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Investigating Blame for Human-Wildlife Conflict: Reason Conditions for Human-Elephant Conflict in Borneo

Abstract

Background and Research Aims

Blame attribution, the process of assigning responsibility for a negative event, has critical implications for managing human-wildlife conflict (HWC). This study advances understandings of blame attribution in human-elephant conflict (HEC) on the island of Borneo. Specifically, we advance theory on how internal (villager-related), and external (societal) attributions influence HEC and villagers' willingness to participate in its mitigation efforts.

Methods

We conducted surveys with villagers living in and near elephant habitats who have experienced HEC firsthand. We collected data on participants' attributions of blame for HEC, dividing them into internal and external factors, as well as their willingness to engage in HEC mitigation actions.

Results

Findings reveal that villagers attribute blame to both external factors, such as global demand for products cultivated in elephant habitat, and internal factors, including local misunderstandings of elephant behavior. Additionally, villagers who blamed external factors expressed a greater willingness to engage in HEC mitigation efforts.

Conclusion

These findings underscore the importance of blame attribution in shaping attitudes toward HEC mitigation. Villagers' propensity to engage in mitigation actions varies based on whether they attributed blame for HEC to external or internal factors.

Implications for Conservation

The study highlights the need to address socio-political and environmental drivers of HEC in Sabah, Borneo, Malaysia. Acknowledging external attributions may foster local participation in conflict mitigation efforts by leveraging underlying motives that gave rise to the source of blame in our study.

Keywords: Asiatic elephants; attribution theory; conflict; Malaysia; socio-ecological systems

1 Introduction

2 Scientists and officials are increasingly concerned that the ability of communities and institutions
3 to manage human-wildlife conflict (HWC), defined as interactions between people and wildlife
4 that result in harm to either side, is not strong enough to ensure long-term wildlife conservation
5 (Peterson et al. 2010; Hoare, 2015; Hodgson et al., 2020). At the local level, people living in
6 areas affected by HWC often lack the resources, training, or support to manage these conflicts
7 effectively (Madden, 2004). At state and national levels, policies and funding are limited, while
8 development goals often take priority over conservation needs (Toh & Grace, 2006; United
9 National Development Program [UNDP], 2008). These gaps in capacity, across all levels, make
10 it harder to reduce conflict and design sustainable, long-term solutions for HWC (Acrenaz et al.
11 2007; Desai & Riddle, 2015).

12 Blame attribution is central to understanding how people interpret and respond to HWC.
13 Blame is more than a reaction; it reflects judgments about cause, responsibility, and who should
14 be held accountable for negative events (Shaver, 2004). These judgments are shaped by personal
15 experience, cultural context, and broader expectations about fairness and justice (Leland et al.,
16 2021). The way blame is assigned can influence outcomes such as forgiveness, cooperation,
17 trust, or disengagement (Kim et al., 2006). Blame attribution is typically categorized into two
18 types. Internal attribution involves holding oneself or one's own group responsible for the
19 problem. External attribution assigns responsibility to outside forces such as institutions, other
20 groups, or environmental and economic systems (Heider, 1958). Broader social factors,
21 including political beliefs and values, can influence how blame is assigned. For example,
22 political ideology can shape whether someone holds individuals or social systems responsible for
23 complex societal problems such as homelessness or violence (Pellegrini et al., 1997; Joslyn &
24 Haider-Markel, 2013).

25 HWC is an ideal but understudied domain to further understand blame attribution because
26 outcomes are typically negative (Peterson et al. 2010). However, in comparison to other arenas,
27 researchers have scantily studied the role of blame attribution in wildlife contexts. The literature
28 often mentions blame ascription in the context of HWC, but often in passing. However, a small
29 number of studies have focused increasingly on blame, exploring to whom or what the media
30 assigns blame when reporting instances of HWC (Stafford et al., 2018; Dayer et al., 2019
31 [species itself, policies, or agencies]). Because blame has been undertheorized and empirically
32 examined, particularly in HWC contexts, we asked two research questions: How do villagers
33 attribute blame to HWC? and How do different blame attributions relate to villagers' willingness
34 to participate in various forms of HWC mitigation?

35 To answer these questions, we applied attribution theory, with a focus on on internal
36 versus external blame attributions, to the context of human-elephant conflict (HEC) in Borneo,
37 Malaysia. In this region, growing human populations, expanding infrastructure, and the rapid
38 proliferation of oil palm plantations have brought people and Bornean elephants (*Elephas*
39 *maximus borneensis*) into closer contact (Estes et al., 2012; Evans et al., 2020). These
40 interactions often result in crop damage, property loss, and, at times, retaliatory actions against
41 elephants (Cheah & Yoganand, 2022). HEC has been framed as a territorial struggle between
42 humans and elephants. However, emerging perspectives suggest that affected communities often
43 perceive HEC not as a direct conflict with elephants, but as a symptom of deeper political-

economic forces such as land dispossession, industrial agriculture expansion, or limited community-level agency in HEC governance (Doolittle, 2004; Margulies & Karanth, 2018). Recognizing this framing is important, as it influences how blame is assigned and how affected communities respond to conflict. Although the Sabah Elephant Action Plan 2020–2029 outlines mitigation protocols and conservation priorities, the persistence of conflict suggests that deeper insights into local perceptions of responsibility and accountability are needed (Othman et al., 2019, 2022; Zafir & Magintan, 2016). To our knowledge, ours is the first study to quantitatively investigate how different types of blame attribution (e.g., internal/villager-based vs. external/societal or institutional) influence local behavioral intentions to engage in HEC mitigation.

