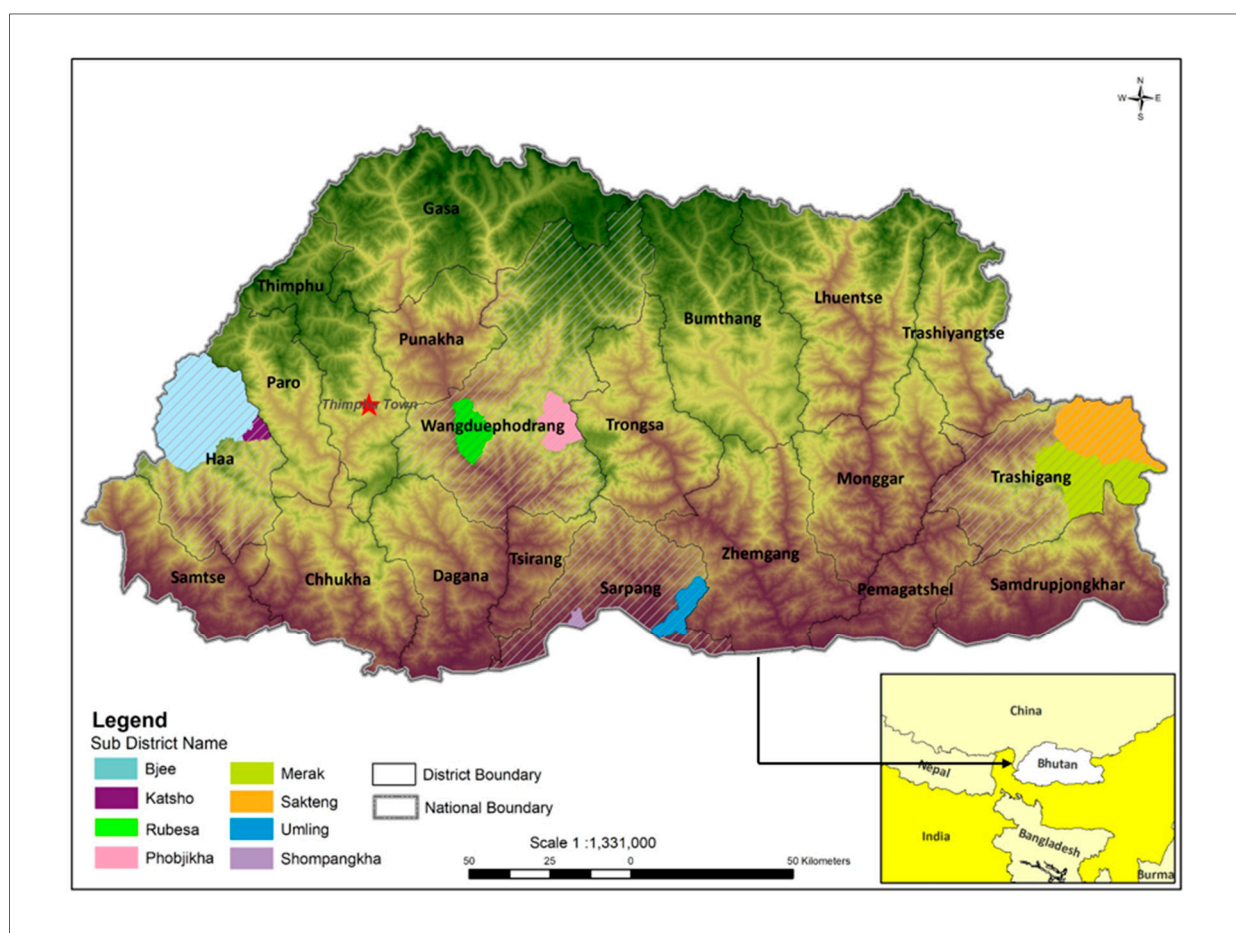
### 2.1. Geographical Context

Bhutan (38,394 km<sup>2</sup>) is located in the eastern Himalayas, between the Tibet Autonomous Region to the north and India to the east, west, and south (Figure 2). Elevation rises from 150 m along the southern border to >7570 m above sea level (m.a.s.l) in the north, within a horizontal distance of 170 km [56]. About 71% of the country is under forest cover [57]. All wild animals and wild plants listed in Schedule I in the legal framework for conservation are fully protected while other wild animals, not listed in Schedule I, are also afforded protection. Crop farming is the economic mainstay of the country however it is confined to only 2.75% of the total land area [58]. More than 90% of farming communities are comprised of subsistence farmers. The state religion of Bhutan is Vajrayana Buddhism and ~90% of the population is Buddhist [59]. Buddhism recognizes all sentient beings with the ability to go through emotions such as fear, love, desire and are capable of suffering and pain [60]. The Buddhist belief system has a strong eco-centric dimension and is congruent with environmental protection [61].

### 2.2. Study Area and Livelihood Sources

This study was conducted across 4 geographically distinct districts of Bhutan (Figure 2). To be able to generate data from diverse situations, within each district, 2 sub-districts were selected: one located inside a protected area and the other outside the protected area. Pastoralism has been and continues to be the primary sources of livelihoods for seminomadic pastoralists inhabiting the rugged landscapes of Merak and Sakteng in Trashigang. These communities depend entirely on livestock (mainly yak) and livestock products for their livelihoods. Aptly referred to as the 'camel of the snows', yak is a multi-purpose animal providing milk, meat, draught power, cash income and manure. Similarly, in Haa, pastoralism is the main livelihood source though it is also supplemented with crop cultivation. Livestock animals reared by the herders in Trashigang and Haa include Yak (*Bos grunniens*), cattle (*B. taurus*), sheep (*Ovis aries*), and horses (*Equus caballus*).

