The Chepang Community and Rhino Conservation in Nepal: Unveiling Perspectives on Wildlife Trade to Foster Conservation

by

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&

THE UNIVERSITY OF QUEENSLAND

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Dedicated to my father, Hemant Krishnani

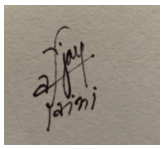
Thank you, Papa, for your constant encouragement, support, and love



One-horned rhinoceros, Kaziranga. Photo Credit: Hemant Krishnani

Supervisor Certification

This is to certify that the thesis entitled "**The Chepang Community and Rhino Conservation in Nepal: Unveiling Perspectives on Wildlife Trade to Foster Conservation"** being submitted by **Ms. Vasundhara Krishnani** to the Indian Institute of Technology Delhi and The University of Queensland for the award of degree of **Doctor of Philosophy** is a record of *bonafide* research work carried out by **Ms. Vasundhara Krishnani,** who has worked under our guidance and supervision and has fulfilled the requirements for the submission of this thesis, which to our knowledge has reached the requisite standard. The results contained in this thesis are original and have not been submitted, in part or full, to any other university or institute for the award of any other degree or diploma.



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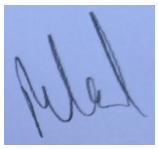


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Abstract

Illegal wildlife trade poses one of the most significant threats to global biodiversity, driving population declines of iconic species, such as rhinoceroses, elephants and pangolins. While enforcement and anti-poaching measures have intensified around the globe in recent years, local communities living in proximity to protected areas often remain both affected by and implicated in illegal wildlife trade. This includes areas in Asia, such as Nepal. Despite strict punishments on illegal wildlife trade in Nepal, including long prison sentences, local participation in rhino poaching persists, raising critical questions about the deeper structural and socio-economic drivers behind such involvement of local community members and their short and long-term impacts on both the community and biodiversity conservation.

This thesis aims to examine these dynamics through a case study of the Chepang, an Indigenous Tibeto-Burman community residing primarily in the Chitwan, Dhading, Makwanpur, and Gorkha districts of Nepal. Historically semi-nomadic hunter-gatherers, the Chepang have faced long-standing marginalisation due to poverty, food insecurity, low literacy rates, insecure land tenure, and limited access to state services. These conditions, combined with the Chepang's extensive ecological knowledge and traditional hunting skills, have rendered some Chepang households vulnerable to recruitment by intermediaries within poaching networks. This paradox, namely the high risk of strict punishments, yet continued involvement in illegal wildlife trade, frames the central puzzle this doctoral research seeks to address and help resolve.

The study is guided by three interrelated research questions, including: (1) What historical, economic, and social conditions are associated with community involvement in illegal wildlife trade? (2) How do conservation-led relocations and governance approaches (top-down models) intersect with existing vulnerabilities among Indigenous communities, and are these intersections associated with wildlife poaching and trafficking? (3) What community-inclusive strategies have been implemented to address illegal wildlife trade, and what evidence is there regarding their outcomes for enhancing equity, supporting the community and for achieving wildlife conservation goals?

Methodologically, the study employed a mixed-methods approach. Data was collected through a semi-structured interview schedule that combined open and close-ended questions. A total of 236 participants were surveyed, ranging across four groups: (i) individuals

incarcerated under wildlife laws for poaching; (ii) family members of incarcerated individuals; (iii) individuals not involved in poaching, and; (iv) family members of individuals not involved in poaching. Within this broader sample, 108 participants belonged to the Chepang community, including 62 who reported direct or indirect involvement in poaching activities. The other participants were part of the non-Chepang local and Indigenous communities in the region, providing comparative perspectives on socio-economic conditions and conservation interactions. Purposive and snowball sampling strategies were used to include both individuals incarcerated for poaching and those who were not involved in poaching. Qualitative thematic coding was employed to analyse narratives of marginalisation, recruitment, and incarceration, while descriptive statistics contextualised socio-economic indicators, such as education, land tenure and food security.

Comparative analysis across individuals incarcerated for poaching and those not involved in poaching, as well as between Chepang and non-Chepang communities, revealed that while general perceptions of well-being and law enforcement impacts did not differ significantly, Chepang respondents expressed distinct negative perspectives on access to resources, cultural identity, and the uneven distribution of conservation benefits. The study also found strong positive within-family concordance in perceptions: members of a family pair tended to provide similarly positive or similarly negative profiles. Households with more negative profiles were more often associated with involvement in illegal wildlife trade, and Chepang households showed a greater propensity toward negative profiles and lower concordance

The findings of this study suggest that the impacts of incarceration on families were profound, exacerbating poverty, school dropout, and food insecurity, especially in households where the absence of men due to imprisonment placed additional burdens on women and children. Social stigma further deepened community marginalisation. The findings also indicate that the Chepang's involvement in rhino poaching may be driven primarily by structural vulnerability, rather than deliberate criminal intent. Interviews highlighted how recruitment into poaching was often facilitated by small cash payments, alcohol, or drugs offered by intermediaries, with local Chepang contributing their ecological expertise while receiving only a minor fraction of the profits relative to the high international value of rhino horn.

Based on the findings of this study, we suggest that enforcement-focused conservation approaches, while necessary, are insufficient when applied in isolation. We suggest that long-

term rhino conservation in Nepal would benefit from strategies and actions addressing socio-economic exclusion among communities such as the Chepang. Targeted interventions in livelihood diversification, equitable benefit-sharing, and inclusive governance are essential to reduce vulnerability to exploitation and to transform communities from being perceived as potential individuals who can be involved in poaching into active stewards of conservation. By situating the Chepang's lived realities within broader debates on illegal wildlife trade and conservation justice, this thesis underscores that sustainable solutions must integrate bottom-up perspectives alongside enforcement, thereby bridging the gap between biodiversity protection and social factors.

Thesis Title in Hindi

नेपाल में चेपांग समुदाय और गैंडा संरक्षण: संरक्षण को प्रोत्साहित करने हेतु वन्यजीव व्यापार पर दृष्टिकोणों का अनावरण

Abstract in Hindi

गैरकानूनी वन्यजीव व्यापार वैश्विक जैव-विविधता के लिए सबसे गंभीर खतरों में से एक है। यह गैंडों, हाथियों और पैंगोलिन जैसी प्रतीकात्मक प्रजातियों की संख्या में भारी गिरावट का कारण बन रहा है। जबकि प्रवर्तन और शिकार-रोधी उपाय वैश्विक स्तर पर तेज़ हुए हैं, संरक्षित क्षेत्रों के निकट रहने वाले समुदाय अभी भी इस व्यापार से प्रभावित हैं और कई बार इसमें संलिप्त पाए जाते हैं। नेपाल में कठोर दंड—जिनमें लंबी जेल सजाएँ शामिल हैं—के बावजूद गैंडे के शिकार में स्थानीय भागीदारी बनी हुई है। यह प्रश्न उठाता है कि ऐसे संलिप्त होने के गहरे संरचनात्मक और सामाजिक-आर्थिक कारण क्या हैं।

यह शोध इन पहलुओं की जाँच चेपांग समुदाय के अध्ययन के माध्यम से करता है, जो तिब्बत-बर्मी मूल का एक आदिवासी समुदाय है और मुख्य रूप से नेपाल के चितवन, धादिंग, मकवानपुर और गोरखा ज़िलों में रहता है। परंपरागत रूप से अर्ध-घुमंतु शिकारी-संग्राहक रहे चेपांग लंबे समय से हाशिये पर रहे हैं—लगातार गरीबी, खाद्य असुरक्षा, कम साक्षरता दर, असुरक्षित भूमि अधिकार और सरकारी सेवाओं तक सीमित पहुँच से जूझते हुए। इन परिस्थितियों के साथ-साथ उनके व्यापक पारिस्थितिक ज्ञान और पारंपरिक शिकार कौशल ने कुछ चेपांग परिवारों को शिकार नेटवर्कों के दलालों द्वारा भर्ती किए जाने के लिए संवेदनशील बना दिया है। यह विरोधाभास—कठोर दंड का उच्च जोखिम, फिर भी निरंतर संलिप्तता—इस शोध का केंद्रीय प्रश्न है।

अध्ययन तीन परस्पर जुड़े शोध-प्रश्नों द्वारा निर्देशित है:

1. कौन-सी ऐतिहासिक, आर्थिक और सामाजिक परिस्थितियाँ समुदायों को गैरकानूनी वन्यजीव व्यापार में संलिप्त करती हैं?
2. संरक्षण-प्रेरित विस्थापन और शीर्ष-से-नीचे शासन मॉडल आदिवासी समुदायों की मौजूदा कमजोरियों के साथ कैसे जुड़ते हैं, और क्या ये संबंध शिकार और तस्करी में संलिप्तता से जुड़े हैं?
3. गैरकानूनी वन्यजीव व्यापार से निपटने के लिए कौन-सी समुदाय-समावेशी रणनीतियाँ अपनाई गई हैं, और उनके न्याय व संरक्षण लक्ष्यों पर क्या परिणाम देखने को मिले हैं?

कार्यप्रणाली के रूप में अध्ययन ने *मिश्रित विधियों* का उपयोग किया। अर्ध-संरचित प्रश्नावली के माध्यम से डेटा एकत्र किया गया, जिसमें खुले और बंद दोनों प्रकार के प्रश्न शामिल थे। कुल 236 प्रतिभागियों का सर्वेक्षण किया गया, जिन्हें चार श्रेणियों में विभाजित किया गया: (i) शिकार के लिए वन्यजीव कानूनों के अंतर्गत कारावास झेल रहे व्यक्ति, (ii) कैदियों के परिवार के सदस्य, (iii) शिकार में संलिप्त न रहे व्यक्ति, और (iv) शिकार में संलिप्त न रहे व्यक्तियों के परिवारजन। इस व्यापक नमूने में से 108 प्रतिभागी चेपांग समुदाय के थे, जिनमें 62 ने शिकार में प्रत्यक्ष या अप्रत्यक्ष रूप से संलिप्तता की सूचना दी। शेष प्रतिभागी अन्य स्थानीय और आदिवासी समुदायों से थे, जिनसे तुलनात्मक दृष्टिकोण प्राप्त हुआ।

लक्षित और स्नोबॉल सैंपलिंग रणनीतियों का उपयोग किया गया, ताकि शिकार में संलिप्त और असंलिप्त दोनों प्रकार के लोग शामिल हों। हाशियाकरण, भर्ती और कारावास की कहानियों का विश्लेषण करने के लिए गुणात्मक *थीमैटिक कोडिंग* अपनाई गई, जबकि सामाजिक-आर्थिक संकेतकों (जैसे शिक्षा, भूमि अधिकार और खाद्य सुरक्षा) को संदर्भित करने के लिए वर्णनात्मक आँकड़ों का उपयोग किया गया।

निष्कर्ष बताते हैं कि चेपांग का गैंडे के शिकार में शामिल होना जानबूझकर की गई आपराधिक प्रवृत्ति से अधिक संरचनात्मक कमजोरियों का परिणाम है। साक्षात्कारों ने दिखाया कि भर्ती अक्सर मामूली नकद भुगतान, शराब या नशीले पदार्थों के माध्यम से की जाती थी, और चेपांग अपने पारिस्थितिक कौशल का योगदान देते हुए भी गैंडे के सींग के अंतरराष्ट्रीय मूल्य की तुलना में केवल नगण्य लाभ प्राप्त करते थे। यह अध्ययन धारणाओं में मज़बूत अन्तःपरिवार अनुरूपता भी दिखाता है: परिवार के सदस्य प्रायः या तो दोनों ही सकारात्मक प्रोफ़ाइल देते हैं या दोनों ही नकारात्मक। अधिक नकारात्मक प्रोफ़ाइल वाले परिवारों का अवैध वन्यजीव व्यापार में संलिप्तता से अधिक संबंध मिला, और चेपांग गृहस्थियोंमें नकारात्मक प्रोफ़ाइल की प्रवृत्ति अधिक तथा अनुरूपता अपेक्षाकृत कम पाई गई।कारावास का परिवारों पर गहरा असर पड़ा—गरीबी बढ़ी, बच्चों की पढ़ाई छूटी, खाद्य असुरक्षा बढ़ी—विशेष रूप से उन घरों में जहाँ पुरुषों की अनुपस्थिति ने महिलाओं और बच्चों पर अतिरिक्त बोझ डाल दिया। सामाजिक कलंक ने समुदाय के हाशियाकरण को और गहरा किया।