Theoretical Background

The literature suggests that the blame for HWC outcomes is often distributed across multiple actors and scales. At the micro level, villagers and local stakeholders may blame government wildlife agencies for poor planning, policy enforcement, inability to manage a population, or imposing wildlife risks without adequate mitigation (Dickman, 2010; Moreto, 2019). Conversely, institutions frequently assign blame back to local communities for inadequate cohabitation strategies or for contributing to conflict through land-use practices (Malley & Gorenflo, 2023). In some cases, blame is assigned horizontally, within the same social group. For instance, Pooley (2016) demonstrated that Nile crocodile (*Crocodylus niloticus*) attacks were sometimes perceived as divine punishment for immoral behavior. Non-human entities may also be blamed for HWC. Jadhav and Barua (2012) described how elephants (*Elephas maximus*) were perceived as demonic entities in parts of Northeast India. Similarly, Hahn (2019) documented retaliatory lion killings (*Panthera leo*) by Maasai herdsman in Kenya after repeated livestock losses.

Environmental and systemic drivers also feature prominently. Factors such as overlapping land use with large carnivores (Viollaz et al., 2021), resource scarcity, and chemical pollution (Guerreiro, 2019) are increasingly recognized as contributors to conflict. These examples demonstrate that blame attribution in HWC settings can span multiple social and ecological levels and moves across a scalar continuum (individual, community, institutional, and societal contexts). Blame attribution is a near-universal human response to conflict, but an overly narrow focus on either internal psychology or broad structural conditions risks missing the complexity of real-world dynamics (Velempini 2021). We consider that though viewing blame as solely a binary (internal vs. external) is useful, it is perhaps more helpful to treat blame as a product of, and contributor, to complex socio-ecological systems. Understanding these layered blame dynamics is essential not only for interpreting local perceptions of conflict but also for designing more inclusive, effective, and sustainable mitigation strategies.

To conceptualize this complexity, we developed a conceptual model of blame attribution specific to HEC (Figure 1). The model distinguishes between two broad attribution categories: internal and external. Internal attribution is depicted as a nested hierarchy of responsibility, ranging from general references to “humans,” to groups like “villagers,” and down to the “individual.” This structure captures how blame may be progressively focused based on proximity or perceived agency. External attribution, by contrast, is organized into four domains: environmental, societal, institutional, and economic, with situational factors positioned at the

center to illustrate the intersectional and context-dependent nature of blame. Together, these dimensions reflect the diverse ways that individuals and communities assign blame for HEC.

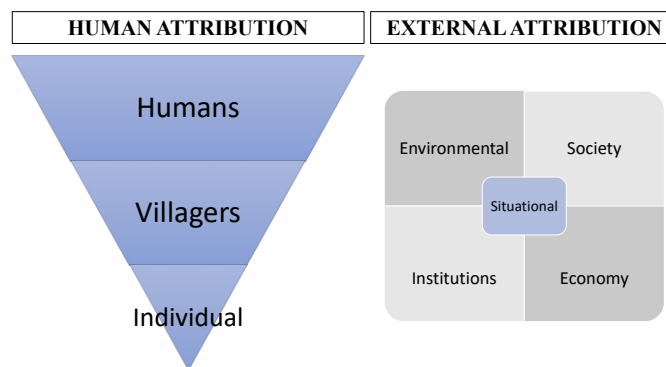


Figure 1. Conceptual model of internal and external blame attribution in HEC. Adapted from Heider's (1958) original conceptualization and social-ecological systems thinking.

Research indicates that who or what people blame for problems has significant implications for their responses. Blame attribution influences how individuals frame both the causes of conflict and the possible solutions, with the potential to either escalate or de-escalate HWC (Dayer et al., 2019). Attribution-driven tactics such as invoking shame or guilt can be used to stimulate action, yet these tactics are typically most effective when individuals perceive themselves as responsible (Tangney & Dearing, 2002). In many HWC contexts, blame is often directed at institutions, global economic forces, or environmental degradation rather than at local communities or individuals (Batanova et al., 2014; Rubino et al., 2020). This external orientation may actually enhance a willingness to act, particularly when the conflict is framed as the result of larger systemic pressures rather than local failings (Simon & Klandermans, 2001).

Conversely, when blame is internalized, such as when individuals believe they or their community are at fault, it may lead to emotional disengagement or reduced motivation to participate in mitigation efforts (Peeters et al., 2019). This pattern is consistent with literature suggesting that blame deflection serves as a coping mechanism to avoid perceived attribution, which, over time, can result in withdrawal from intervention or resistance to externally driven solutions (Bandura et al., 1996; Stoll-Kleemann & O'Riordan, 2020). Understanding how blame is assigned in HWC contexts is therefore critical not only for interpreting community attitudes but also for shaping conservation messaging and designing interventions that align with local perceptions of responsibility (Nicolai et al., 2022).

Relatedly, attribution errors may be made. Specifically, when negative outcomes happen to an individual, they often blame the situation, whereas they tend to blame others' behavior or dispositional qualities for negative outcomes to that person while diminishing the contribution of situational characteristics (Flick & Schweitzer, 2021). Doubleday and Adams (2020) illustrated blame attribution and partiality with a compelling case from rural India: after a woman failed to collect enough fodder due to risk of tiger (*Panthera tigris tigris*) attack, her husband blamed and then beat her for establishing a deficient amount of bargaining power with the milkman after family income was substantially reduced that day. Instead of blaming the tiger population or the

sanctuary system, the husband blamed the woman. In this study, forest officials blamed the community for choosing to live in a high-risk area though the sanctuary itself had introduced those risks, and the authors advocated for the feminization of natural resource collection and use as a way for actors to shift blame for negative outcomes from women to tigers. This case study underscores how uneven, or conflicting blame assignments can hinder consensus and disrupt coordinated action.

Despite its relevance, the role of blame attribution in shaping responses to HWC has received limited empirical attention, particularly in species-specific contexts such as HEC. Without careful examination of the antecedents, dynamics, and consequences of blame, mitigation strategies may rest on flawed assumptions. To address this gap, we analyzed HEC survey data from Sabah, Borneo, Malaysia, to explore how local communities assign blame and how these attributions influence their willingness to participate in conflict mitigation. By linking blame attribution to behavioral intent, this study contributes new insights into the social and ecological dimensions of HEC and offers guidance for designing more inclusive, community-informed conservation strategies. Based on our review, we test three hypotheses:

- H1: villagers tend to assign blame to external factors rather than to themselves or their communities;
- H2: villagers' external blame attributions, particularly those tied to global commodity demand and habitat degradation, will be positively associated with a willingness to act; and
- H3: villagers' internal blame attributions will be associated with lower willingness to engage in mitigation efforts.