The main livelihood sources of respondents in Saprang and Wangduephodrang are based on crop farming supplemented with livestock rearing. Main cereal crops cultivated in these districts include rice (*Oryza sativa*), maize (*Zea mays*), finger millet (*Eleusine coracana*), barley (*Hordeum vulgare*), wheat (*Triticum*) and buckwheat (*Fagopyrum esculentum*). Potato (*Solanum tuberosum*) is the main cash crop in few sub-districts (e.g., Phobjikha, Bjee and Katsho). A wide variety of vegetables are cultivated except in Merak and Sakteng, mainly for home consumption.



**Figure 2.** Map of Kingdom of Bhutan and map showing the location of the research sites (the four districts and the eight sub-districts) which represented different parts of the country. The colors purple to green represents an elevation gradient from 150 in the south to 7570 m.a.s.l.

HWC is widespread in all research sites with substantial economic losses through crop and livestock depredation and destruction of property. About 14 different wildlife species are involved in conflict with farmers including Asian wild dog (*Cuon alpinus*), Tibetan wolf (*Canis lupus chanco*), snow leopard (*Panthera uncia*), tiger (*Panthera tigris*), Himalayan black bear (*Ursus thibetanus*) and leopard (*Panthera pardus*) depredating livestock animals. Wild pig (*Sus scrofa*), Asian elephant (*Elephas maximus*), barking deer (*Muntiacus*), macaque (*Macaca spp.*), sambar deer (*Rusa unicolor*), rabbit (*Oryctolagus cuniculus*), and birds are the main wildlife species reported to damage crops. Among these species wild pig and wild dog caused the highest economic losses through crop and livestock depredation, respectively.

### 2.3. Participant Selection and Data Collection

An exploratory qualitative approach used semi-structured interviews and focus group discussions (FGD) to examine and understand the effects of indirect impacts of HWC on livelihood capitals as conceptualized in Figure 1. The aim of the exploratory qualitative ap-

proach is to interpret and understand human experience through capturing an individual's point of view [62]. For better understanding of what lies behind any phenomenon about which little is yet known, qualitative methods are applicable [63]. In Bhutan, there has been no research in the area of indirect impacts of HWC on subsistence farmers' livelihood capitals, indicating the need for an exploratory, qualitative approach [64].

Research participants were selected through stratified random sampling. The total number of households in each selected sub-district were stratified based on wealth category and gender of the head of the household as this is related to livelihoods and likely impact by HWC. First, we collected the list of the total number of households in each selected sub-district from the head of the sub-district (Gup). Then, during the FGDs, with the use of local criteria for wealth classification, the households were categorized into three wealth groups: Rich, Average, and Poor. Local criteria for wealth classification included land and livestock holding size, type and size of the house, number of household labour, and number of family member in government service. The total households within each wealth category were further stratified based on the gender of the household head. Then, from each sub-group, 1 male-headed and 1 female-headed households were selected randomly following a probability sampling technique, giving every household in the sub-group an equal probability of being selected [65] to capture an unbiased representation of the sub-total population. In total, six households were selected (three male-headed and three female-headed) from each sub-district totaling to 48 households from eight sub-districts who took part in the semi-structured interview and each household form as a unit of analysis. Then, from each selected household, one member was interviewed, in most cases the head of the household was interviewed. Where household head was not available, a female in female-headed sample households and a male in male-headed sample households were interviewed, who were judged to have longer crop farming and livestock husbandry experiences. Individuals from these selected households were readily available for the interview, in both FGDs as well as for the individual interviews. This could be because of the increasing intensification of HWC and wildlife impacts on people's life and livelihoods. Respondents seemed to be perceiving their participation in this research as an opportunity for them to voice their concerns and share their knowledge about HWC and the impacts they are grappling with. They wanted to be heard, this was clear from the way they expressed their gratitude for being selected as one of the research participants to be interviewed on a nationally important issue such as HWC.

Interviews were carried out in the local language by the first author at each respondent's residence. All interviews were noted down verbatim in English and also audio recorded with the permission of the interviewee. After each interview, the written interview was read to the respondent for accuracy and completeness and then further crosschecked with the audio recorded in the evening of the same day. Any inconsistencies or doubts found, no matter how minor, were further followed up with the respondent during the following day.

The interview lasted ~45–60 min for each respondent with another 15–20 min for checking accuracy and completeness of the interview. The interviews were started with few structured questions (e.g., Is HWC occurring in your village?) to sketch the scene and to see how the respondent have experienced HWC. Then, the following key guiding questions were asked: (1) why you think HWC is occurring, (2) how wildlife impact on your livelihood capitals, (3) How do you adapt to these impacts, (5) How do you think HWC should be managed, and; (5) How important is wildlife to you. These key questions were further followed up with prompts (e.g., can you go little deeper on this? or can you tell me more about this?). In addition, socio-demographic information was gathered for all the respondents. The interview themes were pre-tested on 12 people of varying ages, sexes and backgrounds to ensure clarity before use.

In addition to the semi-structured interviews, eight FGDs were conducted for data triangulation [66] to enhance the trustworthiness of the research findings [67]. FGD participants were selected in consultation with the head of the sub-district (Gup) and extension

staff. Irrespective of gender and wealth category, farmers believed to have longer crop farming and livestock husbandry experience were selected. This was done to get a historical and contextual account of HWC in the locality. Altogether 63 farmers (30 women and 33 men) participated in the FGDs. In most cases, FGDs lasted between 3 to 4 h. Indirect impacts of HWC as we know a complex issue requires different means to uncover a range of perspectives and experiences for which the choice of FGDs as one of the data collection strategies was appropriate.