तुलनात्मक विश्लेषण (कैदियों और गैर-शिकार परिवारों, तथा चेपांग और गैर-चेपांग समुदायों के बीच) से पता चला कि जबकि सामान्य कल्याण और कानून प्रवर्तन प्रभाव की धारणाओं में बड़ा अंतर नहीं था, चेपांग

उत्तरदाताओं ने संसाधनों की पहुँच, सांस्कृतिक पहचान और संरक्षण लाभों के असमान वितरण पर स्पष्ट नकारात्मक दृष्टिकोण व्यक्त किया।

यह शोध तर्क देता है कि केवल प्रवर्तन-आधारित संरक्षण, यद्यपि आवश्यक है, पर्याप्त नहीं है। नेपाल में दीर्घकालिक गैंडा संरक्षण प्रयासों के लिए चेपांग जैसे हाशिये पर मौजूद समुदायों के सामाजिक-आर्थिक बहिष्कार को संबोधित करना आवश्यक होगा। लक्षित हस्तक्षेप—जैसे आजीविका का विविधीकरण, संरक्षण लाभों का न्यायपूर्ण वितरण, और शासन में समुदाय की भागीदारी—उनकी कमजोरियों को कम कर सकते हैं और उन्हें अपराध नेटवर्क में शोषित होने से बचाकर संरक्षण के सक्रिय संरक्षक में बदल सकते हैं। चेपांग की ज़मीनी हकीकत को गैरकानूनी वन्यजीव व्यापार और संरक्षण न्याय की व्यापक बहस में रखकर यह शोध रेखांकित करता है कि स्थायी समाधान प्रवर्तन के साथ-साथ नीचे से ऊपर (bottom-up) दृष्टिकोण को भी शामिल करने चाहिए, जिससे जैव-विविधता संरक्षण और सामाजिक न्याय के बीच सेतु स्थापित हो सके।

Declaration by Author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly authored works that I have included in my thesis.

I have clearly stated the contribution of others to my thesis as a whole, including statistical assistance, survey design, data analysis, significant technical procedures, professional editorial advice, financial support and any other original research work used or reported in my thesis. The content of my thesis is the result of work I have carried out since the commencement of my higher degree by research candidature and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution. I have clearly stated which parts of my thesis, if any, have been submitted to qualify for another award.

I acknowledge that an electronic copy of my thesis must be lodged with the University Library and, subject to the policy and procedures of The University of Queensland, the thesis be made available for research and study in accordance with the Copyright Act 1968 unless a period of embargo has been approved by the Dean of the Graduate School.

I acknowledge that copyright of all material contained in my thesis resides with the copyright holder(s) of that material. Where appropriate I have obtained copyright permission from the copyright holder to reproduce material in this thesis and have sought permission from co-authors for any jointly authored works included in the thesis.



Vasundhara Hemant Krishnani

Contributions by others to the thesis

All chapters

Conceptualization of study planning, ideas, advice in analysis, editing of chapters were provided by the candidate's supervisors, Prof. Salit Kark, Prof. Ajay Saini, Dr. Patrick Ward and Dr. Dibesh Karmacharya. Review was provided by the PhD committee, Prof. Vivek Kumar, and Prof. Upasna Sharma.

The study was conceived and designed by Vasundhara Krishnani with support from Salit Kark, Ajay Saini and Dibesh Karmacharya. Field access and on-ground logistics were enabled by Dibesh Karmacharya and Madhav Giri. The questionnaire and interview guides were developed by Vasundhara Krishnani with support from Patrick Ward, Salit Kark, Ajay Saini and Dibesh Karmacharya. Community liaison and permissions were arranged by Vasundhara Krishnani with support from Dibesh Karmacharya and Bishwo Shrestha. Data collection (interviews, surveys, and field notes) was conducted by Vasundhara Krishnani with translation and transcription by Vasundhara Krishnani. Data entry, cleaning, and coding were carried out by Vasundhara Krishnani and Patrick Ward, under oversight from Salit Kark. Analysis and interpretation were led by Vasundhara Krishnani with input support and review from Patrick Ward. Figures and maps were prepared by Vasundhara Krishnani, with technical support from Bivisha Khadka. The original draft was written by Vasundhara Krishnani, and review and editing were undertaken by Salit Kark, Ajay Saini, Dibesh Karmacharya, and Patrick Ward. Ethics, risk management, and safeguarding oversight were provided by Dibesh Karmacharya and Nepal Health Research Council, with compliance materials prepared by Vasundhara Krishnani. Project administration and record-keeping were managed by Vasundhara Krishnani, and funding acquisition and institutional support were provided by Ragini Gill.

Statement of parts of the thesis submitted to qualify for the award of another degree

No works were submitted towards another degree have been included in this thesis.

Research involving human or animal subjects

No animal subjects were involved in this research.

This study involved human participants solely for the purpose of conducting semi-structured interview schedules. No biological samples, laboratory testing, or clinical procedures were undertaken. Participation was voluntary, and informed consent was obtained from all respondents. The research design ensured confidentiality and minimised any potential risks to participants while focusing exclusively on documenting perceptions, socio-economic conditions, and lived experiences related to wildlife conservation and illegal wildlife trade. Ethical approval for the study was granted by the Nepal Health Research Council (Approval ID: 413 – 2022).

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ਨਾ ਹਮ ਕਰਮ ਕਰੇ ਕਰਤਾਰ। ਸਭੁ ਕਿਛੁ ਕਰਤਾ ਤੇਰਾ ਪਿਆਰ।

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Illegal wildlife trade, one-horned rhinoceros, wildlife conservation, Indigenous community, Chepang, Chitwan National Park, Nepal, poverty, socio-economic impact, alternate sources of livelihood.

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List of abbreviations used in the thesis

CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DNPWC	Department of National Parks and Wildlife Conservation
EIA	Environmental Investigation Agency
HWC	Human-wildlife conflict
ILO	International Labour Organization
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IUCN	International Union for Conservation of Nature
IFAW	International Fund for Animal Welfare
IRF	International Rhino Foundation
INTERPOL	International Criminal Police Organisation
LMICs	Low-and Middle-Income Countries
NTCA	National Tiger Conservation Authority
NTNC	National Trust for Nature Conservation (Nepal)
TCM	Traditional Chinese medicine
TRAFFIC	Trade Records Analysis of Flora and Fauna in Commerce
UNEP	United Nations Environment Programme
UNODC	United Nations Office on Drugs and Crime
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WCO	World Customs Organisation
WII	Wildlife Institute of India
WWF	World Wildlife Fund
WLPA	Wildlife Protection Act

Chapter 1

Introduction



A Chepang Village, Nepal. Photo Credit: Vasundhara Krishnani

1.1 Rationale for the Study

Illegal wildlife trade is widely recognised as a major threat to biodiversity, contributing to the decline of iconic species such as rhinoceroses, elephants, and pangolins among others (Harfoot et al., 2018; ZSL, 2023; UNODC, 2024). While enforcement and anti-poaching measures have been central to conservation efforts, growing evidence shows that these interventions alone are insufficient to address the deeper structural drivers of wildlife crime (Duffy et al., 2019; Roe & Booker, 2019; Lunstrum & Givá, 2020). Communities living adjacent to protected areas, including Indigenous and marginalised groups, often experience restricted access to forests and land, livelihood insecurity, and exclusion from decision-making processes (Agrawal & Redford, 2009; Büscher & Dressler, 2012). These conditions can create vulnerabilities that trafficking networks exploit for ground-level operations, even though most community members receive minimal benefit compared to higher tiers of trade (UNODC, 2024; Duffy et al., 2015; Cooney et al., 2016). Despite the increasing emphasis on community-based conservation globally, there remains limited empirical, bottom-up research that captures how affected communities perceive, experience, and interact with conservation governance (Roe & Booker, 2019; Lunstrum & Givá, 2020; Paudel et al., 2020). This study aims to address that gap by examining the case of the Chepang community in Nepal, situating their lived realities within broader debates on conservation justice and sustainable strategies for addressing illegal wildlife trade.

1.2 Study Area

Chitwan National Park (Figure 2), established in 1973 and designated as a UNESCO World Heritage Site in 1984, is Nepal's first national park and remains a cornerstone of the country's biodiversity conservation efforts (UNESCO, 1984). Spanning 952 km² in the subtropical lowlands of south-central Nepal, the park encompasses a range of ecosystems, including sal forests, grasslands, wetlands, and riverine habitats, and is bounded by the Rapti, Narayani, and Reu rivers (DNPWC, 2021; Jnawali et al., 2011). As part of the Terai Arc Landscape, Chitwan National Park provides critical habitat for numerous endangered species, such as the greater one-horned rhinoceros (*Rhinoceros unicornis*), Bengal tiger (*Panthera tigris*), Asian elephant (*Elephas maximus*), and gharial crocodile (*Gavialis gangeticus*) (Subedi et al., 2013; DNPWC & WWF Nepal, 2016; Wilson, 2020).

Surrounding the park are buffer zones and community forests inhabited by Indigenous and local communities, including the Chepang, Tharu, Bote, and others, whose interactions with

the landscape are shaped by their culture, subsistence needs, evolving conservation frameworks and more (Spiteri & Nepal, 2008; Paudel et al., 2018). Chitwan National Park plays a central role in Nepal's rhino conservation efforts, with over 600 of the nation's estimated 752 greater one-horned rhinoceroses residing within its boundaries as of the 2021 rhino count (DNPWC, 2021; Wilson, 2020).

Fieldwork was conducted in a cluster of villages situated within two districts in the buffer zone of Chitwan National Park, Nepal. To safeguard participant identity and due to the sensitivity of the topic, the exact village locations are not disclosed. The sites were purposively selected in consultation with a local not-for-profit organization focusing on biodiversity conservation around Chitwan National Park. The organisation has a long-standing engagement in Chepang communities, including prior work with individuals incarcerated for involvement in greater one-horned rhinoceros poaching. The selected villages included both households directly affected by rhino hunting and those not involved.

1.3 Structural Overview of the thesis

This thesis aims to emphasise on the need to focus on a bottom-up approach to tackle illegal wildlife trade by focusing on community conservation and upliftment. The study focuses on the Chepang community involved in the poaching of the greater one-horned rhinoceros (*Rhinoceros unicornis)* around Chitwan National Park, Nepal. Although the empirical work concentrates on a single community, the approach is designed to be replicable for other Indigenous and tribal communities living in impoverished conditions around protected areas in developing countries. Each chapter deepens understanding of this complex problem and contributes case-study evidence for community upliftment as a core strategy to reduce involvement in trade (Figure 1).

Following the introduction, **Chapter 2** presents a systematic review examining the intersection of local communities and megafauna trafficking across Nepal, India, and sub-Saharan Africa. It identifies recurring socio-economic, historical, and governance-related drivers that shape community involvement in illegal wildlife trade. Key themes include livelihood insecurity, land dispossession, poverty, and exclusion from conservation decision-making. The objectives of this study were to: i) What structural factors (e.g., marginalisation, poverty, historical legacies) are associated with local community involvement in illegal wildlife trade? ii) How, if at all, do conservation-related relocations or displacement intersect with Indigenous communities' vulnerabilities, and how are these intersections associated with

involvement in illegal wildlife trade? iii) What locally grounded, community-inclusive strategies have been implemented to address illegal wildlife trade in Nepal, India, and sub-Saharan Africa, and what evidence exists regarding their outcomes?

Chapter 3 presents empirical findings from my field research with the Chepang community, examining the socio-economic drivers of their involvement in one-horned rhinoceros poaching in Nepal. Data was collected through structured and semi-structured interview schedules with 108 participants across Chitwan, Dhading, and Makwanpur districts, including 62 of whom were directly or indirectly involved in poaching. Interviews were analysed through qualitative thematic coding, which involved identifying and categorising recurring themes—such as livelihood insecurity, poverty, food shortages, the use of traditional ecological knowledge, and the social impacts of incarceration.