Methods

Study Area

This study was conducted across multiple rural communities situated within Sabah's Managed Elephant Ranges (MER), encompassing the Lower Kinabatangan floodplain in eastern Sabah, Malaysian Borneo. This floodplain forms part of one of Southeast Asia's most critical biodiversity hotspots, supporting a range of endemic and endangered species, including the Bornean elephant, a genetically distinct subspecies of the Asian elephant (Fernando et al., 2003; Estes et al., 2012). The Lower Kinabatangan region is a geologically young, alluvial floodplain shaped by prolonged fluvial sedimentation, with much of the area lying below 30 meters in elevation and highly prone to seasonal inundation (Horton et al., 2017). The region experiences a humid tropical climate with high annual rainfall averaging around 3,000 mm, most of which occurs during the northeast monsoon between November and January (Hai et al., 2001).

The landscape is a mosaic of riparian forests, freshwater swamps, oxbow lakes, and lowland dipterocarp forests that has become increasingly fragmented due to the rapid expansion of oil palm plantations and related infrastructure. (Alfred et al., 2012). These land-use changes have led to a significant decline in habitat availability and connectivity, thereby intensifying HEC in surrounding agricultural communities (Othman et al., 2019; Rubino et al., 2020). The Bornean elephant population in the region, estimated at 1,500 to 2,000 individuals, now routinely traverses cultivated areas, resulting in crop loss, property damage, and occasional retaliatory actions by affected communities (Cheah & Yoganand, 2022). According to the Sabah Wildlife

Department (SWD), over 50 elephants were killed between 2018 and 2022 due to poisoning, snaring, and gunshot wounds, underscoring the persistent challenges to coexistence (Othman et al., 2022). While the Sabah Elephant Action Plan 2020–2029 aims to support long-term coexistence through landscape-level strategies, its implementation has been constrained by limited resources, governance gaps, and mismatches between institutional policy frameworks and local realities.

Study Design

We categorized the causes of HEC using two common attributional styles: internal and external (Lei & Rau, 2021). In this study, internal attribution refers to self-blame, where villagers see their own actions, either individually or as a group, as contributing to HEC. This approach follows cultural perspectives in many East Asian contexts, where groups, rather than individuals, are often seen as the main actors (Menon et al., 1999). In contrast, external attribution refers to assigning blame to factors beyond oneself.

However, we argue that the simple internal-versus-external distinction does not fully explain the social and ecological complexity of HEC. In our study, we defined external attributions to include institutions, society, and elephants. Internal attributions included actions taken by villagers themselves, both past and present (Kim et al., 2006). We used both internal and external attributions as predictor variables to examine the community's willingness to take part in actions aimed at reducing HEC. We grouped our attribution variables as follows:

Internal (villagers)

1. Villagers' dependence on crops for income
2. Villagers' dependence on crops for subsistence
3. Villagers' dependence on palm oil trees for income
4. Poor understanding of elephant behavior among villagers

External attribution (institutional)

5. Expanding human infrastructure (e.g., roads)
6. Strict laws that protect elephants

External attribution (natural/elephant)

7. Elephants are unpredictable
8. Damage to crops by elephants
9. Growing elephant populations
10. Competition for resources between humans and elephants

External attribution (societal)

11. Global demand for products cultivated in elephant territory
12. Human degradation of elephant habitat.

To ensure respondents felt comfortable sharing their views and did not fear negative consequences, we avoided using direct terms such as blame or fault in our survey questions. Instead, we relied on the concept of reason conditions for blame (Heuer, 2010). We originally planned to measure blame using a 1 to 5 scale, where 1 meant least important and 5 meant the most important reason for HEC. However, we simplified this to a binary scale, where 0 represented no blame and 1 represented blame. While measuring the strength and underlying reasons for blame would provide a more complete understanding (Lowry, 2011), that level of detail was beyond the scope of this exploratory study and should be considered in future

research. We selected ten predictor variables (X1 to X10) for further analysis based on whether they showed a correlation greater than 0.2 with the dependent variables (see Table 1).

We also examined how blame is connected to the willingness to take action. Prior research suggests that how people assign blame can affect their thoughts, attitudes, and behavior. For example, people may consider forgiveness or revenge based on how blame is attributed (Bradfield & Aquino, 1999). Kogut (2011) showed that people are less likely to help a victim if they believe the victim is responsible for their situation. Takaku (2001) found that blaming others can have a different emotional effect than blaming oneself. When individuals or groups accept blame, they may be more willing to participate in actions that correct the issue (Bilstein, 2018). This relationship between blame and accountability may strongly influence whether individuals or communities are willing to engage in efforts to reduce HEC.

Using the action categories proposed by Naito et al. (2022), we grouped participants' willingness to act into three types of transformative actions:

- a. Private action: actions or behavior conducted on a personal level to live alongside elephants
- b. Social signaling action: actions or behavior involving public act, like sharing or supporting values, attitudes, identities and opinions to further inspire others in participating in elephant conservation and minimizing the conflict.
- c. System changing action: actions or behaviors aimed at supporting, reforming or developing a formal acceptable system to manage the conflict and promote elephant conservation.

These three types of action form our 17 dependent variables, labeled Y1 to Y17 (Figure 2). We measured willingness on a 1-to-5 Likert scale, where 1 meant "unwilling" and 5 meant "very willing."