#### 2.4. Data Analysis

Qualitative thematic analysis was used to code interview data. All the written interviews were transcribed into an electronic text format by the first author and a thorough data familiarization was carried out by reading and re-reading the transcript files and checked for typo errors. The interview data was also tallied with FGDs records and field notes for triangulation. Once all aspects of the data were clearly understood, the first author carried out the initial open marking of segments of the data to different themes based on their theoretical significance, primarily following an inductive process [68] and then checked by the other authors. Thematic coding began within each interview and then extended outwards across interviews. The outcomes were then categorized as indirect considering the criteria (e.g., immaterial, and on-going nature, chain of causation). Interview excerpts that represent views that were widespread in the sample were selected for inclusion. While some segments of the interview did not relate to the themes, some segments are linked with more than one theme. The first author then coded the data using the contemporary livelihood capitals as codes. Once the first author had completed the coding process, again other authors checked for triangulation and coder reliability. NVivo 12 Plus, a qualitative data analysis software package, was used to organize and code the interviews. Field notes or the reflective journal contain direct field observation notes, conceptual reflection, insights, and theoretical connections which emerged during the field work, which complemented the individual interview data. FGD records were transcribed, organized, and identify major themes and insights which complemented the individual interview data to enhance research validity and to create a more in-depth picture of this complex and dynamic indirect impacts of HWC on the life and livelihoods of subsistence farmers. Results are presented in order of our two research objectives. In particular, we offer insight into (1) types of indirect impacts and their effects on PsyCap, and (2) variation of the effects on PsyCap between gender and wealth category. We present results for all respondents combined and then note, where relevant, any key differences between gender and wealth attributes.

### 3. Results

In response to the question on types of indirect impacts of HWC in rural Bhutan and how these impacts affect PsyCap, respondents reported a wide range of indirect impacts of HWC (see Table 2) as affecting their livelihood capitals. As has been seen in this study and in others, wildlife impacts are both direct, occurring in a discrete segment of time (e.g., crop and livestock losses), and indirect and ongoing (e.g., fear, worry, stress, anxiety). These impacts affect subsistence farmers' livelihood capitals through different pathways with outcomes potentially impeding the achievement of their broader development and human well-being goals.

The following sections present empirical results from the qualitative interviews in narrative form, the effects of indirect impacts of HWC on respondent's livelihood capitals. The quotes used are all from respondents' descriptions of their experiences with wildlife. First, we described the effect of indirect impacts on livelihood capitals with their cumulative consequence on PsyCap as multifaceted by gender and wealth class. We then present the effects of indirect impacts on GNH domains.



**Table 2.** Presenting the direct costs and consequences of implementation of HWC adaptation measures as sources of indirect impacts of HWC on contemporary livelihood capitals as reported by the respondents.

Direct Impacts	Intermediary	Indirect Impacts	Livelihood Capital Impacted
Crop and livestock depredation	Loss of crops and livestock to wildlife	Food and income insecurity	Financial
		Inability to renovate or build new home	Physical
		Unable to send children to school	Human
Movement restrictions	Due to presence of wildlife in vicinity	Opportunity cost due to foregone activities	Financial
		Loss of income leading to increasing debts	Financial
	Not able to visit or help relatives and neighbours in times of need	Children unable to go to school and miss class	Human
		Ruptures social relations and weakens community vitality and social cohesion	Social
Increased labour demand	Use of children for crop guarding and livestock herding	Children miss school attendance leading to poor performance and low educational attainment	Human
	Not being able to protect crops from wildlife damage in field located far from homestead	Abandonment of field and food and income insecurity	Natural/Financial
	Continuous yak herding keeps male away from home for long time	Infidelity leading to breaking of marriage	Social/human
Increasing implementation of intensive crop protection and management measures	Farmers need to do night crop guarding which exposes them to indescribable hardships	Loss of sleep, loss of peace of mind, persistent fear and worry, increase stress and anxiety levels, expose to insect borne disease (e.g., malaria) leading to poor and diminished physical and mental health.	Psychological/human
	Repairing destroyed fences and re-planting or re-sowing damage crops		

### 3.1. Effect of Indirect Impacts on Livelihood Capitals

Our analyses showed that indirect impacts typically occur through a direct chain of causation; a direct impact leading to an indirect impact, affecting several livelihood capitals (Figure 3). Livelihood capitals are interlinked and the effect of an indirect HWC impact on one capital decreases the abilities of other capitals or asserts more pressure, driving respondents into situations of feeling helplessness and hopelessness, greatly impacting on the psychological well-being.

### 3.2. The Cumulative Effects of Indirect HWC Impacts on Psychological Well-Being

Irrespective of gender and wealth, the key indirect impact of HWC most respondents reported was the poor psychological well-being resulting from: the on-going loss of sleep, loss of peace of mind, persistent fear and worry, frustration, anxiety, and feelings of stress and/or insecurity. These strong emotions are the cumulative outcomes of the effects of indirect impacts on traditional livelihood capitals as described in the following sections.

Respondents described crop and livestock protection from wild predators as one of the most labour-intensive measures and referred to these as a full-time job. For example, respondent (#9) stated: “These days we need to guard all the fields, otherwise we will have no crop harvest”. On an average, one to two household members spent at-least two months a year guarding crops. Most respondents described this situation as stressful and frustrating, making them feel economically insecure. This is because of the acute shortage of labour due to rural out-migration which is in part triggered by HWC. The scarcity of labour is also partly due to increased children’s school enrolment as mandated by the government’s policy of ‘no child left behind’.



to trade-offs. The fear of being attacked by elephant forces farmers to make sacrifices and forgo actions which they would prefer, and which would bring direct benefits. For example, respondent (#21) stated: “When these elephants loitering around, no matter how important our work may be, we just cannot go out in the field to work. We stay home feeling restless, frustrated, and worried”. Such incidents have pushed respondents into situations where they feel constantly anxious and insecure.