Chapter 4 focuses on the quantitative data collected from close-ended questionnaire survey conducted with 236 individuals belonging to four groups : 1)Participants belonging to the Chepang community who were directly or indirectly involved in poaching of the one-horned rhinoceros in Nepal, 2)Participants belonging to the Chepang community who were not involved in poaching of the one-horned rhinoceros in Nepal, 3)Participants not belonging to the Chepang community who were directly or indirectly involved in poaching of the one-horned rhinoceros in Nepal, 4) Participants not belonging to the Chepang community who were not involved in poaching of the one-horned rhinoceros in Nepal. This chapter examines community perceptions of illegal wildlife trade, its socio-economic drivers, and the impacts of poaching-related incarceration, comparing Chepang and non-Chepang households, as well as individuals incarcerated for illegal wildlife trade and those that were not involved belonging to other communities.

Chapter 5, the thesis Discussion integrates findings from the systematic review (Chapter 2), the Chepang case study (Chapter 3), and the comparative survey analysis (Chapter 4) to argue that durable reductions in illegal wildlife trade require a shift from exclusionary conservation toward community-centred, bottom-up strategies. The review identifies recurrent structural drivers—livelihood insecurity, land dispossession, poverty, and exclusion from conservation decision-making—across Nepal, India, and sub-Saharan Africa, and shows how conservation-led displacement can heighten risk.

Fieldwork with Chepang households around Chitwan National Park echoes these patterns: families facing chronic food shortages, limited land, and social marginalisation are recruited into low-reward, high-risk roles; traditional ecological knowledge is appropriated by external actors; and incarceration imposes long-lasting social and economic costs on individuals and

their families. The comparative results further indicate that Chepang families and families associated with wildlife crime hold consistently more negative perceptions than their counterparts, suggesting compounded disadvantage where ethnic marginalisation and contact with the justice system intersect. Taken together, the evidence supports a policy pivot that secures land and resource access, ensures equitable benefit-sharing, embeds participatory governance, and funds targeted livelihood diversification, alongside post-release reintegration services.

Figure 1: Thesis framework linking evidence streams across chapters

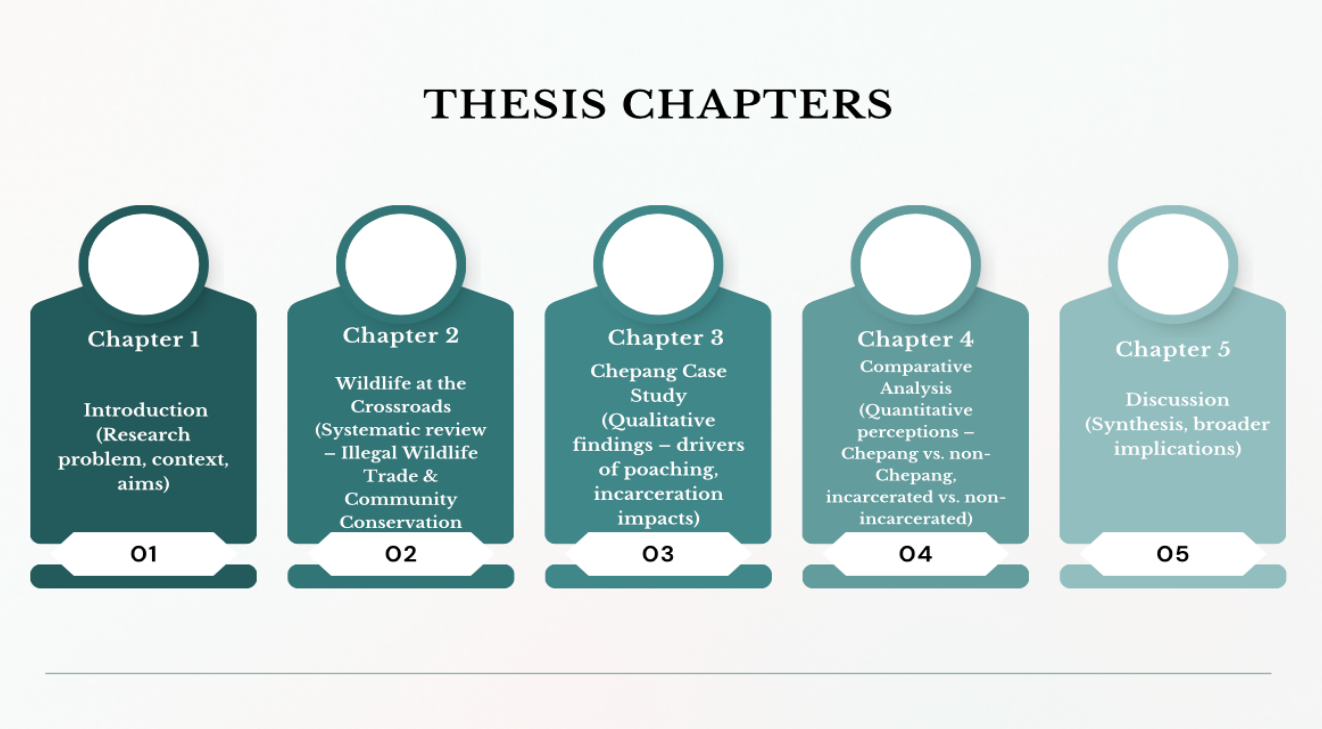


Figure 2: Study area map highlighting Chitwan National Park (dark green) and the four Chepang-inhabited districts—Gorkha, Dhading, Makwanpur, and Chitwan—shown with contrasting fills. District boundaries are displayed for reference, with a north arrow for orientation. Administrative boundary layers at district level.



1.4 Literature Review

1.4.1 Illegal wildlife trade overview

Illegal wildlife trade is a multifaceted operation program that has emerged as one of the most pressing global conservation challenges, threatening biodiversity and undermining sustainable development efforts (ZSL, 2023; UNODC, 2024). It includes the unlawful collection of wild animals, living or dead, for various purposes such as food, exotic pets, medicine, ornaments, status symbols as well as traditional items (Nellemann et al., 2014). It is a dynamic and vast global industry, with an estimated revenue between $7 and US$23 billion annually, and involving the trafficking of over 100 million plants and animals worldwide each year (Harfoot et al., 2018). Globally, illegal wildlife trade constitutes the fourth largest illicit trade after human, drug, and weapon trafficking. Illegal wildlife trade currently impacts at least 4,000 known animal and plant species, with ~3,250 of these listed under the Convention on International Trade in Endangered Species (CITES); this includes critically endangered mammals such as pangolins, rhinos, and elephants (UNODC, 2024).

High-value animal products in illegal wildlife trade include rhino horn, pangolin scales, elephant tusks, and tiger parts (UNODC, 2024). Demand for illegal wildlife products varies

by species and end use. Traditional medicine markets in parts of East and Southeast Asia (e.g., China and Vietnam) continue to drive demand for rhino horn, pangolin scales, and big-cat bones, whereas elephant ivory is primarily sought for carvings and jewellery rather than medicinal use (Milliken & Shaw, 2012; Wong, 2019; United Nations Office on Drugs and Crime [UNODC], 2024; WWF & GlobeScan, 2021). Global seizure analyses identify rhino horn, pangolin scales, and elephant ivory among the most frequently trafficked wildlife commodities, with major flows from African source regions to Asian end markets (UNODC, 2024). Consumer research in Vietnam shows that intentions to purchase rhino horn are linked to perceived therapeutic benefits and status signalling (Vu & Nielsen, 2022). Concurrently, the Environmental Investigation Agency (2025) reports, licensed traditional Chinese medicine products in China that list leopard bone, and TRAFFIC (2022) documents ongoing seizures of tiger parts across tiger range countries (Morgan et al., 2020).

Illegal wildlife trade is commonly described in two overlapping streams: (i) illicit hunting of protected or regulated wildlife for wild meat and associated subsistence or cultural uses; and (ii) organized commercial trade in high-value commodities—such as elephant tusks, rhino horn, big-cat parts, and pangolin scales—sought for ornamentation, traditional medicine, and status goods (IPBES, 2022; UNODC, 2024). Empirical work from West and Central Africa shows that bushmeat markets remain widespread and, in places, connect local consumption to urban and cross-border trafficking networks (Majiteu et al., 2024; Olunusi, 2024; Vodouhe et al., 2024). Seizure-based analyses from 2015–2024 further document persistent large-scale trafficking of pangolin scales and ivory along Africa–Asia supply chains, underscoring the commercial dimension of the trade (UNODC, 2024; Wildlife Justice Commission, 2025). While this two-stream framing is analytically useful, boundaries often blur (e.g., wild meat entering international markets), and other major streams—particularly the live pet trade—also drive exploitation and merit attention (UNODC, 2024).

"Hunting" may be lawful or unlawful depending on permits, seasons, and species; "poaching" denotes unlawful take (Hessami et al., 2021; Carter et al., 2017). Within this framing, actors are commonly described as: i) subsistence poachers focused on small to medium game for food and local exchange, ii) commercial poachers embedded in coordinated supply chains, and iii) "hybrid" or opportunistic actors who straddle self-consumption and market sale as incentives shift (Duffy, 2013; IPBES, 2022; UNODC, 2024; Wyatt, 2020; Hübschle, 2016). In practice, boundaries blur: subsistence hunting can feed urban markets, while commercial networks recruit local hunters and upgrade their methods. Recent assessments document increasing use of efficient but indiscriminate gear (e.g., wire snares)

and broader access to firearms, vehicles, and mobile communications, which raise hunting success and conservation impacts; at the same time, organized criminal groups remain active across Africa–Asia supply chains, linking local actors to international demand (Denny et al., 2025; Mitchell et al., 2024; Nana et al., 2025; UNODC, 2024; Skidmore, 2022).

1.4.2 Illegal wildlife trade in Low-and Middle-Income countries

Illegal wildlife trade not only threatens biodiversity but also has multiple negative impacts on local and indigenous communities across the Global South (Harfoot et al., 2018; Roe & Booker, 2019; IPBES, 2019; UNODC, 2024). Beyond species loss, it depresses nature-based economies by reducing wildlife essential for ecotourism; the COVID-19 tourism collapse further strained conservation budgets and, in some settings, coincided with heightened poaching risks (Lindsey et al., 2020; Spenceley et al., 2021; Conservation Strategy Fund, 2022). Wild meat is an important subsistence and cultural food for over 150 million households in the Global South (Nielsen et al., 2018). In parallel, demand for high-value wildlife products such as rhino horn and pangolin scales for ornamentation, medicine, and status fuels commercial trafficking (Bowen-Jones, Brown & Robinson, 2003; UNODC, 2024). Approximately 800 million people in the rural tropics are dependent on wildlife for livelihood and food security (Neilsen et al., 2018).

South Africa, home to approximately 75% of Africa's rhino population, remains a poaching hotspot: 499 rhinos were killed in 2023 (up from 2022), with organized networks moving horn primarily to Vietnam and onward to China; early 2025 data indicate a subsequent decline to ~420 rhinos, reflecting shifting pressures and intensified protection (Milliken & Shaw, 2012; Balfour et al., 2025; Reuters, 2024; Reuters, 2025; UNODC, 2024). Structural drivers—including poverty and especially local economic inequality—remain central to recruitment into poaching syndicates around Kruger–Limpopo (Lunstrum & Givá, 2020; Wilston-Holt O and Roe D, 2021). More broadly, trafficking networks adapt routes and actors across species (rhino, elephant, pangolin), with higher-tier profits accruing to organised brokers while ground-level risks fall on rural hunters and guides (UNODC, 2024; Duffy et al., 2015; Cooney et al., 2016). In parts of West and Central Africa, bushmeat hunting for subsistence remains important for protein and income; however, where offtake exceeds local regeneration, it can compound biodiversity losses and intersect with food-security pressures (Fa et al., 2003; Nasi et al., 2011). Taken together, these patterns underscore that poaching pressures span both commercial ivory/horn markets and subsistence use, so effective responses typically combine targeted enforcement with livelihood, food-

security, and local governance measures tailored to context (Cooney et al., 2016; Roe & Booker, 2019; Lamichane et al., 2020; UNODC, 2024).