Private action	Social signaling action	System changing action
• Willing to appreciate elephant because they exist (Y1). • Willing to totally change the way to earn income to avoid HEC (Y2). • Willing to use non-injurious elephant deterrents (Y3). • Willing to receive small salary to live near elephants (Y4). • Willing to diversify income source to minimize HEC (Y5). • Willing to receive expert's instruction on how to deal with elephant behavior (Y6). • Willing to recognize elephant's right to move through the landscape unharmed (Y7). • Willing to change personal negative views about elephants (Y8).	• Willing to advocate for elephant conservation in community (Y9). • Willing to support creation of village level committee to deal with elephants (Y10). • Willing to travel other villages to learn how to minimize HEC (Y11).	• Willing to participate in HEC record keeping efforts (Y12). • Willing to volunteer as a member of village committee to minimize HEC (Y13). • Willing to participate in scientific studies involving elephants (Y14). • Willing to help with project that ensure the long-term survival of elephants in Sabah (Y15). • Willing to purchase insurance that will pay for loss due to elephant damage (Y16). • Willing to join elephant ranger team for village (Y17).

Figure 2. Categorization of mitigation actions reflecting willingness to address HEC.

Data Collection

After approval by the Texas State University Institutional Review Board (#6716), we surveyed villagers living within a 5-km zone of the Kinabatangan, Tabin, and Central Sabah Elephant Managed Ranges (MERs) (Figure 3). The initial list of prospective subjects officially reported HEC to the Sabah Wildlife Department or experienced it (N=37). We concentrated our sampling efforts on farmers and parcel caretakers (in the case of absentee landowners) in 27 villages that fell within the buffer and where HEC had been identified (Diwara, Tampasak, Bobotong, Batu Puteh, Bauto, Brantian, Bulot, Desa Permai, Diwara, Gambaron, Kalabakan, Kenang-Kenangan, Karamuak Dalam, Kg. Abai, Kg. Litang, Kukuamas, Liningkung, Mukandut, Murut Ulu Kalabakan, Sg. Udin, Simatuoh, Tampasak, Tangkugan/Kuamut, Telupid, Tenaga Baru, Ulu Muanad, and Ulu Murut).

We collected data in three waves: February 2020 (n=29), July 2022 (n=31), and March through May 2023 (n=58). These waves were determined based on access, local conditions, and COVID-19 disruptions. The number of respondents per region roughly corresponded with the intensity and frequency of HEC as reported by the SWD and local leadership. For example, higher sampling concentrations were achieved in villages such as Kalabakan and Kinabatangan, where elephant-related conflict has historically been more acute. Final locations accessed for this study were based on HEC information obtained from official documents and state and local officials and then identified by villager leadership. The research team administered surveys by arranging a specific day and time with each village in advance and conducting interviews at preferred locations to ensure comfort and participation. The research team had one chance to collect data and gathered as many prospective participants as were available during the visit. We asked participants to reflect on their experiences with HEC over the past five years.

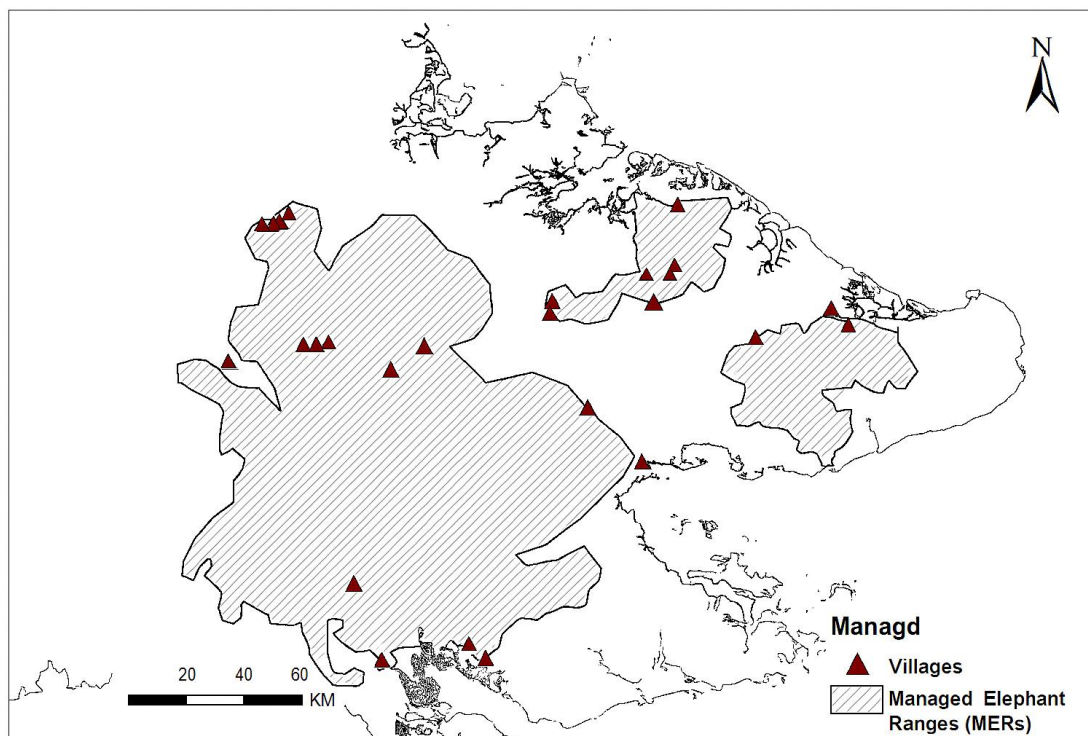


Figure 3. Geographic distribution of surveyed villages within and near Elephant Managed Ranges (EMRs) in Sabah, Malaysia.

Data Analysis

We used descriptive statistics (mean and standard deviation) to summarize the demographic characteristics of study participants. To examine the relationship between respondents' willingness to engage in HEC mitigation (ordinal dependent variables Y1–Y17) and perceived causes of conflict (predictor variables X1–X10), we employed ordinal logistic regression using the cumulative link model (CLM) framework. All analyses were conducted in R version 4.3.1 (R Core Team, 2023) via RStudio version 2023.06.1+524, utilizing the ordinal package, version 2023.12-4.1 (Christensen, 2023). The `clm()` function was used to estimate model coefficients, which reflect the direction and strength of the relationship between predictors and ordinal response categories. Significance was evaluated at $p < 0.05$. To ensure reproducibility and retain individual-level resolution, we linked all responses using anonymized survey IDs. This structure allowed us to assess how each participant's blame attribution corresponded with their stated willingness to take specific actions.