Socially, indirect impacts such as restrictions on movement due to wildlife presence in the locality, the added demand on labour, and rural out-migration have negatively impacted on community vitality, social network and cohesion and interpersonal relations. Many rural homes were left with elderly parents who spoke of feeling a sense of loss of connections and support within their community. An elderly respondent (#43) narrated stories about the empty homes (*Guntong*) in their village. The respondent saw more and more homes kept locked and farms fallow. He summed up his story by stating: “there are less human than wildlife in rural areas these days. We old people do not get jobs in towns. We have to stay put despite the difficulties and the hardships we are bound to face and survive on what is there. Often, we suffer extreme loneliness and feel left out but we belong here, we grew up here”. Studying the pull and push factors of rural out-migration, is beyond the scope of this study, nonetheless HWC emerged as one the factors.

Physically, most respondents reported destruction of fence, houses, drinking water pipes, kitchens, and cowsheds by wildlife. Such losses can be the main psychological stressor for subsistence farmers as making up for these losses can represent a substantial proportion of subsistence farmer’s annual income. Further, whether wildlife damaged houses or not, the fear that wildlife may destroy their house and/or attack them drove respondents into a condition of persistent fear, stressful moments, and un-certainty of life. For instance, respondent (#16) narrated: “My family live in a very old hut and it is not safe. Elephants can destroy it easily. Often at night when elephant come to eat banana or sugarcane nearby our home, we have to grab our children and run to neighbor’s place. It is scary as sun goes down; elephants frequently come for banana”.

On the other hand, when the destruction has happened, farmers must invest both labour and financial resources. Respondents spoke of how frequently they must repair the fences to protect their crops and more often when the crops nearing harvest. For instance, (#15) stated: “Elephants can make their way in, no matter what kind of fence we installed. Even electric fence cannot keep them out. We need to keep on repairing them, otherwise we lose everything”. This shows that subsistence farmers suffer not only the effects of indirect impacts of HWC but also indirect costs from wildlife damage. Indirect costs are the financial investment incurred in repairing of damage properties (e.g., fence) or the loss of income due to fore gone off-farm work activities.

Due to the inability to use effective and efficient crop protection measures (e.g., night crop guarding), most female-headed households, and those families in poor category suffered significant crop loss. This has forced most female-headed households to abandon fields that are located far from the homestead. Respondent (#9) reported the situation: “These days we need to guard all the fields, otherwise we will have no harvest. There are many different wild animals damaging our crops these days. Because of guarding pressure, many farmers keep distant fields fallow”. In line with this respondent’s narrative, our data showed that, ~ 3.1% of the total land holding (116 Ha) of the interviewees spread over 3 districts was left fallow (Natural capital).

Importantly, most respondents expressed their difficulty in making decisions or as-erting personal choices in responding to HWC, in part due to their religious beliefs. For example, (#4) stated: “As long as we keep yaks and grow crops, wild animals are going to come and take their share. We do not know what should be done. Killing wild animals is not alright. They are living beings. Not killing them is not alright for us. We work hard and they come to eat our crops and kill our yaks. I think government do not have solution as well. We complain to park, but nothing happens. We have no choice, but to accept wild animals as part of our life”. Most respondents expressed how helpless and inadequate they

feel when wildlife frequently deplete their crops and kill their livestock and yet they are not able to do anything, driving them into stressful situations and making them more susceptible to anxiety, stress, and depression. These results highlight that the consideration of PsyCap can elicit new lines of thinking about HWC and wildlife management, and improvements to human well-being and happiness.

Our second research objective was to explore how the effects of indirect impacts on livelihood capitals vary between gender and wealth groups. Our analyses here suggested that the intensity and magnitude of indirect impacts varied greatly between respondents of different gender and wealth category, with female-headed households and those families in poor category tending to exhibit greater impacts than other groups. This was expected, as economic loss incurred through direct crop and livestock depredation was significantly higher for female-headed households and those families in poor category in relation to their annual income. These households lack both financial and human resources and are unable to either absorb the impacts of the losses or to protect their crop and livestock against wildlife through implementation of effective adaptation measures. This demonstrates that wealth and gender are an important determinant of HWC intensity. For example, respondent (#2) stated: "I cannot afford to put effective measures to keep out wild pigs and elephants and I get to harvest less than half of what I plant. I cannot go to guard crop at night. It is scary and not safe for us (females) to stay out in the field alone at night. There are risk of wildlife attack and people coming across border knap us. Sometime, men can assault us, and we can end up losing everything. I could not afford to send my eldest daughter to school. She is working as baby-sitter in Thimphu and helping me with her salary to feed her siblings".

Most female-headed households and those families in the poor wealth category have abandoned fields even when they could not produce enough food for their family. As illustrated in the above quote, some households stopped sending children to school, although their children aspire to learn. This finding suggests that women's vulnerability to indirect impacts of HWC is not only gender-based but shaped by their wealth status. Wealth allows subsistence farmers to lessen wildlife impacts by having increase access to effective crop and livestock protection measures (e.g., electric fence, green net fence to protect vegetables, male human resource for night crop guarding). Further the results also showed that, wealth makes subsistence farmers less vulnerable to losses cause by wildlife as wealth acts like a buffer.