India, home to 3,167 wild tigers as of 2022, continues to face targeted poaching and trade despite strengthened enforcement. India's Wildlife Protection Act, 1972 criminalized the possession, handling, and trade of tiger parts (PIB, 2023). Yet enforcement data show persistent illegal killing and trade: drawing on Wildlife Protection Society of India records, Environmental Investigation Agency (EIA) reported 684 tiger poaching and seizure cases in India between 1994 and 2003 (Banks & Newman, 2004). At the global scale, TRAFFIC's seizure analyses estimate the equivalent of 2,359 tigers confiscated between 2000 and 2018 across 32 countries, underscoring ongoing transnational demand (Wong & Krishnasamy, 2019; NTCA/WII, 2023; TRAFFIC, 2022; UNODC, 2024). While some hunting remains subsistence-oriented, evidence from multiple regions indicates that local offtake often intersects with commercial supply chains—serving ornament, traditional medicine, and status markets in parts of East and Southeast Asia (UNODC, 2024; Wong & Krishnasamy, 2019). Retaliatory killing linked to human–wildlife conflict (e.g., elephants, big cats) adds pressure where communities bear costs of living alongside wildlife (Dertien et al., 2023).

Nepal illustrates both vulnerability and progress in addressing poaching; Vulnerability stems from its position between India and China—acting as a source and transit corridor for high-value species such as rhinoceros, tiger, and pangolin—and from entrenched trafficking networks and conflict-era enforcement gaps; hotspot analyses repeatedly flag Kathmandu and Chitwan National Park within national trade networks (Jnawali et al., 2011; Subedi et al., 2013; Paudel et al., 2020; Wilson, 2020). Progress is reflected in a robust legal framework under the National Parks and Wildlife Conservation Act (1973) which aims to safeguard Nepal's unique biodiversity. Historically, open retail of rhino horn, tiger parts and other protected wildlife parts persisted into the 1990's (Heinen et al., 1995). During Nepal's civil war (1996–2006), security withdrawals from protected areas created enforcement gaps and poaching surged (Rai et al., 2021). Post-conflict, wildlife crime persisted—as reflected in numerous arrests of local people during 2011–2015—with the greater one-horned rhinoceros (*Rhinoceros unicornis*) being a primary target (Paudel et al., 2020). Although government data later reported declining illegal wildlife trade arrests (Acharya et al., 2020), studies warn that entrenched trafficking networks spanning rhino, tiger, leopard, and pangolin could re-escalate if not proactively disrupted.

1.4.3 Conservation approaches in Low-and Middle-Income countries: Historical contexts and community dimensions

An early definition of 'conservation', included "saving of resources for later use" (IUCN 1980). Over recent decades, conservation thinking has shifted markedly since the 1970's and 80's pure nature/wildlife focused models toward approaches that acknowledge people–nature interdependence and social equity (Mace, 2014). At the same time, biodiversity loss has accelerated, driven by land-use change, overexploitation, pollution, invasive species, and climate change, with indirect drivers such as inequality and governance failures shaping outcomes (IPBES, 2019, 2022).

Demography and development amplify these pressures. The world population passed 8 billion people in 2022 and is projected to grow further—especially in low-and middle-income countries (LMICs), intensifying demand for land, energy, food, and infrastructure (UNDESA, 2024). In many LMICs, large-scale agriculture, transport corridors, and energy projects frequently intersect, and at times conflict, with conservation priorities (White and Hunter, 2009; Bhattarai et al., 2017; IPBES, 2019). For many Indigenous peoples and local communities, biodiversity is the basis of subsistence, culture, and identity. Wild foods, fish, timber and non-timber forest products, and medicinal plants remain central to livelihoods and health systems (IPBES, 2022; Kothari, 2002). Where strict protection restricts access without viable alternatives or fair benefit-sharing, costs are disproportionately borne by these communities, and conflict can follow (Agrawal & Redford, 2009; Brockington & Igoe, 2006).

While developing countries face major economic pressures, several of these countries have channelled funding for wildlife conservation projects both within and outside protected areas (Benson, 1998). Kenya banned trophy hunting in 1977 under national regulations linked to the Wildlife Conservation and Management Act. Despite the ban, enforcement and funding challenges persisted (Government of Kenya, 1977). The importance of the existence of the exotic megafauna in the African landscape was not only for the preservation of biodiversity but also for the economy of the country as the lucrative wildlife tourism industry generated millions of dollars by attracting approximately 360,000 tourists to Kenya (Government of Kenya, 2013). This economic gain pushed the conservation agenda and another ban to prevent poaching was implemented in 1977 which made the sale of animal skins and trophies illegal (Lovelock, 2007).

Post-independence conservation in India was formalised through the Wildlife Protection Act (WLPA),1972, the creation of a national protected-area network, and flagship

programmes such as Project Tiger (1973) and Project Elephant (1992). While these initiatives contributed to notable species recoveries, early approaches often emphasised strict protection, with documented cases of village relocations from tiger reserves and other protected areas and mixed outcomes for Adivasi and other forest-dependent communities—ranging from inadequate compensation to disrupted livelihoods (Rangarajan & Shahabuddin, 2006; Lasgorceix & Kothari, 2009). Subsequent reforms introduced more participatory instruments—e.g., Joint Forest Management (1990), Community and Conservation Reserves via Wildlife Protection Act amendments (2002), and the Forest Rights Act (2006) recognising individual and community forest rights and requiring community consent for diversion—yet implementation has been uneven, and tensions persist around rights recognition, benefit-sharing, and human–wildlife conflict (Kothari et al., 2013; NTCA, 2010). Overall, India's trajectory reflects a shift from fortress to more community-inclusive frameworks, but outcomes continue to vary with local governance capacity, tenure security, and the design of relocation/compensation and coexistence measures (Karanth & Madhusudan, 2002; Kabra, 2019; Bathija & Sylvander, 2019, 2023).

Nepal's modern conservation era began with the National Parks and Wildlife Conservation Act (1973), followed by the creation of a dedicated Rhino Patrol ("Gainda Gasti") and, later, World Heritage inscription of Chitwan National Park. Early approaches were largely exclusionary; from the late 1980's and 1990's Nepal pivoted to community-based models (e.g., the Annapurna Conservation Area Project) and legally designated buffer zones (1996) to share benefits and responsibilities. Outcomes have been mixed: many communities report tangible gains (tourism, infrastructure), yet rights, equity, and elite capture concerns persist (Heinen, 2006; UNESCO/WHC, 2003; FAOLEX, 1996; Bajracharya et al., 2006; Kellert et al., 2000; Mehta & Heinen, 2001; Heinen et al., 2019; Bhattarai et al., 2017; Amnesty International, 2021).

1.4.4 The Chepang community

The Chepang are an Indigenous Tibeto-Burman (Sino-Tibetan) people concentrated in Nepal's south-central mid-hills, especially Chitwan, Makwanpur, Dhading, and Gorkha districts along the Mahabharat range. According to the 2011 census, their population was approximately 68,399 (about 0.26–0.3% of Nepal's population), with the vast majority residing in those four districts (Central Bureau of Statistics [CBS], 2014; Indigenous Voice, n.d.). Geographically, Chepang settlements span the steep mid-hills of the Mahabharat (Lesser Himalaya) and Siwalik/Churia ranges, typically between ~500 and 1,500 m above sea

level with many villages clustered around 500–1,200m on rugged slopes (Sharma, 2011; Khatri, 2024; Rijal, 2011). In community oral histories and some secondary accounts, Chepang are portrayed as among the earliest settlers of the Mahabharat range, a young east–west mountain system separating the plains from the higher Himalaya (Sharma,2011; Rijal,2011). In Nepal's official governance/social framework, Chepang (also known as Praja) are recognized among the "Highly Marginalized" Indigenous nationalities within the government's list of 59 Indigenous Peoples (Indigenous Voice, n.d.; IFAD & IWGIA, 2022).

Religiously and culturally, Chepang lifeways are syncretic: many households blend Hindu practice with animist cosmologies and localized shamanic traditions (Riboli, 2000; Caughley et al., 1971; Rijal, 2011). They celebrate major Hindu festivals such as Diwali/Tihar and Holi, alongside ancestral rites—e.g., kul/kulan puja honouring deceased forebears (Rijal, 2011; Riboli, 2000). In recent decades, Christianity has expanded notably among Chepang; tabulations from the 2011 Nepal census indicate that around a quarter of Chepang identified as Christian (Central Bureau of Statistics [CBS], 2014). Ethnographic and journalistic accounts note that, amid economic hardship, mission and NGO outreach sometimes combined spiritual teaching with material assistance (e.g., food, clothing), shaping conversion dynamics in some communities (The Record Nepal, 2017; Indigenous Voice, 2024).

Historically, the Chepang were semi-nomadic cultures, relying on hunting, gathering wild tubers, and subsistence farming (Rijal, 2011; Sharma, 2011). Skilled with bows and arrows and using snares, nets, and other low-technology tools, they hunted monkeys, deer, wild boar, bats, and various birds (Caughley et al., 1971). Although such practices have diminished, some hunting—especially of bats associated with Chiuri trees—persists (Uprety & Asselin, 2023). Today, trapping of birds and small game remains documented, alongside animal husbandry—particularly pig and goat rearing—as part of diversified subsistence (Caughley et al., 1971; Maharjan, 2016). Settlements have traditionally been scattered across steep hills, contributing to weaker supra-household organization and reliance on kin-based networks (Rijal, 2011). Over the past century, livelihoods have shifted toward more sedentary agriculture—including slash-and-burn (*khoriya*) and terrace farming—while many households continue fishing and foraging for wild roots and fruits (Rijal, 2011; Sharma, 2011). During the broader colonial era in South Asia, Chepang interests were largely neglected within Nepal's governance structures, where shifting cultivation and foraging were weakly recognized relative to titled, settled agriculture (Cox, 1990; International Labour Organization [ILO], 2008). The Private Forests Nationalization Act, 1957 further exacerbated

marginalization by vesting ownership of private forests in the state; communities lacking documentary proof of tenure lost access to long-used forest resources central to subsistence (Amatya, 2017; FAOLEX, 1957; ILO, 2007; World Bank/FCPF, 2010).

Colonial and state-building legacies, followed by Nepal's recent political transitions, have shaped the status and rights of the Chepang, leaving persistent gaps between formal commitments and practice. Although Nepal ratified International Labour Organisation Convention No. 169 in 2007 and its 2015 Constitution guarantees proportional inclusion and social justice for indigenous nationalities, implementation has been uneven, with limited awareness and capacity at local levels and barriers to meaningful participation (Anaya, 2009; ILO, 2007; Government of Nepal, 2015; Asia Foundation, 2018). Socio-economic change and environmental degradation have further disrupted Chepang livelihoods. Empirical studies document chronic food insecurity; Studies report chronic seasonal shortfalls: in one Dhading site ~70% of households were self-sufficient for 7–10 months and 16% for <6 months, while a two village development committee survey found 7.3 months average self-sufficiency (Aryal et al., 2009; Piya et al., 2011). Constraints such as small landholdings, lack of irrigation, and marginal upland agro-ecologies compound poverty risks (Acharya, 2013; Maharjan, 2016; Gurung et al., 2014).

Against this backdrop of limited livelihood options and weak inclusion some Chepang individuals have been drawn into wildlife crime economies principally for income rather than for cultural reasons. National analyses identify Nepal as both a source and transit country, with hubs in Kathmandu and border districts; poverty and conflict have historically intensified poaching pressures, notably on the one horned rhinoceros (Martin & Martin, 2006; Paudel et al., 2020). Case reporting from Chitwan National Park likewise links arrests for rhino poaching to economically marginalized local populations, including Chepang (Dasgupta, 2017). These dynamics underscore the need to pair conservation enforcement with social factors, economic considerations and inclusive governance.

1.5 Material and Methods

The study adopted a mixed-methods approach, integrating both qualitative and quantitative data to capture the complexity of community involvement in illegal wildlife trade.

1.5.1 Data collection

Fieldwork was conducted over a seven-month period between 2022 (September, October, November, December 2022) and 2024 (March, April, May 2024). The primary tool for data collection was semi-structured interview schedules, which were conducted by principal investigator in Hindi and/or Nepali, with the support of local translators from the participating villages who translated to local languages when needed.

A total of 236 participants were surveyed from communities around Chitwan National Park. These were distributed across four categories:

1. Individuals incarcerated under wildlife laws for poaching
2. Family members of incarcerated individuals
3. Individuals not involved in poaching
4. Family members of individuals not involved in poaching

Within this broader sample, 108 participants identified as Chepang, including 62 who reported direct or indirect involvement in poaching. The remaining respondents came from other local and Indigenous communities, providing comparative perspectives.