To select predictors, we first examined the correlation between blame attribution variables and willingness-to-act items, retaining variables with correlation coefficients $\geq |0.2|$. These ten selected predictors (X1–X10) were used in model construction and are presented in Table 1. For each of the 17 response variables (Y1–Y17), we constructed a separate ordinal logistic regression model with simultaneous consideration of the selected predictors. We interpreted model coefficients to assess the direction and magnitude of each effect and examined statistical significance to determine meaningful associations. To improve model robustness, we applied model averaging using the MuMIn package, version 1.48.4 (Bartoń, 2024). The `model.avg()` function combined parameter estimates from multiple models weighted by their corrected Akaike Information Criterion (AICc) values, allowing us to identify the most influential predictors across all outcomes (Lundberg et al., 2019).

Results

We surveyed 118 villagers, of whom 109 reported experiencing HEC. Only these 109 responses were included in the analysis. The sample was majority male ($n = 77$, 71%), and the mean age of respondents was 42.7 years ($SD = 11.3$). Most respondents were over the age of 35 ($n = 91$, 83%). In terms of ethnicity, respondents primarily identified as Sungai ($n = 45$, 50%) or Kadazan-Dusun ($n = 34$, 38%). Study participants' monthly household income ranged from RM150 to RM5,000, with a mean income of RM938 ($SD = RM691$), approximately USD \$204 ($SD = \150). Regarding education, most respondents had achieved at least a primary education ($n = 41$, 38%), with $n = 53$ (50%) attaining secondary or higher education.

On HEC experiences, 81% ($n = 88$) reported experiencing crop or property damage to varying degrees, with incidents occurring rarely to frequently. Perceptions of crop damage trends over time indicated that $n = 50$ (47%) saw no change, while $n = 35$ (33%) believed incidents were increasing. Most ($n = 59$, 57%) had not participated in SWD-led training or meetings within the past five years, although $n = 59$ (61%) were attended by agency representatives.

Preferred sources of learning about elephants were friends and family (n = 49), social media (n = 32), and popular press (n = 33).

Respondents were drawn from 27 villages across Sabah's MERs, with variation in representation. Communities such as Kenang-Kenangan (n = 13), Kg. Abai (n = 9), and Kg. Litang (n = 9) had higher participation, whereas many villages such as Murut, Desa Permai, and Tangkutan/Kuamut were represented by one respondent. Due to this uneven geographic distribution, comparative statistical analysis by village was not feasible. However, all responses were included to retain the breadth of perspectives across the landscape.

Attributing Blame

Our preliminary analysis revealed that ten out of the twelve predictor variables exhibited correlation coefficients of ± 0.2 or higher, suggesting their potential relevance for inclusion in our model (Table 1).

Table 1. Correlations between blame attributions and HEC mitigation willingness. Correlation coefficients between 10 blame attribution variables (X1–X10) and 17 mitigation actions (Y1–Y17) indicate how perceived causes of HEC relate to villagers' willingness to act. Only variables with correlations $\geq |0.2|$ are included.

Attribution		Predictor variables (X1 to X10)	Response Variables	Correlation coefficient
Internal attribution	Villagers	Villager dependence on crops for income (X1)	Joining elephant ranger team for my village (Y17)	-0.21
		Villager dependence on crops for subsistence (X2)	Totally change the way I earn income to avoid HEC (Y2)	0.29
		Villager dependence on palm oil trees for income (X3)	Receive a small salary to live near elephants (Y4)	0.26
		Poor understanding of elephant behavior among villagers (X4)	Appreciate elephants because they exist (Y1)	-0.20
	Institutional	Expanding human infrastructure (e.g., roads) (X5)	Volunteer as a member of a village committee to minimize HEC (Y13)	0.25
		Strict laws that protect elephants (X6)	Receive expert instruction on how to deal with elephant behavior (Y6)	0.21

External attribution	Natural (elephant)	Elephants are unpredictable (X7)	Appreciate elephants because they exist (Y1)	0.23
		Growing elephant population (X8)	Appreciate elephants because they exist (Y1)	-0.24
		Global demand for products cultivated in elephant territory (X9)	Totally change the way I earn income to avoid HEC (Y2)	0.37
	Societal	Human degradation of elephant habitat (X10)	Appreciate elephants because they exist (Y1)	0.27

Further analysis using model averaging of ordinal logistic regression identified three of these ten predictors as statistically significant in explaining respondents' attribution of blame for HEC (Table 2):

- i. Poor understanding of elephant behavior among villagers (X4)
- ii. Global demand for products cultivated in elephant territory (X9)
- iii. Human degradation of elephant habitat (X10).

These three predictors emerged as the primary reasons to which respondents attributed blame for HEC. Notably, the variable representing global demand for products cultivated in elephant habitats (X9) produced a positive beta coefficient ($\beta = 1.72$, $p = 0.001$). Similarly, human degradation of elephant habitat (X10) also showed a positive association ($\beta = 1.08$, $p = 0.04$). In contrast, the internal attribution to villagers' poor understanding of elephant behavior (X4) yielded a negative coefficient ($\beta = -2.06$, $p = 0.006$). This negative association indicates that respondents who internalize blame may be less likely to perceive HEC as a broader systemic issue, potentially reflecting a sense of resignation or reduced perceived efficacy.

Table 2. Model-averaged coefficients for predictors of blame attribution. Results from ordinal logistic regression show which internal and external factors significantly influence villagers' likelihood to assign blame for HEC. Positive or negative beta coefficients indicate direction and strength of influence.