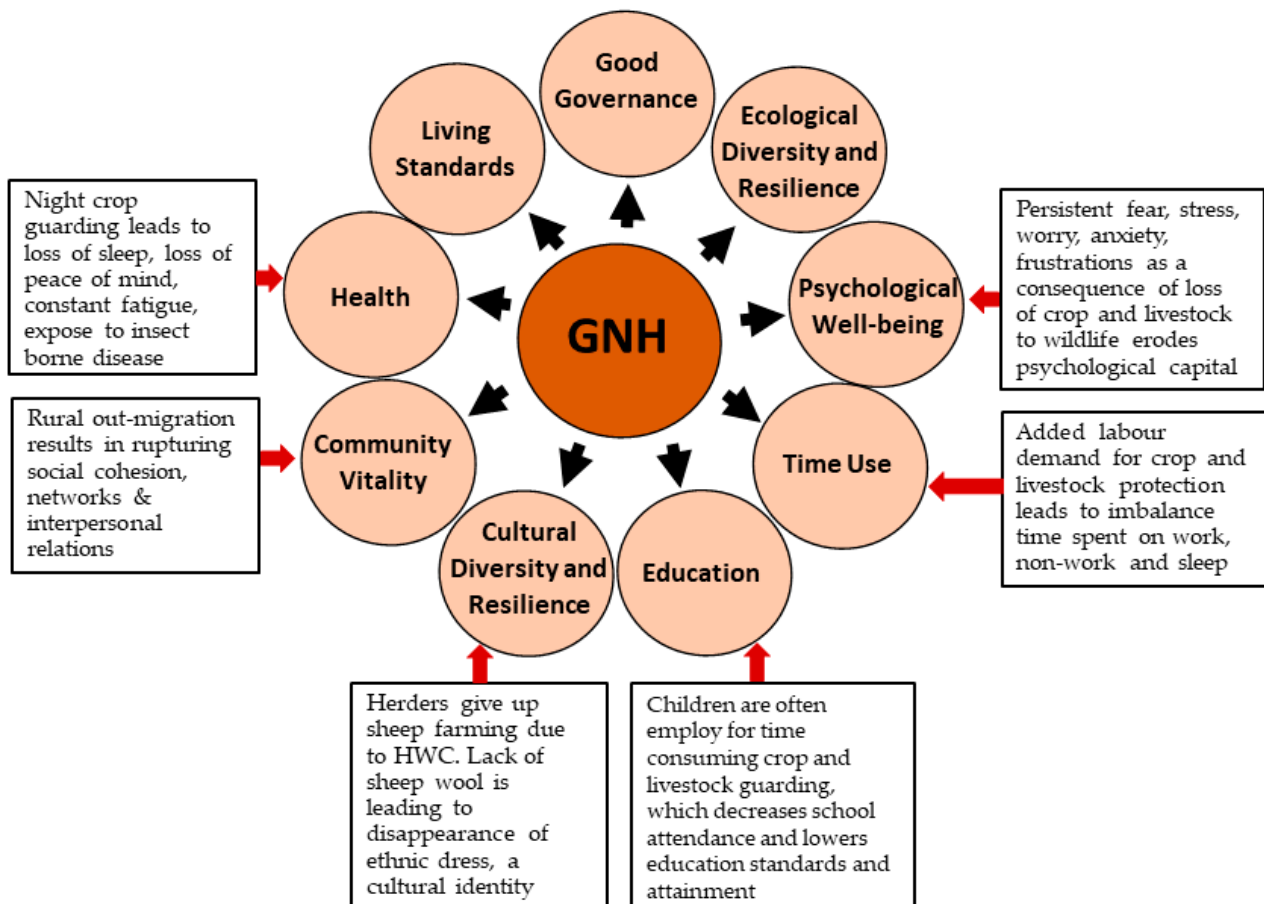
### *3.3. Effects of Indirect Impacts of HWC on GNH Domains*

Recognizing human well-being and happiness as the central tenets of GNH philosophy, we simultaneously examined the effects of indirect HWC impacts on GNH domains. As presented in Figure 4, the indirect impacts affect at least six of the nine GNH domains. In Bhutan, the GNH framework is a departure from the traditional global practices to measure a nation's wealth and well-being and the nine domains represent GNH values and signify the most important factors or conditions that give rise to well-being and happiness in the Bhutanese context. The effects of the indirect impact of HWC on these six GNH domains suggests that the achievement of the broader goal of GNH, particularly in subsistence farming communities, is at risk.

### *3.4. Key Findings*

Taken together, our findings suggest that indirect impacts can be a serious problem at the individual level, significantly impacting on his/her overall well-being and happiness. Respondents spoke of stress, frustration, worries, fears, anxiety, and anger as consequence of loss of crop and livestock to wild predators, despite enduring efforts made to reduce losses. These efforts have led to a loss of sleep, lack of peace of mind, and loss of income. The emotional pain that respondents expressed can be summed up in a statement made by respondent (#33) who stated: "Physically herders may look healthy, but mentally the worry and fear of losing yaks to predators will not let us sleep even at night". While direct costs

of HWC are borne by the whole family, household heads who are responsible for feeding the family are more likely to absorb the brunt of the negative psychological and physical consequences associated with indirect impacts. Such pressure can significantly undermine the collective well-being and happiness of subsistence farmers, especially female-headed households, and those in the poor wealth category. These households suffer from compounding vulnerability that erodes both traditional livelihood and psychological capitals. This study findings highlight how PsyCap must be considered along with traditional livelihood capitals as a significant facet of long-term HWC management in landscapes impacted by negative wildlife interactions.



**Figure 4.** Illustration of how indirect impacts of HWC effect on GNH domains which potentially can impede the achievement of GNH goals in general and subsistence farmer’s well-being and happiness in particular.

Importantly, our findings showed that not all wildlife interactions lead to negative outcomes. For instance, human elephant conflict in Sarpang district facilitated communities coming together and collaborating with forest officers to chase elephants back into forest whenever elephants entered their crop fields where electric fences were not effective. This strategy has contributed positively to social capital building. Respondents expressed their gratitude to forest staff for supporting them in such events leading to social participation and relationship building. Interestingly, despite having experienced the psychological stress as a result of indirect impacts, several respondents also described wildlife interactions as exciting and fun, providing opportunities for enjoyment, pleasure, and happiness, contributing towards PsyCap building. Respondents spoke of how hearing of bird songs makes them feel happy and encountering with wildlife species such as elephant and tiger make them feel spiritually enriched. These respondents used terms such as ‘treasure’ and ‘ornament’ to describe these species and spoke of how they add ‘beauty’ to forest and make

forest 'lively place'. For instance, respondent (#13) stated: "You will gain great pleasure through engagement with the forest and the animals therein, it can provide you with many experiences of pleasure, happiness and beauty". These findings may reflect the Buddhist belief of interconnectedness and living in harmony with nature (Yeshey et al., submitted).