The interview schedules included both open ended and close ended set of questions. The open-ended questions focused on obtaining qualitative data administered to only participants incarcerated for poaching, included questions on the financial, psychological, and social impacts of rhino poaching-related imprisonment, the participants' awareness of wildlife laws and penalties prior to their involvement in illegal wildlife trade, as well as broader socio-economic challenges such as poverty, access to education, healthcare, and land rights. The second survey instrument focused on obtaining quantitative data was designed as a structured set of close-ended questions, administered to all participants, and organised into multiple thematic sections which explored participants' perceptions toward cultural identity, well-being, conservation, and governance. In addition, key informant interviews were conducted with stakeholders, including representatives of NGO's, government and army officials, and conservation practitioners, to contextualize community perspectives within larger conservation frameworks. Reports from government agencies (e.g., Department of National Parks and Wildlife Conservation), NGO's, and INGO's provided supplementary secondary data.

1.5.2 Participant selection approach

Participants were identified using purposive and snowball sampling techniques to ensure inclusion of individuals with direct or indirect experiences of poaching.

Snowball sampling was employed in this study due to the sensitive nature of wildlife crime and the challenges associated with accessing individuals and households connected to such contexts. In settings where participation is shaped by trust, rapport, and social networks, this approach is widely recognised as appropriate and often necessary.

Initial access to the field was facilitated through a local organization active in communities around Chitwan district near Chitwan National Park. However, participation was not restricted to individuals affiliated with this organization. As the study progressed, independent relationships were established within the community, and participant recruitment evolved organically through respondent referrals, extending beyond the organization's immediate network.

Care was taken to engage with a diverse range of households across different community groups and levels of association with wildlife crime, ensuring that multiple perspectives were represented. The role of the organization was therefore limited to facilitating initial entry, while the sampling process itself remained adaptive and researcher-led.

Accordingly, snowball sampling in this context is best understood as a methodologically appropriate strategy that enabled access to otherwise hard-to-reach participants, while maintaining sufficient breadth and independence in the sample.

1.5.3 Data analysis

- Qualitative data (from semi-structured interview schedules) were analysed using thematic coding, focusing on recurring patterns of marginalisation, recruitment into poaching, household impacts of incarceration, and perceptions of conservation.
- Quantitative data (from structured questionnaires) were analysed descriptively and through statistical models. Likert-scale responses were reduced using principal component analysis (PCA) to generate composite perception scores. Regression analyses (*geeglm* in R) tested associations between perceptions and two binary variables: Chepang identity and wildlife-crime association.

- Comparative analyses were conducted across Chepang vs. non-Chepang households, and incarcerated vs. non-incarcerated households, to assess socio-economic disparities and perception differences.

1.5.4 Ethical considerations

Human participants were included solely for interview-based data collection. No biological samples or laboratory testing were involved. Ethical approval for the study was granted by the Nepal Health Research Council (Approval ID: 413 – 2022). Verbal informed consent was obtained from each participant prior to the interviews. Given the sensitive nature of the subject matter—particularly the participants' involvement in illegal wildlife activities—written consent was not collected, respecting community members reluctant to sign or provide thumbprints. Interviews were conducted in private spaces to ensure comfort and confidentiality, and each participant was assigned a unique identifier to ensure anonymity. Participants retained the right to withdraw at any point; if a respondent chose not to continue, the interview was immediately discontinued, and the information was excluded from the study.

Chapter 2

Wildlife at a Crossroads— Intersections Between Local Communities and Megafauna Trafficking: A Systematic Review



Wild One-horned Rhinoceros, Chitwan Nepal, Photo credit: Vasundhara Krishnani

2.1 Abstract

1) Illegal wildlife trade poses a significant threat to biodiversity, and can lead to species declines and habitat degradation. This complex global issue often involves marginalised local communities, who may be driven to participate in illegal wildlife trade activities due to socioeconomic and other pressures. While conservation efforts frequently focus on the impacts of illegal trade on wildlife, the role of local communities in addressing this issue remains under-represented and less understood in the literature.
2) The objectives of this study were to examine: i) What structural factors are associated with local community involvement in illegal wildlife trade (e.g., marginalisation, poverty, historical legacies)? ii) How do conservation-related relocations or displacement intersect with Indigenous communities' vulnerabilities, and how are these intersections associated with involvement in illegal wildlife trade? iii) What locally grounded, community-inclusive strategies have been implemented to address illegal wildlife trade in Nepal, India, and sub-Saharan Africa, and what evidence exists regarding their outcomes?
3) The goal of the study was to highlight the importance of shifting from traditional top-down conservation and management strategies to include a bottom-up approach that empowers local communities. The study aimed to address this gap by addressing several research questions, including: i) What social, historical, and economic conditions are associated with community involvement in illegal wildlife trade? ii) How do community displacements, conservation governance approaches (e.g., exclusionary models), and livelihood insecurities intersect with illegal wildlife trade in high-biodiversity regions? iii) What community-inclusion strategies have been implemented to address illegal wildlife trade, and what evidence is there regarding their outcomes for both equity and conservation?
4) We undertook structured search of academic databases (e.g., Web of Science, Scopus, JSTOR, Google Scholar) as well as policy literature and reports by using keywords such as "wildlife trafficking," "local communities," "poverty," "conservation," and "megafauna." Articles were included if they provided empirical data or in-depth analysis of the relationship between local communities and illegal wildlife trade in the specified regions.
5) The study shows that the interaction between local communities and illegal wildlife trade is shaped by a complex interplay of structural inequalities, historical marginalisation and economic precarity. These dynamics are further influenced by cultural practices,

governance structures and varying degrees of enforcement pressure, creating diverse and context-specific patterns across regions.

6) By involving communities in planning and decision-making, recognising their traditional rights and unique worldviews, and providing them with sustainable economic opportunities, we can help foster a sense of ownership and responsibility, ultimately leading to more effective and sustainable conservation outcomes.

2.2 Introduction

Illegal wildlife trade is a complex and urgent global conservation challenge, threatening biodiversity and hindering sustainable development efforts (Rosen & Smith, 2010; United Nations Office on Drugs and Crime [UNODC], 2024). It is a dynamic and vast global industry, with an estimated revenue between $7 billion and $23 billion annually, and involving the trafficking of over 100 million plants and animals worldwide each year (Harfoot et al., 2018; World Bank group, 2016, 2025). Globally, illegal wildlife trade constitutes the fourth largest illicit trade after human, drug, and weapon trafficking. According to the United Nations Office on Drugs and Crime Report (2024) approximately 13 million items were confiscated between 2015 and 2021. Notably, around 81% of these illegal trade seizures involved animal and plant species that are listed in the CITES Appendices across 162 countries and territories, with hotspots in regions such as East Africa, Southeast Asia, and parts of Europe (World Wildlife Fund, n.d.). Illegal wildlife trade currently impacts at least 4,000 animal and plant species, with ~3,250 of these listed under the Convention on International Trade in Endangered Species (CITES, 2024). This includes critically endangered mammals such as pangolins, rhinos, and elephants (UNODC, 2024). High-value animal products in the illicit wildlife trade include rhino horn, pangolin scales, elephant ivory, and tiger parts (UNODC, 2024). For example, tiger populations have drastically declined in Asia due to poaching and habitat loss, with approximately 5900-6000 individuals remaining in the wild (Global Tiger Forum, 2023; Bhattarai & Fisher, 2014). Additionally, sea turtles, crocodilians, and various bird species are also targeted, amongst other species and across ecosystems (WWF, n.d., 2025).

Indigenous and local communities have stewarded their homelands for generations and today occupy, use, or manage at least a quarter of Earth's land surface (Colchester, 2004; IPBES, 2019; Garnett et al., 2018; Rai et al., 2021). Throughout this review, we distinguish among *Indigenous*, *local*, and *marginalised* communities to reflect their different identities, governance structures, and historical experiences. "Indigenous" refers to groups with longstanding cultural and ancestral ties to particular lands, officially recognised in Nepal and India by national legislation (e.g., Nepal's NFDIN Act 2002; India's Forest Rights Act 2006). "Local" refers to non-Indigenous rural populations residing near protected areas, often affected by conservation policies. "Marginalised" encompasses both Indigenous and non-Indigenous groups experiencing socio-economic exclusion or political underrepresentation. This usage follows international practice (IPBES; CBD), noting that 'local communities' has

no single definition in international law, and that vulnerabilities can heighten risks of illegal wildlife trade involvement (IPBES, 2019; UNODC, 2017). Not all communities discussed in this review are Indigenous; however, they all share conditions that may increase vulnerability to illegal wildlife trade involvement.

In many high-biodiversity landscapes across Nepal, India, and sub-Saharan Africa, Indigenous and local communities are intricately connected to the ecosystems they inhabit (Infield, 2001; IPBES, 2018a; IPBES, 2018b; IPBES, 2019; Garnett et al., 2018; Menzies, 2024). Nevertheless, over the past decades, some community members become involved in various stages of illegal wildlife trade, mainly in activities that facilitate trade, such as spotting, hunting, or transporting wild animals (UNODC, 2024; Wildlife Justice Commission, 2025). Several socioeconomic and other factors play a significant role in the Indigenous and local community members' involvement in the early stages of illegal wildlife trade, which includes poaching and transportation of wildlife products, such as pangolin scales, rhino horns, elephant tusks, tiger skins and bones, among other several illegal wildlife products (Duffy et al., 2015; Winter, 2016; Lunstrum & Givá, 2020; UNODC, 2024; Paudel et al., 2020). Recognising the historical experiences and perspectives of Indigenous peoples and local communities is crucial to understanding the broader social, economic, and political contexts that influence any interaction with illegal wildlife trade (Lunstrum & Givá, 2020). Beyond the increasing demand for wildlife products, it is important to explore why community members may shift from traditional livelihoods to engage in illegal wildlife trade. Identifying these underlying factors is key towards developing effective strategies to combat illegal wildlife trade and related illegal activities (Arroyave et al., 2023).

Protected areas have played a crucial role in safeguarding biodiversity globally (Geldmann et al., 2019; UNEP-WCMC, IUCN & NGS, 2021). Nonetheless, certain conservation targeted models have at times resulted in the displacement and marginalisation of Indigenous and local communities (Heinen & Shrestha, 2006; Heinen et al., 2019). Rooted in historical and postcolonial governance structures, these strategies have often cast Indigenous peoples and local communities in ways that overlook their deep ecological knowledge and histories of sustainable resource management (Gadgil & Guha, 1993; Menzeis, 2024). Such practices, including displacement for the creation of new protected areas, to resolve human-wildlife conflict (IUCN, 2024) can disrupt deeply embedded social-ecological relationships, impacting cultural integrity, traditional livelihoods, and changing the ability of communities to sustain themselves by their traditional hunting, gathering, or farming (Sapre & Gori, 2023; Tauli-Corpuz et al., 2020; IUCN, 2022). These impacts are

particularly profound where Indigenous identity and spirituality are closely tied to ancestral lands (IUCN, 2022; Forest Peoples Programme et al., 2020).

The diverse nature and intensity of illegal wildlife trade worldwide have sparked ongoing debates among conservationists, managers and policy makers regarding the effectiveness of current methods to combat it (Pires & Moreto, 2016; Sollund, 2022). Top-down approaches primarily involve security-heavy measures and law enforcement strategies, including militarised tactics, strengthening law enforcement through training and equipment, and effective legal frameworks to deter and prosecute offenders (UNODC, 2024; INTERPOL 2023, 2025; WCO, 2023). Digital surveillance is also employed to monitor and track illegal activities online (Cardoso et al., 2023). Critics argue that these top-down approaches often fail to address the root causes of community involvement in illegal wildlife trade and have resulted in the counterproductive hyper-law enforcement and militarization of natural spaces (Witter, 2021; Duffy 2014; Duffy et.al., 2015; Menzies, 2024). Between 2010 and 2023, international donors committed over US$3.63 billion to combat illegal wildlife trade; ~59% went to protected/conserved area management and law-enforcement/criminal-justice, while ~18% supported sustainable-livelihoods (community-focused) interventions (World Bank Group, 2019, 2025).