Predictors (Blame vs. No blame)	Estimate (β)	S.E.	z-value	Pr(> z)
Poor understanding of elephant behavior among villagers (X4)	-2.13	0.76	2.80	0.005**
Global demand for products cultivated in elephant territory (X9)	1.68	0.52	3.20	0.001**

Human degradation of elephant habitat (X10)	1.08	0.53	2.01	0.04*
Strict laws that protect elephants (X6)	-0.77	0.58	1.32	0.18
Villager dependence on crops for subsistence (X2)	-0.85	0.67	1.27	0.20
Expanding human infrastructure (e.g., roads) (X5)	0.65	0.56	1.15	0.24
Villager dependence on palm oil trees for income (X3)	0.93	0.87	1.06	0.28
Villager dependence on crops for income (X1)	-0.69	0.76	0.90	0.36
Elephants are unpredictable (X7)	-0.36	0.49	0.74	0.45
Growing elephant population (X8)	-0.1824	0.44	0.41	0.68

* indicates a p-value less than 0.05 (significant at the 5% level).

** indicates a p-value less than 0.01 (significant at the 1% level).

*** indicates a p-value less than 0.001 (significant at the 0.1% level).

Threshold Analysis for Willingness Categories

The ordinal logistic regression model identified a highly significant threshold between categories 2 ("not that willing") and 3 ("somewhat willing"), with an estimated threshold value of -5.2322 ($p < 0.001$). This sharp distinction in willingness categories reveals meaningful differences in how blame attributions influence villagers' motivation to act:

- (X4) poor understanding of elephant behavior: Associated with a decreased likelihood of being in category 3 ("somewhat willing").
- (X9) global demand for products cultivated in elephant territory: Associated with an increased likelihood of being in category 3 ("somewhat willing").
- (X10) human degradation of elephant habitat: Associated with an increased likelihood of being in category 3 ("somewhat willing").

Willingness to Act as a Function of Blame Attribution

We then examined how these three significant predictors influenced villagers' willingness to engage in specific mitigation actions (Table 3). These actions ranged from individual changes (private) to community signaling (social), to more institutional or systemic responses.

(X4) Understanding of elephant behavior: Internal (villagers) attribution

The individual coefficient for X4 ($\beta_4 = -2.06$, $p = 0.006$) indicated a significant negative relationship with the response variable Y11, which measures the willingness to travel to other villages to learn how to minimize HEC.

(X9) Global demand for products from elephant territory: External (societal) attribution
External attribution to global market demand was strongly linked to willingness across multiple action types. Specifically, it was significantly associated with a willingness to:

- Completely change income-generating activities to avoid HEC ($\beta_2 = 2.18$, $p < 0.001$)
- Diversify income sources ($\beta_5 = 1.29$, $p = 0.005$)
- Advocate for elephant conservation ($\beta_9 = 1.45$, $p = 0.003$)
- Travel to learn from other villages ($\beta_{11} = 1.72$, $p = 0.001$)
- Purchase insurance for HEC-related losses ($\beta_{16} = 1.23$, $p = 0.005$)

(X10) Human degradation of elephant habitat: External (societal) attribution
Attributing blame to habitat degradation was associated with:

- Greater appreciation of elephants for their existence ($\beta_1 = 1.18$, $p = 0.008$)
- Willingness to travel for learning (Y11, $\beta_{11} = 1.08$, $p = 0.04$)
- Willingness to purchase insurance ($\beta_{16} = 1.06$, $p = 0.02$)

However, it was negatively associated with the willingness to receive expert instruction on elephant behavior ($\beta_6 = -1.18$, $p = 0.008$).

Table 3. Blame attribution predictors and willingness to act on HEC. Shows significant links between three blame predictors (X4, X9, X10) and specific actions villagers are willing to take. Each action is categorized as private, social signaling, or system-changing behavior.

Predictor variables	Estimate	Pr(> z)	Response variables (willingness to take action)	Action categories
X4	-2.06	0.006**	Willing to travel other villages to learn how to minimize HEC (Y11)	Social signaling action
X9	2.18	1.81e-05***	Willing to totally change the way to earn income to avoid HEC (Y2)	Private action
	1.29	0.005**	Willing to diversify income source to minimize HEC (Y5)	Private action
	1.45	0.003**	Willing to advocate for elephant conservation in community (Y9)	Social signaling action

	1.72	0.001**	Willing to travel to other villages to learn how to minimize HEC (Y11)	Social signaling action
	1.23	0.005**	Willing to purchase insurance that will pay for loss due to elephant damage (Y16)	System changing action
X10	1.18	0.008**	Willing to appreciate elephants because they exists (Y1)	Private action
	-1.03	0.02*	Receive expert instruction on how to deal with elephant behavior (Y6)	Private action
	1.08	0.04*	Willing to travel other villages to learn how to minimize HEC (Y11)	Social signaling action
	1.06	0.02*	Willing to purchase insurance that will pay for loss due to elephant damage (Y16)	System changing action

* indicates a p-value less than 0.05 (significant at the 5% level).

** indicates a p-value less than 0.01 (significant at the 1% level).

*** indicates a p-value less than 0.001 (significant at the 0.1% level).

These findings are visually summarized in Figure 4, which maps the significant blame attribution variables to corresponding types of willingness to act.