#### 4. Discussion and Synthesis

Indirect impacts of HWC are intangible but their effect on the well-being and happiness of subsistence farmers is extremely significant. Approached through a well-being framework with contemporary livelihood capitals as human well-being constituents, this research provides an overview of the effect of indirect HWC impacts on traditional livelihood capitals with their outcomes cumulatively affecting PsyCap. Indirect impacts of HWC were multidimensional and their effects multidirectional, affecting social, financial, physical, natural, human, and psychological capitals. Our finding that indirect impacts of HWC greatly affect the psychological well-being of farmers highlights the need to consider PsyCap as a significant facet of long-term HWC management along with the traditional livelihood capitals.

##### 4.1. Impacts on Financial Capital

Our findings showed that, subsistence farmers suffer not only the effects of indirect HWC impacts but also indirect costs from wildlife damages. Crop guarding, livestock herding, repairing and maintaining damage property (e.g., fence) entails opportunity cost and income loss, placing constraints on building financial capital through other livelihood activities. Indirect costs are the financial investment incurred in repairing of damage properties (e.g., fence or house) and opportunity cost is the loss of income due to foregone activities (e.g., crop guarding). This is consistent with other studies in which HWC forced farmers to take one action instead of other more preferred and beneficial activity [69,70] thereby losing income. For instance, in some parts of Tanzania farmers must walk longer distance to collect water as water pipes were damaged by elephants [71], an activity often at the expenses of other more beneficial work [9]. Indeed, indirect costs incurred as much income loss to farmers as through direct crop and live-stock losses. A study in Narok County of Kenya found that subsistence farmers spent ~USD 180 on an average per month on wage labour for guarding crops [12] an amount which is substantial for the rural subsistence farmers who live on less than USD 2 per person per day [72]. Similarly, farmers in Amboseli and Mt. Kenya in Kenya spent USD 1913.00 and USD 1205.00, respectively on average for guarding livestock and crops, an amount much higher than their annual income [69].

##### 4.2. Impacts on Human Capital

This study supports the assertion that crop guarding is labour intensive [73–76] and night crop guarding in particular is a difficult task which is mostly carried out by men [3]. Our study found that during night crop guarding, farmers must spend nights out in the field without sleep irrespective of weather conditions, which is congruent with the findings of [77]. They are exposed to insect-borne diseases (e.g., malaria) or snake bites, wild animal attack, and assault by other people. In nearby Nepal, maximum human injuries and death caused by wildlife are found to occur during the night [78]. Similarly in the Amboseli region of Kenya, pastoralists spent most nights in the wet season guarding their livestock against predators [69]. Our study found that the physical and mental hardships associated with night crop guarding can have health implications possibly affecting human capital, which is consistent with the findings of [9,79] who pointed out the possible health implications of night crop guarding. More importantly, our study showed that children in landscapes impacted by HWC are missing school as most parents, particularly in female-headed households and those in the poor wealth category needed to use children for day crop guarding to lessen the pressure on household labour. Children missing school can affect their school attendance, their performance, and their overall educational attainment,

potentially creating lifelong inequalities in education, reducing the building of human capital and promoting the transfer of poverty to the next generation [80–82]. Our results are consistent with the findings of [83] in Uganda; [81,84] in Ethiopia and [85] in Rwanda.

#### 4.3. Impacts on Physical Capital

The results of this research also provide the evidence of wildlife's impact on physical capital through destruction of barriers (e.g., wooded, bamboo, bushes fences, hedges, and stone-wall), water pipes, and houses. Farmers observed wild pig (*Sus scrofa*) easily digging under and destroying most fences, thus any type of barrier targeting wild pigs needs to be partially buried, thereby adding to the construction costs. On the other hand, several farmers spoke of elephants breaking through electric fence by trampling on the poles while monkeys quickly learning to negotiate electric fences because of their agility and climbing skills. This not only affects the physical capital but adds to the cost (financial cost) of maintaining fences. Destruction of properties were reported in Ghana [86], in Bangladesh [87], in India [88,89] significantly affecting psychological well-being of those impacted.

#### 4.4. Impacts on Natural Capital

Our findings revealed wildlife impacts as one of the factors triggering abandonment of fields located far from settlements due to inability to guard or install effective crop protection barriers, especially among female-headed households. Our results supports the findings of [90] who stated how feminization of agricultural farming contributes to abandonment of fields further aggravating rural food insecurity. Our findings are consistent with [91] who showed how social capital influences farm abandonment. In abandonment of fields, we found that, there is a “neighbourhood effects” in keeping farms fallow; a farmer abandons his/her field following the abandonment of adjacent fields by other farmers, mainly because of the difficulties in protecting crops when all surrounding fields are uncultivated. Farmer must make such decision even when they are faced with food shortages and feeling economically insecure. While abandonment of fields may support ecosystem restoration [92], its impact on rural livelihoods is two-fold. The abandoned fields act as wildlife habitat and refuges leading to further intensification of HWC, which then increases the challenge to safeguard rural food security. Field abandonment thus has a positive effect on ‘natural capital’ from a wildlife perspective but can exacerbate poverty in subsistence farmers [93–96].