This systematic review examines drivers of local community participation in the poaching and transport stages of illegal wildlife trade for tiger, pangolin, rhino, and elephant in sub-Saharan Africa, Nepal and India (2000–2025). To address this, this chapter had three specific objectives: 1) Identify and classify socio-economic and governance drivers associated with community involvement in poaching/transport; 2) Synthesize evidence on how conservation-related access restrictions or displacement interact with those drivers; 3) Assess the reported effectiveness of community-centred interventions (e.g., livelihood diversification, benefit-sharing, community ranger models) in reducing poaching/transport participation. The study aims to inform more inclusive, locally grounded conservation strategies that not only address biodiversity loss, while considering the lived realities and agency of communities most affected by and involved in this global wildlife trade.

2.3 Methods

2.3.1 Literature search strategy

This literature review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure transparency and reproducibility. We systematically searched peer-reviewed articles and relevant grey literature addressing the social, cultural, and economic factors driving the illegal wildlife trade of megafauna-specifically elephants, tigers, and rhinoceroses-in Nepal, India, and sub-Saharan Africa. These regions were selected due to the nature of illegal wildlife trade of iconic megafauna species, and shared challenges such as historical land dispossession, poverty, and conservation models that have sometimes excluded or marginalised local communities. Other regions globally, such as Europe and Latin America, were beyond the scope of this study.

2.3.2 Data sources and search terms

Digital databases including Web of Science, Scopus, and PubMed were searched for literature published up to May 2025. Search terms combined keywords and Boolean operators relating to: ("illegal wildlife trade" OR "poaching") AND ("elephants" OR "tigers" OR "rhinoceroses" OR "megafauna") AND ("social factors" OR "cultural factors" OR "economic factors") AND ("Nepal" OR "India" OR "sub-Saharan Africa"). Additional records were identified through manual searches of reference lists and relevant organizational reports.

2.3.3 Eligibility criteria

Studies were included if they focused on illegal wildlife trade involving elephants, tigers, or rhinoceroses; were conducted in Nepal, India, or sub-Saharan Africa, and those which examined social, cultural, or economic drivers; and presented empirical data or systematic reviews. Studies not included were the ones that focused on the specified species or regions; reviews lacking empirical or systematic methodology; and non-English publications.

2.3.4 Screening and selection process

All identified records were imported into reference management software and duplicates removed. Titles and abstracts were screened for relevance, followed by full-text assessment against inclusion criteria. Discrepancies were resolved through discussion among reviewers.

2.3.5 Data extraction and synthesis

Data were extracted on study location, species, methodologies, and key findings related to social, cultural, and economic drivers. The synthesis was narrative, structured around recurring themes and regional patterns.

2.3.6 Reporting

The selection process was documented using the PRISMA 2020 flow diagram, detailing the number of records identified, screened, excluded, and included, with reasons for exclusion at each stage. The review adhered to the PRISMA 27-item checklist to ensure comprehensive reporting.

2.4 Background of poaching in Sub-Saharan Africa, India, and Nepal

Illegal wildlife trade poses a persistent threat to biodiversity across the world, including in sub-Saharan Africa, India, and Nepal, with each region facing unique yet interconnected challenges (Table 1). In Africa, trafficking of elephants, rhinos, and pangolins has long been driven by international demand, particularly from Asia, with South Africa serving as a key transit hub due to weak governance (Wildlife Poaching and Trafficking in Africa: An Overview, 2021; FCN., n.d.). India grapples with a wide spectrum of Illegal wildlife trade, ranging from iconic species such as tigers, leopards and elephants to lesser-known reptiles, complicated by both local and international networks (Hance, 2012; Wood et al., 2000; Winter, 2016). Nepal, though smaller in size, is critical for rhino conservation and has experienced fluctuating poaching trends, especially during times of political instability (Paudel & Heinen, 2015b; Rookmaker, 2004). While all three regions have enacted conservation policies—ranging from strict enforcement to community-based approaches—persistent issues such as corruption, human-wildlife conflict, militarized conservation, and marginalization of local communities continue to undermine efforts (Wyatt, 2015; Zain,

2020; Rai, 2022; Gulati et al., 2021b). Demand for wildlife parts in traditional medicine and luxury markets, alongside socio-economic pressures, remain core drivers of the illegal trade.

Table 1: Comparative overview of history of poaching across Sub-Saharan African countries, India and Nepal

Theme	Sub-Saharan Africa	India	Nepal
1. Historical & Ongoing Illegal Wildlife Trade	Long-standing trafficking of megafauna such as elephants, rhinos, pangolins, driven by demand from Asian markets (UNODC, 2024).	Trade includes tigers, leopards, elephants, rhinos, pangolins, tortoises. Both domestic and international networks involved (TRAFFIC, 2010,2019).	History of poaching fluctuates, notably targeting rhinos, tigers, elephants. Nepal also serving as a transit route between illegal products being smuggled between India and China (UNODC, 2024).
2. Key Trade Routes & Drivers	South Africa acts as a major transit hub, with weak regulations and corruption facilitating smuggling to Asia(Zain, 2020; UNODC, 2024).	Biodiversity hotspot acting as source, transit, and destination. Driven by both domestic and international trade (WWF, 2024; UNODC, 2024).	High biodiversity with many threatened species. Historic poaching spikes linked to malaria eradication, settlement, and land conversion in Terai region (Jones, 2007).
3. Population Trends & Poaching Stats	South Africa holds ~75% of Africa's rhinos. High poaching levels: 1000+ rhinos/year (2013–2017); 420 in 2024; 103 in Q1 2025 (Balfour et al., 2025; Save the Rhino International, 2025; Department of Forestry, Fisheries and the Environment (DFFE, 2025).	India holds 75% of global tiger population. Tiger poaching persists: 32 (2021–2023), 26 (2024), 19 (2025 to May) **(**NTCA, 2023; Wildlife Protection Society of India, 2025).	Nepal holds ~19% of global greater one-horned rhinos. Poaching surged during civil war (1996-2006); reduced after establishment of protected area, however poaching still observed(DNPWC, 2025; International Rhino Foundation, 2022; Thapa et al., 2013; Acharya et al., 2020).
4. Cultural Practices & Demand Drivers	Colonial game laws and trophy hunting reshaped local wildlife use; contemporary rhino poaching involves local recruits, with economic inequality a key driver	Tiger parts are trafficked for traditional medicine and belief-based uses; wild-meat hunting persists in parts of	Rhino horn demand in Asian markets spans medicinal and prestige/status uses (UNODC, 2024; Milliken & Shaw, 2012).

	(Hutton et al., 2005; Neumann, 1998; Lunstrum & Givá, 2020).	Northeast India (Winter, 2016; Nittu et al., 2022/2023; TRAFFIC, 2019; Aiyadurai, 2010; Longchar et al., 2025).	
5. Policy Interventions	Historical policies removed hunting rights from locals for tourism/sport(Neumann, 1998; Hutton et al., 2005; Brockington & Igoe, 2006).	Wildlife (Protection) Act, 1972; establishment of the Wildlife Crime Control Bureau (2007); Project Tiger (launched 1973); recent India–Nepal WCCB bilateral coordination (India Code, 1972; WCCB, 2007; NTCA/Project Tiger; WWF-India, 2024; SAWEN, 2024).	Royal Chitwan National Park established in 1973; strict anti-poaching and multi-agency coordination credited with curbing rhino poaching; relocations documented around CNP (DNPWC, 1973 /UNESCO; Acharya et al., 2020; McLean & Straede, 2003).
6. Community Impact & Enforcement Issues	Policy changes impacted livelihoods; cash crop economy worsened poverty, food insecurity (Cernea & Schmidt-Soltau, 2006; West et al., 2006).	Enforcement gaps and corruption undermine responses to wildlife crime; human–wildlife conflict remains a serious challenge and can trigger retaliatory killings (UNODC, 2024; NTCA, 2023; Zain, 2020; Rana & Kumar, 2023; Mongabay India, 2025).	Reports document alleged forced evictions, access restrictions, and other human-rights violations in and around protected areas such as Chitwan and Bardiya, raising concerns about due process and safeguards in conservation enforcement (Dongol & Neumann 2021; Amnesty International & Community Self-Reliance Centre, 2021; Amnesty International, 2020; Human Rights Watch, 2020).

2.5 Contextual Factors Associated with Indigenous Community Involvement in Illegal Wildlife Trade

The involvement of Indigenous communities in illegal wildlife trade is a complex issue, deeply intertwined with economic necessity, limited livelihood options, systemic marginalization, and non-recognition of traditional rights (Wilson-Holt & Roe, 2021). These factors have been identified as crucial through research and analysis of the social and economic contexts in which indigenous communities operate. Studies and reports from organizations such as the United Nations Office on Drugs and Crime (UNODC, 2024; IUCN, 2024) and the World Wildlife Fund highlight how poverty, lack of awareness, weak enforcement, and the perceived benefits of wildlife exploitation create a challenging environment where poaching and trafficking become survival strategies for many indigenous communities (UNODC, 2024).

2.5.1 Conservation-driven relocation and displacement impacts

Conservation interventions that involve community relocation have historically aimed to protect biodiversity, but they have in some cases also produced complex unintended social consequences (Agrawal & Redford, 2009; Cernea & Schmidt-Soltau, 2006; IUCN, 2022). While efforts such as those seen in Nepal's Chitwan National Park or India's tiger reserves have contributed to species recovery efforts (Duangchantrasiri et al.,2016), they have often disrupted traditional livelihoods and access of local communities to forest resources (Paudel et al., 2018; Sahoo & Pradhan, 2020; Tripathy, 2024). In communities such as the San people in South Africa or tribal communities in parts of India (Assam and Odisha), relocation has also weakened cultural ties to land and hindered communities' ability to maintain sustainable land-use practices (Barnard, 2019; Koot & Büscher, 2019; Lasgorceix & Kothari, 2009; Hussain et al., 2012; Tripathy, 2024).

Research shows that when relocation of communities lacks adequate planning, compensation, or integration support, it can lead to increased poverty, food insecurity, and marginalisation (Kabra, 2009; Mahapatra et al., 2015; IUCN, 2022). Displaced communities may struggle to adapt to new environments, face difficulties in securing livelihoods, and experience social disarticulation. Schmidt-Soltau (2005) identifies nine primary dimensions of risks associated with unplanned resettlement, including loss of land, jobs, education, traditional knowledge, and community cohesion (Figure 3). These disruptions can erode

community trust in conservation efforts, especially when decision-making excludes local voices.

In the absence of viable alternatives, some individuals may turn to illegal wildlife trade as a survival strategy. This is not a rejection of conservation itself, but a reflection of unmet socio-economic needs. Studies suggest that conservation outcomes are more equitable and effective when local and Indigenous communities are meaningfully involved, and when their rights, knowledge systems, and livelihoods are recognised and supported (Vidal, 2022; Amnesty International, 2021).

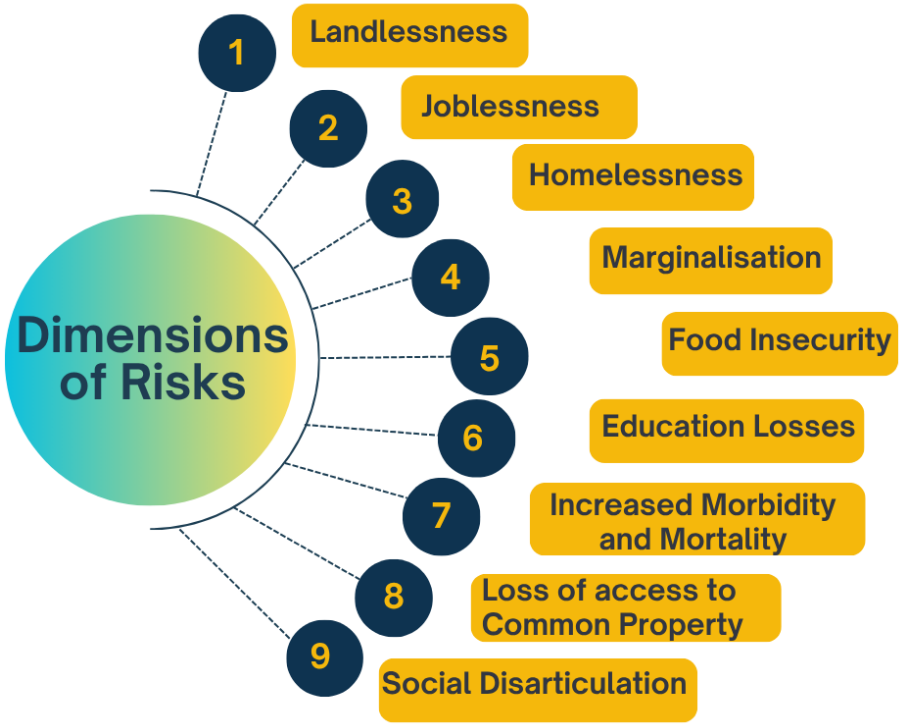


Figure 3: Nine primary dimensions of risks associated with Indigenous community resettlement (Schmidt-Soltau,K., 2005a), including:
Landlessness: Loss of access to land essential for survival, sustenance, and cultural and religious practices; ***Joblessness:*** Transition to low-wage, temporary jobs in overcrowded towns and cities with limited job opportunities***; Homelessness:*** Loss of both physical homes as well as the sense of community and cultural and religious spaces such as sacred groves; ***Marginalisation:*** Disconnection from traditional lifestyles and having to learn to fit in in a new society with a new, unfamiliar societal framework; ***Food Insecurity:*** Having to adapt to new agricultural practices as well as a lack of access to traditional food sources leading to malnourishment; ***Education Losses:*** Loss of traditional knowledge and skills which cannot be passed on to the next generation due to change in lifestyle and landscape***; Increased Morbidity and Mortality:*** Exposure to new diseases; ***Loss of access to Common Property*****:** Displacement from communal spaces vital for food, water, and cultural, traditional, and religious activities**;** ***Social Disarticulation*****:** Disconnection with traditional social structures (Schmidt-Soltau, 2005).