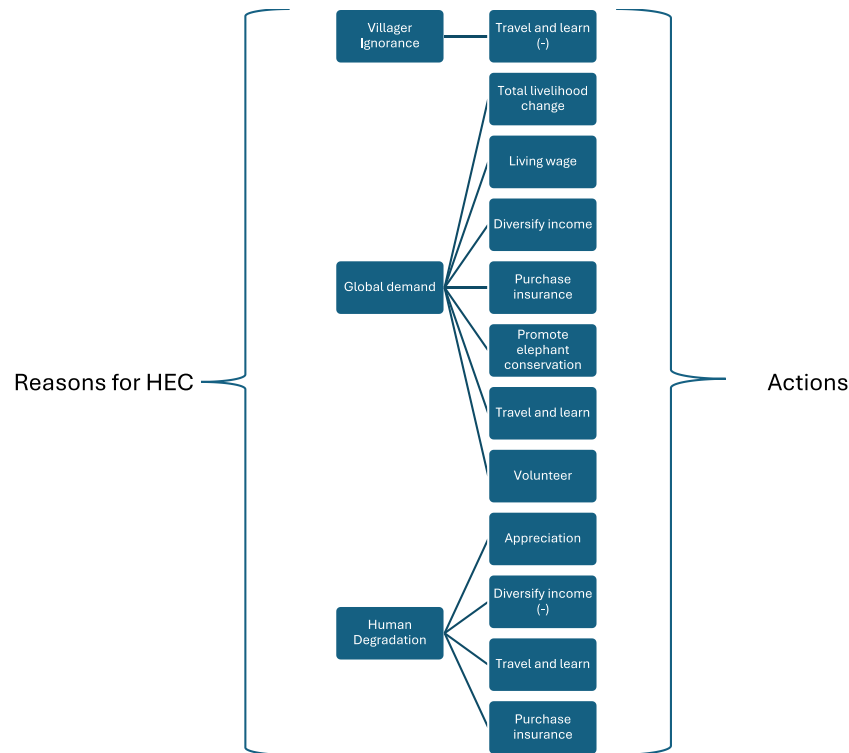


Figure 4. Visual model linking significant blame attribution predictors to villagers' willingness to engage in HEC mitigation

Discussion

Blame Attribution

Our findings revealed a clear distinction between internal versus external blame attributions. Findings suggest that respondents who assigned blame for the occurrence of HEC were signaling a desire to maintain a sense of control and predictability about the conflict, as well as expressing unmet expectations about how it should be managed (Malle et al., 2014; Ames & Fiske, 2015). Given HEC has persisted in Sabah for over half a century, perhaps villagers, at this point, see HEC as foreseeable, anticipated, or even intentional (Alicke, 2000; Ames & Fiske, 2015), or they have grown weary of carrying the burden of living with Bornean elephants (Bernama, 2016), thus providing the impetus to assign blame. The literature on the Sabah case offers several variables that could influence blame attribution in this study, such as emotions, economic loss, or power imbalances (Zafir & Mangitan, 2016; Rubino et al., 2020; Pimid et al., 2022). Further research is needed, however, to develop models that explain the drivers of blame attribution in HEC and HWC contexts.

Causal factors revealed by this study were primarily anthropocentric, oriented towards political-economy and activities that degrade elephant habitat. Villagers rarely blamed themselves for HEC. Studies indicate that denying culpability is a tactic people use to protect oneself from outcomes or repercussions (Sedikides et al., 1998). Since our study showed that behaviors and policies causing elephant habitat degradation increased willingness to act, it suggests that past environmental events may influence how people assign blame in HEC cases in

1 Sabah. Rural people living near the forest have a long history of being blamed for forest
2 degradation by technocrats and political elites (Doolittle, 2004) while the influence of legal,
3 political and economic level forces is rarely implicated though they create conditions that result
4 in violence against those who outwardly oppose them (Zuckerman, 2021). Our results may be
5 interpreted as the villagers pushing back on that silence, echoing calls by researchers to take
6 seriously the influence of political economy on conservation outcomes (Margulies & Karanth,
7 2018; Fletcher & Toncheva, 2021). Often, rural people lay blame for HWC at the feet of
8 government and non-governmental conservation entities, which oversee managing elephant
9 populations and their habitat, as well as oil palm companies (e.g., Jadhav & Barua, 2012; Dhakal
10 & Thapa, 2019; Law, 2022). Guilty by association, elephants may also be entangled in the blame
11 web because they can be a symbol of government control or decision making or devastation
12 (Borah et al., 2022). Elephants can be viewed as wards of the government or their responsibility
13 (Gross et al., 2021) and, thus targets for retaliation (Wilshusen et al., 2002). That does not seem
14 to be the case in our study. Elephants have been, for the most part, disentangled from larger
15 social forces (e.g., elephants as ancestors [Rubino et al. 2020]).

16 Governing bodies hold significant power and resources to influence HWC outcomes,
17 whereas rural communities often lack the means to stop the harmful effects driven by unchecked
18 economic development and poverty. Our results suggest that villagers still long for decision
19 makers to integrate their perspectives and needs in natural resource decision making, including
20 elephant conservation, and to be viewed as a valued partner rather than an obstacle. Rebuilding
21 relationships between government and citizens to address HEC requires reciprocal commitment
22 from all parties, with each acknowledging the consequences of both their actions and inactions
23 (Othman et al., 2019). Sabah's elephant action plan made HEC a central issue to resolve, which
24 is a start to operationalizing the "everyone...join hands" approach (Free Malaysia Today, 2024),
25 but urgent action at the highest levels of government is required if humans, corporations, and
26 elephants are to prosper in the same region. A future-oriented HEC mitigation design requires
27 commitment to innovative governance thinking, cross-jurisdictional collaboration, and policy
28 experimentation at the highest levels of society (Serenari & Schlechte, 2023).

29 *Willingness to Act*

30 Our results revealed a connection between blame attribution and how villagers negotiate
31 HEC in Sabah. Respondents were more willing to engage in social signaling and system
32 changing actions, but their stated proclivities depended on how fault was framed, with larger
33 scale reasons being more powerful in terms of driving willingness to take action. Our findings
34 may be explained by studies of attribution bias, which help us understand how bias orients blame
35 and influence how people negotiate situations (Hsung et al., 2023). Studies are inconsistent
36 concerning how human agents involved in HEC will respond ranging from adaptation (Fernando
37 et al., 2005) to retaliatory actions (Best, 2007; Kopnina, 2016; Othman et al., 2022). These
38 relationships between blame attributions and action types are illustrated in Figure 4, which
39 summarizes how internal versus external attribution patterns shaped villagers' willingness to
40 engage in private, social, and system-level responses.