#### 4.5. Impacts on Social Capital

Socially, our findings also shed new light on the on-going debate on the pull and push factors of rural out migration. Our research showed that rural out migration is in part triggered by the hardships that subsistence farmers must endure to protect crops and livestock from wildlife damages resulting in displacement of family and community members, rupturing social cohesion, interpersonal relationships and community networks with significant negative impacts on social capital, an important asset for rural development. Congruent with the findings of [97], our research showed how rural out migration can impact on family cohesion and community vitality. Our results suggest that rural out migration increases women's workload, both in farm and non-farm thereby increasing their exposure to wildlife impacts and these supports the findings of [4,90,98] and increases the rate of field abandonment [90]. Similarly, elsewhere studies have also shown increasing rate of seasonal out-migration of men when families faced with severe food shortages [4,99] resulting in feminization of most mountain farming systems [98]. Rural out-migration affect food productivity, rural livelihood and rural socioeconomic development [98]. As Mendola [100] states, “no one element can be considered the single contributing force in fostering migration pressure, and the relative importance of each may be highly context-specific” there may be many push-pull factors of rural out migration in Bhutan; however, HWC emerged as one of them.

#### 4.6. Impacts on PsyCap

Fear, worry, anxiety, depression, stress, frustrations, and insecure feelings are typical examples of indirect impacts occurring through a chain of causation (see Figure 3). Our findings show that these emotions come into play through different pathways: (1) as a result of direct economic loss through crop and livestock depredation and destruction of property, and (2) as a consequence of implementation of HWC adaptation measures (e.g., crop guarding). This research has identified the pathways of indirect impacts cumulatively affecting the PsyCap. Consistent with [5,9,11,77], indirect impacts are on-going, in that whether or not wildlife depredates crops, kill livestock, damage property, or attack humans, the thought about wildlife may cause such damages triggers persistent fear, worry, frustration and uncertainty of life in farmers. These strong emotions linger on in their minds, significantly affecting their mental and psychological well-being [2,3,10]. This has been found in the Indian Sunderbans where women were found to have psychological problem with high rates of depression due to wildlife (e.g., tiger and crocodile) impacts [101] and children exhibiting chronic fear and stress when living in landscapes with elephants [77]. In these landscapes parents were also shown to constantly worry about the risk of children being attack by wildlife while going to school. Similarly, farmers in southern Kenya were reported to suffer emotional and mental distress due to crop losses to elephant damage [102].

#### 4.7. Differentiated Effect of Indirect Impacts

Indirect impacts of HWC are disproportionately distributed between communities and individuals. The level of severity of the impacts was influenced by gender and wealth. Female-headed households and those in poorer section of the society lacked both human and financial capitals to absorb the impacts of the losses or the capacity to put effective adaptation measures to protect their crops and livestock from wild predators, thereby compounding their vulnerability to wildlife impacts. For example, in addition to the risk of being attack by wildlife, there are also other reasons why women do not do night crop guarding. There is a practice of PchiruShelni which is culturally and socially entrenched in rural Bhutanese society. The term 'pchiru' means night and 'shelni' implies to wander around, meaning men wander in search of women, popularly known as 'night hunting'. Female-headed households reported to use day guarding while most wildlife activities are nocturnal, and they suffer higher crop loss. The loss of crops to wildlife have implication for these women's workload as food insecurity forces them to work harder to be able to provide [4] as women being food provider and caregiver due to their traditional positions in the family [71]. To fulfil women's obligation as food provider, women in Tanzania take equal responsibility in night crop guarding [71]. These findings highlight that gender perspectives matter in understanding not only the differential impacts of HWC but also the divergent responses to HWC created by gender inequality [9,13,103]. These gendered differences shape farmers' attitudes and willingness to coexist with wildlife [104]. As with climate change, where the poor are hit the hardest [105], such is the case with HWC where poor and female-headed households are typically the ones most impacted [3,9–11] because of their high dependency on limited resources for food or income. This may likely reinforce inequalities in the society.

### 5. Effects of Indirect HWC Impacts on GNH Goals

As seen in (Figure 4), indirect impacts of HWC can be affecting at least six of the nine GNH domains, mainly those that concerning psychological well-being and happiness. As described in the earlier sections, indirect impacts of HWC can compromise psychological well-being of subsistence farmers as strong emotions such as fear, worry, stress, frustration rise continuously and interfere with their ability to function in their daily life. 'Psychological well-being domain' evaluates quality of life based on reflective cognitive evaluations, such as life satisfaction and emotional reactions to life's events. In a similar vein, indirect impacts can affect 'Health domain'. The 1948 constitution of the World Health Organization (WHO) defined health as "a state of complete physical, mental and social well-being and not merely



the absence of disease or infirmity'. In GNH framework, health domain measures both mental and physical health believing that a healthy life is important to get through our daily activities without physical or mental stress [21].

Further, the increasing labour demand resulting from indirect impacts can be asserting pressure on the 'Time use domain' which evaluates the nature of time spent on paid work, unpaid work, leisure, and sleep, as well as the flexibility of working life, highlighting the importance of maintaining a harmonious worklife balance. The human body needs enough sleep to maintain optimum health and performance. Lack of sleep has negative influence on the mechanisms that facilitate physiological and cognitive function [106], however, as shown by our research findings, subsistence farmers in landscapes impacted by HWC are deprived of sleep. Indirect impacts can be affecting the 'Education domain' as children in female-headed households and those in poor families miss school due to their engagement in crop guarding and livestock herding (See Figure 4). This domain measures holistic schooling, literacy, knowledge, values and skills which are important for one's well-being and happiness in life.

The inability to herd sheep vigilantly due to labour shortages lead most yak herders to stop rearing sheep while others reduced flock size. Sheep are an important livestock species for alpine pastoral communities, primarily kept for wool which is used for making clothes and blankets. The declining of sheep farming may be leading to disappearance of traditional costumes of herders in Merak and Sakteng as several herders expressed this as an emerging concern. Their dress is one of their cultural ethnic identity and loss of this may impact on GNH's 'Cultural diversity and resilience domain' (Figure 4). Our result is congruent with the findings of [107] in that, the increased focus on conservation of large carnivores has impacted on Romanian shepherd's lives, livelihoods and their identity. Ethnic identity is important not only for one's cultural identity, but it is an important psychosocial resource that buffers the effects of ethnic discrimination and stereotypes [108]. Importantly, people subscribe to different religious beliefs and those believe in loving kindness, nonviolence, and compassion as core values have strong relationship and believe in animals deserving of ethical treatment with love, care and trust [60].