2.5.2 Systematic Marginalisation of Local Communities

Multiple studies have found that local and Indigenous communities living in and around forests have traditionally relied on bushmeat hunting and other forest-based practices for food security and cultural continuity (Robinson & Redford, 1991; Fa et al., 1995; Nasi, Taber, & van Vliet, 2011; IPBES, 2019). These subsistence strategies predate the establishment of formal conservation areas. However, the criminalisation of such activities—without the provision of viable livelihood alternatives—has created significant economic hardship for many communities (Sharma & Mendiratta, 2023).

Evidence from the literature indicates that Indigenous communities are often excluded from conservation planning and governance due to lingering colonial-era perceptions. These exclusions have, in several cases, weakened the link between communities and forest stewardship and contributed to socio-economic marginalisation (Schiffman, 2018; Mutanga et al., 2015). Where access to forests has been restricted or rights over traditional lands removed, some individuals have turned to illegal wildlife trade as a coping mechanism (Hubuschle & Shearing, 2018). The substantial profits associated with illegal wildlife trade can potentially create strong incentives for individuals in economically vulnerable communities—particularly in regions with limited livelihood options and weak governance structures—to engage in poaching and related activities (Hubuschle & Shearing, 2018).

2.5.3 Poverty and Livelihood Insecurity

Numerous studies reviewed identify poverty as a central underlying factor influencing the involvement of Indigenous and marginalised communities in illegal wildlife trade (Duffy et al., 2015; Lunstrum & Givá, 2020; UNODC, 2024; Paudel et al., 2020). Communities residing near protected areas often face persistent economic insecurity, characterised by limited access to education, employment, and essential services (West et al., 2006; Brockington & Wilkie, 2015; IPBES, 2019). Those living adjacent to conservation zones are frequently more socioeconomically disadvantaged than populations farther away—a condition described in the literature as the "poverty trap," which perpetuates exclusion and vulnerability (Azariadis & Stachurski, 2005).

Research suggests that in the absence of alternative livelihood opportunities, restrictions on traditional subsistence practices can lead some individuals to engage in illegal wildlife trade as a means of coping with economic hardship, particularly when external actors offer financial incentives (Duffy et al., 2015; Harrison et al., 2015). In many cases, motivations are

linked more to subsistence needs than to profit-seeking behaviours (Duffy & St. John, 2015). This situation highlights the need for more nuanced, context-specific interventions that integrate poverty alleviation with conservation objectives, ensuring both human well-being and biodiversity protection are addressed in tandem (Gaikar, 2020). Several studies also emphasise the role of global demand in fuelling these trade networks, which can indirectly draw impoverished communities into illicit activities (IFAW, 2008; Challender & Macmillan, 2014).

Human-wildlife conflict has emerged as an additional burden in multiple case studies. Damage to crops and livestock from species such as elephants, tigers, and boars can intensify livelihood insecurity and food scarcity (Dickman, 2010; Gulati et al., 2021b; Treves & Karanth, 2003). In contexts where compensation schemes are either inaccessible or insufficient, some community members reportedly resort to retaliatory actions, including poisoning or electrocution of wildlife (Mazzoleni & Pavan, 2019). These findings underscore the complex interplay between poverty, ecological pressures, and illegal wildlife trade in conservation landscapes.

2.5.4 Lack of alternative livelihood opportunities

Several studies reviewed indicate that relocation initiatives, when poorly planned or inadequately supported, can disrupt traditional lifestyles and present major adaptation challenges for affected communities (Vikhman et al., 2018). Compensation schemes that provide lump-sum payments often lack financial literacy support, leading to mismanagement of funds and short-term financial insecurity (Negi & Azeez, 2022b). Similar patterns were observed in evaluations of cash transfer programs, where inadequate guidance resulted in beneficiaries prioritizing immediate needs over sustainable investments (Molyneux et al., 2016; Skovdal et al., 2013).

Evidence from multiple contexts shows that relocated communities often face limited access to viable economic opportunities in new settlements: in India's Similipal Tiger Reserve, post-relocation households experienced income declines, fewer wage options, and persistent livelihood insecurity despite compensation (Mahapatra et al., 2015; Dash & Behera, 2018). In Nepal, families moved from the Padampur villages near Chitwan National Park struggled to rebuild farm and forest-based livelihoods and found few off-farm jobs at the resettlement site (McLean & Straede, 2003). In Mozambique's Limpopo National Park, resettled households reported restricted agricultural land, weak market linkages, and scarce wage work (Milgroom & Spierenburg, 2008); and comparable patterns are documented

across Central Africa, where conservation-related resettlement led to loss of land and common-property access alongside constrained economic prospects (Schmidt-Soltau, 2003). In such cases, the appeal of illegal wildlife trade may increase as a last-resort livelihood strategy (Sharma & Mendiratta, 2023). The literature further identifies livelihood insecurity, social exclusion, and limited institutional support as key factors that may increase vulnerability to involvement in illegal activities following relocation (Cernea & Schmidt-Soltau, 2006; Agrawal & Redford, 2009; Duffy et al., 2015).

2.6 Networks and Mitigation Strategies to tackle Illegal Wildlife Trade

The literature reviewed indicates that illegal wildlife trade, particularly involving high-value species such as elephants, rhinoceroses, and tigers, is largely orchestrated by organised criminal networks (Anagnostou & Doberstein, 2021). While socio-economic hardship is often a factor in community-level involvement, studies emphasise that it is not the sole catalyst for poaching. Local participation typically occurs at lower tiers of these networks (Duffy et al., 2015). High-level trafficking operations are primarily driven by global demand and facilitated by syndicates with substantial resources and influence (Basel Institute on Governance, 2021).

Evidence from several sources points to weak governance structures, limited enforcement capacity, and corruption, as key factors enabling the persistence of illegal wildlife trade in many biodiversity-rich regions (Lawson & Vines, 2014; IFAW, 2008). In many developing countries, resource limitations constrain the ability of authorities to implement comprehensive protections across vast protected areas, particularly when compounded by other national challenges such as poverty and urban crime (Duffy, 2010; Ayling, 2013; Challender & MacMillan, 2014; Heinen et al., 2019).

A subset of studies reviewed highlights efforts at the policy level to integrate conservation with poverty reduction (Adams, 2004; CBD, 2014; World Bank Group, 2025). In 2010, at its high-level meeting on biodiversity (held during the International Year of Biodiversity), the UN General Assembly underscored that conserving biodiversity is inseparable from poverty eradication (United Nations General Assembly [UNGA], 2010). This framing now sits within the 2030 Agenda, reflected in SDG targets that link nature and livelihoods—1.4 (secure access to land and natural resources), 2.3/2.4 (small-scale producers' incomes; sustainable agriculture), 6.6 (protect & restore water-related ecosystems), 14.2/14.4 (sustainably manage marine ecosystems; end overfishing) and 15.1,

15.5, 15.7, 15.c (conserve terrestrial ecosystems; halt biodiversity loss; end poaching/trafficking; build community capacity) (CBD, 2010).

International frameworks have explicitly urged protected areas to contribute positively to local livelihoods: the 2003 IUCN World Parks Congress adopted *Recommendation 5.29* calling for protected area integration into sustainable development, equitable benefit-sharing, and compensation of affected communities (IUCN, 2004, Rec. 5.29); and CBD COP-9 (2008) encouraged parties to integrate protected areas into wider land/seascapes "including aiming at poverty eradication," and to ensure protected area actions contribute to poverty eradication with fair, equitable benefit sharing and full participation of Indigenous and local communities (CBD, 2008, Decision IX/18, paras. 4(a), 19, 22; Berkes, 2009). Despite some progress, debates persist in the literature regarding the equitable distribution of conservation outcomes, especially for communities living adjacent to or within protected landscapes (Archabald & Naughton-Treves, 2001). Developing countries face unique challenges in addressing the complex issue of illegal wildlife trade. To tackle this effectively, the following strategies are proposed (Figure 4):

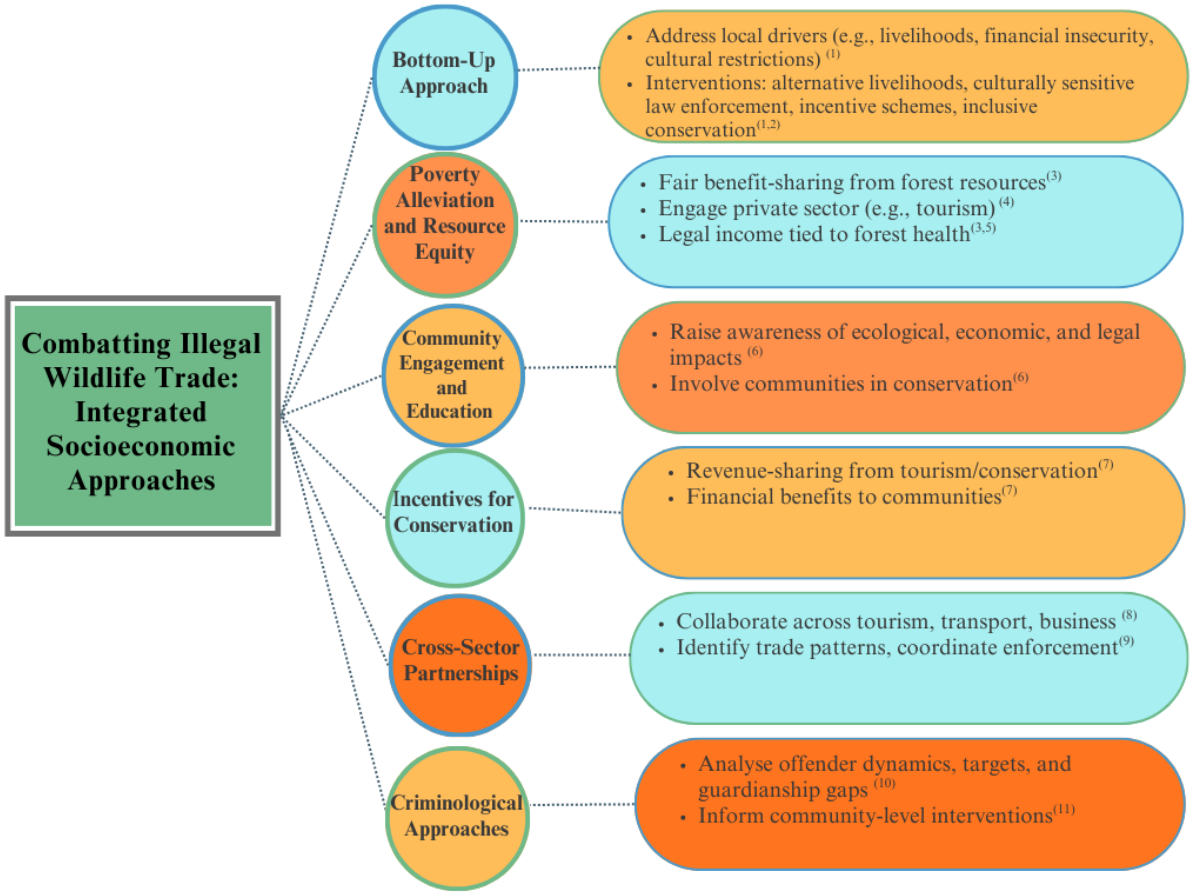


Figure 4. Integrated socio-economic approaches to combating illegal wildlife trade.
Note. Conceptual synthesis of six mutually reinforcing pillars: bottom-up approaches, poverty and resource equity, community engagement and education, conservation incentives, cross-sector partnerships, and criminological approaches. Numbers correspond to sources**:** 1 = Duffy & St. John et al., (2013); 2 = Ostrom (2010); 3 = Cheng et al. (2019); 4 = Bhattarai et al., (2017) 5 = Forest Trends (2010); 6 = Booker and Roe (2016); 7 = United States Agency for International Development, Biodiversity Technical Brief (2016); 8 = International Air Transport Association (n.d.); 9 = Grossmann (n.d.); 10 = Cohen and Felson (1979); 11 = Brantingham and Brantingham (1993). Full citations appear in the reference list**.**