41 In the context of rural Malaysia, many communities operate within landscapes heavily
42 shaped by external political and economic forces. Historical land alienation, top-down forest
43 management, and palm oil expansion have marginalized rural people's access to land and

1 decision-making (Doolittle, 2004). Conservation efforts, though well-intentioned, are often
2 perceived as externally imposed and inattentive to local needs (Margulies & Karanth, 2018),
3 while the palm oil industry continues to shape ecological and social conditions that exacerbate
4 HEC (Suba et al., 2017). As a result, villagers may perceive themselves not as primary
5 contributors to conflict, but as victims of structural systems that generate risk and restrict agency.
6 This externalized blame may increase their willingness to act, as the source of the problem lies
7 outside their immediate control (Batanova et al., 2014). Nonetheless, as is common in ecological
8 behavior, the ability to respond is often limited by situational constraints such as lack of
9 resources, support, or influence (Gaspar et al., 2010). The variety of reasons linked to villagers'
10 willingness to act, along with the range of actions they endorsed, highlights the need for future
11 research to clarify how blame attribution influences mitigation behaviors. A clearer
12 understanding of these connections can guide more targeted interventions. In the meantime,
13 elephant conservation decision makers can apply insights from this study to improve governance
14 by strengthening human-elephant relationships, designing responsive policies, and creating more
15 inclusive engagement strategies.

16 Changes in land use have reduced available elephant habitat, disrupted migration routes,
17 and altered movement patterns. These shifts increase the likelihood of elephants entering farms
18 and human settlements (Estes et al., 2012; Othman et al., 2019; Evans et al., 2020). It is therefore
19 important to examine the extent to which elephants are blamed for HEC and to consider the
20 broader drivers behind changes in their behavior. Few villagers in our study attributed blame to
21 elephants' unpredictability, population growth, or competition for resources. This aligns with
22 earlier findings suggesting that elephants are sometimes unjustly blamed for their own decline
23 (Lawton & Gough, 1970; Lotter, 2006) or for HEC itself (Malley & Gorenflo, 2023). Our study
24 of blame attribution revealed that elephants are not exclusive targets of blame in Sabah, and
25 causal factors are anthropocentric and environmental. Officials and conservationists with the
26 power to make change in Sabah can build off the idea that the notion of HEC is really a fallacy.
27 Elephants and humans are not viewed as locked in a battle for territory or supremacy. Rather,
28 rural people fully understand that political-economic forces underpin HEC. Recognizing this
29 reality can help build mutual understanding needed to engage afflicted communities in dialogue
30 and actions that help them curb negative interactions with elephants that have gone on for what
31 should arguably be considered far too long.

32 ***Implications for Conservation***

33 Our findings offer several practical implications for the design and delivery of human-elephant
34 conflict (HEC) mitigation strategies in Sabah. First, we observed that when villagers attributed
35 blame to external forces such as global demand for palm oil and habitat degradation. They were
36 more willing to engage in a wide range of mitigation actions. This highlights the importance of
37 framing HEC not simply as a behavioral issue at the community level but as a result of broader
38 political, economic, and environmental changes. On the ground, this takeaway aligns with how
39 many villagers describe their situation: they did not start out in conflict with elephants, but over
40 time, fragmentation and land-use change brought them into closer and more frequent contact.

41 In several areas of Malaysian Borneo, particularly Central Sabah, many communities settled in
42 the 1970s to access land. Back then, forest cover was still substantial and elephant encounters
43 were rare. Today, forest fragmentation has drastically increased human-elephant contact,

1 resulting in property damage, injury, fear, and tension. Yet, rather than blaming elephants or
2 themselves, many communities recognize that the HEC problem is systemic. This broader
3 understanding has opened the door to collaborative efforts to mitigate it. In response, members of
4 the research team and other critical stakeholders have co-developed community-based strategies
5 that build upon the insights provided by this human dimensions study. For example, through the
6 Community Honorary Wildlife Warden initiative, local villagers have been empowered to take
7 an active role in elephant protection and monitoring. These wardens not only help respond to
8 HEC but also serve as local ambassadors for coexistence with a variety of wildlife. Similarly,
9 members of the research team have worked closely with communities to co-design and maintain
10 HEC mitigation tactics tailored to villagers' lived experiences and informed by elephant
11 movement data, such as the installation of electric fencing. These collaborations have
12 strengthened relationships between HEC stakeholders and ensured the solutions are rooted in the
13 realities of both people and elephants.

14 Second, our findings show that when communities internalize blame such as believing they lack
15 knowledge about elephant behavior they are less willing to engage in learning opportunities. To
16 address this finding in Sabah, officials avoid top-down training that can feel patronizing or
17 irrelevant. Instead, the emphasis is on mutual learning, peer-to-peer exchanges, and storytelling
18 that values local knowledge alongside scientific insights. When villagers feel heard and
19 respected, they are more open to experimenting with new approaches and sharing their own
20 successful strategies with others.

21 Third, our work confirms that support for income diversification, HEC-related insurance, and
22 inter-village learning resonates strongly with communities who view conflict through a systemic
23 lens. In practice, we are exploring pilot insurance models, promoting livelihood alternatives such
24 as small-scale agroforestry, and organizing village-to-village learning exchanges where
25 communities can learn directly from one another's experiences. These approaches not only
26 reduce risk but also build solidarity and confidence.

27 Finally, this study reinforces that blame attribution matters not just as a personal opinion, but as a
28 key driver of behavior. Conservation efforts must go beyond technical solutions and recognize
29 how people emotionally and cognitively experience HEC. Combining this study with years of field
30 experience in the study area, it has become apparent that when people feel respected, included,
31 and supported rather than blamed they are more willing to become active partners in long-term
32 coexistence with elephants.

33 *Limitations and Future Research*

34 While this study offers insights into how blame attribution influences willingness to act in the
35 context of HEC, several limitations must be acknowledged. First, the survey data rely on self-
36 reported perceptions and behaviors, which may be influenced by, for instance, social desirability
37 or recall bias. Second, our sampling was concentrated in regions with documented conflict
38 intensity, potentially limiting the generalizability of findings to lower-conflict or emerging HEC
39 zones. Third, the cross-sectional design of the study restricts our ability to assess causal
40 relationships or changes in attribution and willingness over time. Future research could benefit
41 from longitudinal studies that track shifts in attitudes and actions in response to interventions or
42 ecological changes. Additionally, integrating ethnographic or participatory approaches may

1 deepen understanding of cultural norms and lived experiences that shape HEC perceptions and
2 behaviors.

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