Equally important is the rural out migration with its drain upon rural communities going beyond shortage of labor, abandonment of fields and elder farmers' destitute. We encountered many elderly respondents expressing a sense of loss of connections and support within their community and being left out, a sign that GNH's 'Community vitality domain' was being impacted. Arguably, younger generations may have drawn to the magnetism of urban area's office jobs, educational and health facilities, and other comforts. A finding of GNH survey 2015 showed urban residents being happier than rural farmers [21]. From this perspective, indirect impacts may not have been the main underlying factor driving rural-urban migration, but it could have been one of the factors. Studies showed, ~3% of rural-urban migration in Bhutan is attributed to HWC [18].

Indirect impacts of HWC are multidimensional and so are GNH domains. Therefore, the effect of indirect impacts on the above six domains can have ripple effect on other three domains and hinder their achievement. For example, effect on psychological well-being may induce negative attitudes toward wildlife which may then impact on 'Ecological diversity and resilience domain'. Long exposure to psychological distress increases people's hostility and negative attitudes toward wildlife [109].

Bhutan has focused public policies on the well-being and happiness of its citizens by adopting the unique development philosophy—GNH. This policy framework focuses on the individuals who make up society and their well-being and happiness, rather than external economic phenomena. Our research is the first study to show how indirect impacts of HWC affect Bhutan's unique GNH framework, the philosophical foundation for the policy-making process and implementation of development in Bhutan.

## 6. Human Wildlife Interactions

Wildlife interactions occur on a gradient from positive to negative impacts. Despite having endured the varied effects of indirect impacts of HWC, most respondents also showed positive attitudes toward wildlife and support conservation. These respondents viewed wildlife impacts as a result of people's encroachment into wildlife habitat and accept losses caused by wildlife without much resentment, an indication of their persistence and adaptability to HWC induced impacts. This is to a large extent shaped by respondent's value system underpinned by Buddhist beliefs. For example, some respondents expressed encountering certain wildlife species as spiritually enriching experiences. They relate wildlife encounters to different positive emotional pathways such as pleasure, enjoyment, happiness, excitement, engagement, and fun. These suggest that human wildlife interaction is not always negative, wildlife provide a range of positive psychological benefits [110–113].

Our result supports the findings of [112,114,115] who stated happiness as one of the well-established positive feelings and emotions induced by wildlife encounters. Wildlife has important effects on human well-being dimensions which include human health, psychological well-being, social well-being, identity, and spirituality [116]. The popularity of 'whale watching' is an example of the significant inter-relationships between human and wildlife and the contribution this makes to psychological well-being [117]. Evidence has also shown that people get higher psychological benefits from natural environments with rich biodiversity [118] while loss of interaction with nature have shown to have negative impacts on human mental health [119,120]. Even in urban green space, people related only biodiversity to the perceptions of psychological restoration [121]. However, whether an interaction is considered positive or negative partly depends on the context and it is strongly related to economy and livelihood type.

### *Limitations of the Research*

Data collected for the research represents a single point in time without prospective or retrospective follow-up with the research participants on the issue being investigated for change over time to make causal inference as the research employed a survey design with cross-sectional and comparative components. Our data are research participant-led, who spoke for themselves, giving full account of their experience of the effects of indirect impacts of HWC on their life and livelihoods and therefore data revealed valuable insights. The strength of the data also comes from the nature of the data, in that data being narrative of their day-to-day experience of the indirect impacts of HWC for which respondents do not have to rely on their memory.

## 7. Conclusions

Our findings provide critical contextual information about the effects of different indirect impacts of HWC being experienced by subsistence farmers in landscapes impacted by HWC, and thus complement previous studies on indirect impacts. However our research findings advance our understanding of how these indirect impacts cumulatively effect the psychological well-being and happiness of subsistence farmers. This research also showed how these indirect impacts come into play through different pathways.

This research explored the types of indirect impacts of HWC in rural Bhutan and how these impacts affect PsyCap. A wide range of indirect impacts of HWC affect traditional livelihood capitals through different pathways with their outcomes cumulatively impacting the psychological capital greatly. Strong emotions such as stress, frustration, worry, fear, anxiety, and anger because of loss of sleep, lack of peace of mind, and loss of income have significant effects on psychological well-being. This undermines the collective well-being and happiness of subsistence farmers, highlighting how psychological capital must be considered along with traditional livelihood capitals as a significant facet of long-term HWC management in landscapes impacted by wildlife.

Our research findings also shed light on how indirect impact of HWC impedes six of the nine GNH domains, highlighting that the achievement of broader GNH goals, particu-

larly ones centered on well-being and happiness, in subsistence farming communities is at risk. Currently some subsistence farmers grudgingly reconcile themselves to the economic loss of wildlife and regard HWC as a critique of GNH. HWC therefore appears as a very delicate and complex issue for Bhutan government as it is for the farmers, and it is likely to challenge GNH goals.

These research findings suggest that any policy formulation aimed at maximizing human well-being and happiness must be multifaceted and interventions must contribute positively to poverty reduction, social well-being enhancement, greater equity, and biodiversity conservation. Policy actions should focus on human well-being factors such as psychological health, education, spiritual, social connection, and sense of community. The adoption of HWC mitigation-oriented policies must also provide additional social safeguards to enable woman to attain economic equality and allow children to aspire to the highest education they deem fit.

Finally, our research also lends itself to an extension. For example, future research could assess the positive benefits of wildlife interactions and add to the on-going efforts toward fostering human wildlife coexistence. Positive benefits of wildlife interactions occur on a gradient from positive to negative impacts.

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