2.7 Discussion

This review of literature from sub-Saharan Africa, Nepal, and India highlights that illegal wildlife trade is shaped by a complex interplay of ecological, economic, and social factors. While conservation has played a vital role in safeguarding species and habitats, evidence shows that outcomes are strongly shaped by how interventions interact with local histories, governance, and livelihoods (Oldekop et al., 2015; IPBES, 2019). In some contexts, exclusionary measures—notably relocation without adequate planning, compensation, or participation—have produced unintended social and economic disruptions (Cernea & Schmidt-Soltau, 2006; Agrawal & Redford, 2009; IUCN, 2022). For example, following the relocation of the Maasai from Tanzania's Ngorongoro Crater in 1974, poaching activity reportedly increased as communities lost secure access to resources (Charnley, 2005). Similar effects were noted after the 19th-century removal of Indigenous peoples from Yellowstone National Park, which led to ecological imbalances due to the loss of traditional management practices (Conservation Policy and Indigenous Peoples, 2010).

At the same time, multiple examples demonstrate that Indigenous and local communities play key roles in biodiversity stewardship (IPBES, 2019; Forest People Programme et al., 2020). Aboriginal fire management practices in Australia and in Africa, for instance, have been shown to reduce the risk of large-scale wildfires and support ecosystem regeneration (Brown, 2003; Shaffer, 2010; Russell-Smith et al., 2013; Binskin et al., 2020; Larris et al., 2020). In South Asia, local communities have developed land-use and seasonal movement patterns that contribute to human-wildlife coexistence and positive conservation outcomes (Karanth & Gopal, 2005; Gulati et al., 2021b). In Nepal's Chitwan National Park, studies show that tiger densities are often higher in buffer zones inhabited by people than in core protected areas, highlighting the ecological value of shared-use landscapes (Carter et al., 2012).

Experiences with conservation vary widely. In some settings, communities benefit from tourism revenues, secure resource rights, and co-management (Andam et al., 2010; Naidoo et al., 2019; Hajjar et al., 2021). Elsewhere—especially where poverty, marginalisation, or displacement persist—conservation has been linked to social and economic disruptions (Sharma, 2003; West et al., 2006; Cernea & Schmidt-Soltau, 2006; Saini, 2025). In such situations, limited access to legitimate livelihoods and weak institutional support can contribute to vulnerability, and in some cases, lead to involvement in illegal activities such as poaching (Duffy et al., 2015; Harrison et al., 2021). However, these dynamics are typically embedded within broader structural and global systems. Organised criminal networks, enabled by corruption and international demand for wildlife products, often play a central role in driving illegal wildlife trade, with community members frequently positioned at the lowest tiers of these trade chains (Anagnostou & Doberstein, 2021; Basel Institute on Governance, 2021; Lawson & Vines, 2014).

To address such complex and multi-scalar challenges, global frameworks have increasingly emphasised the need to link conservation with development. The IUCN World Parks Congress (2003) called for protected areas to contribute to local poverty reduction and avoid exacerbating inequalities. Similarly, the Convention on Biological Diversity's Decision IX/18 (2008) recommended that conservation activities contribute to sustainable development (CBD,2008). The UN General Assembly (2010) highlighted that conserving biodiversity is inseparable from poverty eradication. Recent CBD COP16 outcomes (Rome, Feb, 2025) reinforced this linkage by agreeing on a resource-mobilization plan (pathway to $200 billion/year by 2030, including $20–30 billion/year for developing countries) and a full monitoring/indicator framework to align biodiversity action with sustainable-development goals (CBD, 2025a; CBD, 2025b; UNEP-WCMC, 2025). In practice, some policy models—such as Botswana's Special Game Licences (1979–2004), which allowed food-insecure communities to engage in regulated hunting—have shown potential in aligning community needs with conservation goals (Hitchcock, 1996; Hitchcock & Masilo, 1995). However, the long-term success of such programs has often depended on transparent implementation, institutional capacity, and safeguards against elite capture or misuse (Dressler et al., 2010).

Several studies reviewed highlight growing recognition of the potential for more inclusive conservation models. Indigenous peoples and local communities manage or have tenure rights over at least a quarter of Earth's land. Much of this area overlaps with places of high ecological value and species richness. When land and tenure rights, meaningful participation, and traditional knowledge are recognised, conservation outcomes can be more

effective and more equitable (IPBES, 2019; Garnett et al., 2018; O'Bryan et al., 2020; Schuster et al., 2019; Hajjar et al., 2021; IUCN, 2024).

Overall, the reviewed literature underscores that conservation and community well-being can go hand in hand. Where local knowledge, participation, and rights are recognised, conservation outcomes tend to be more durable and equitable (Vidal, 2022; Garnett et al., 2018). Rather than viewing communities solely as beneficiaries or threats, inclusive conservation approaches position them as partners in biodiversity protection (IPBES, 2019; IUCN, 2024). In contexts where conservation restricts access to land or livelihoods, it is critical that affected communities are not left unsupported (IUCN 2022a, 2022b). As observed through the available literature, individuals often engage in activities such as hunting, transport, or surveillance to support poaching not out of criminal intent, but due to limited livelihood options, financial instability, food insecurity, exclusion from formal conservation processes, and, in some cases, longstanding grievances related to land and resource access (Lunstrum & Givá, 2020; Paudel et al., 2020; Sollund, 2022; UNODC, 2024). Strategies should include provisions for alternative income generation, reskilling, and employment within conservation institutions—such as forest departments or community monitoring teams (Kabra, 2009; Negi & Azeez, 2022b). Without such support, local communities may remain vulnerable to exploitation by external actors who leverage their knowledge of forested landscapes and tracking skills (Sharma & Mendiratta, 2023). A context-specific, socioeconomic and culture oriented approach that addresses these structural risks and builds on community strengths is vital to developing conservation futures that are both inclusive and sustainable.

Chapter 3

Community, Conservation, and Conflict: Chepang Communities' Lived Experiences and Poaching of the One-Horned Rhinoceros in Nepal



Chepang village house in Nepal. Photo Credit: Shailendra Chepang

3.1 Abstract

1. The greater one-horned rhinoceros (*Rhinoceros unicornis*), classified as 'Vulnerable' in the IUCN Red List, has recovered from 100 individuals in the 1960's to over 700 individuals as of 2021 rhino census in Nepal. Yet poaching persists, underscoring the need to understand community-level drivers of illegal wildlife trade. Conservation has made ecological gains, but the socio-economic factors behind local participation of communities in illegal wildlife trade remains underexplored, often marginalising key stakeholders.
2. This study centres the lived experiences of the Chepang people, whose traditional hunter-gatherer lifestyle has been disrupted by systemic poverty, displacement, and restricted resource access.
3. Using interviews with 108 participants—62 directly or indirectly involved in rhino poaching—we examined the historical background of the community and socio-economic factors shaping their involvement.
4. In-depth interviews revealed key challenges, including poverty, food insecurity, exploitation, and the erosion of traditional livelihoods as factors influencing their participation in illegal wildlife trade. Social and cultural dynamics, as well as the consequences of incarceration, such as family fragmentation and disrupted education, were also explored.
5. Though poverty is widespread in the region, the Chepang face distinct vulnerabilities due to geographic isolation and limited agricultural adaptation. Many participated in poaching under economic distress, receiving minimal compensation despite high personal risk. The resulting social impacts, combined with inadequate access to education, healthcare, and employment, perpetuate cycles of marginalisation.
6. Nonetheless, majority of the community members surveyed, expressed aspirations for sustainable livelihoods. Addressing the socio-economic marginalisation of the Chepang is essential for both community resilience and for effective conservation efforts. Development interventions that enhance education options, healthcare, and economic opportunity providing alternative income sources, will be critical in reducing poaching pressures and achieving long-term biodiversity protection in Nepal.

3.2 Introduction

Nepal is home to a diverse group of local and Indigenous communities, also known as '*Adivasi Janajati'*. According to Nepal's 2021 census, Indigenous communities comprise approximately 35% of Nepal's population, and the actual figure may be higher (CBS, 2021). The Government of Nepal officially recognises 59 distinct Indigenous nationalities, including the Chepang, Tharu, Magar, Bote, Rai, and Limbu, among others. These groups possess rich cultural heritage, encompassing distinct languages, traditions, and histories. However, some of these local communities in Nepal have faced enduring marginalisation, including loss of land rights , under-representation in governance, and restricted access to social and economic opportunities (Paudel et al., 2012; Gilbert, 2017; Vivekananda International Foundation et al., 2019; CBS, 2021).

The Chepang community is an Indigenous Tibeto-Burman ethnic group primarily based in the south-central region of Nepal and particularly in the districts of Chitwan, Makwanpur, Dhading, and Gorkha (Figure 2), where over 96% of the Chepang population resides (CBS, 2021; Bista, 1997; Rai & Thapa, 2015). Historically, the Chepangs are believed to be the first settlers in the Mahabharat range (Figure 5), a mountainous region between the plains and mid-hills stretching from east to west of Nepal (Sinha & Subba, 2003). They inhabit a range of ecological and climatic regions ranging from 500 to 1500 m above sea level, and have adapted to living in steep, hilly terrains (Sinha & Subba, 2003; Gurung, 2006). Traditionally semi-nomadic, the Chepang relied in the past on hunting, foraging, and slash and burn agriculture (Rai & Thapa, 2015). Their traditional settlements were often scattered across hills, contributing to a relatively fragile communal bond (Bista, 1997). Over the past century, the Chepangs transitioned to more sedentary agricultural practices, such as terrace farming, although many Chepangs continue to engage in traditional practices, such as honey harvesting, fishing and foraging for wild roots and fruits (Rai & Thapa, 2015; Subba, 1999; Gurung, 2008; Sinha & Subba, 2003).

According to the Nepal's 2021 population census, the Chepang population stood at over 84,000 individuals - approximately 0.3% of the total country's population. Despite their rich cultural history, over recent decades the Chepang community has faced acute socio-economic challenges and are among some of the most marginalised Indigenous groups in Nepal (NEFIN, 2020; CBS, 2021; Sinha & Subba, 2003; Bista, 1997, Gurung, 2006). Their livelihoods remain largely agrarian but are hampered in recent decades by limited access to arable land, inadequate irrigation and lack of modern agricultural techniques (CBS, 2021).

High poverty and illiteracy rates further compound their socio-economic vulnerability (Rai & Thapa, 2015; NEFIN, 2020).

Nepal has garnered international recognition for its community conservation projects and other conservation achievements, including in the recovery of the greater one-horned rhinoceros (*Rhinoceros unicornis*), listed as Vulnerable on the IUCN Red List and under Appendix I of CITES (IUCN, 2021). Once widely distributed across the floodplains of northern India and southern Nepal, the species experienced severe declines during the 20th century due to habitat loss, unregulated poaching (Dinerstein, 2003). As a megaherbivore, *R. unicornis* play a critical role in shaping grassland ecosystems and promoting plant diversity (Laurie et al., 1983). By the late 1960's, the number of one-horned rhinoceros had fallen below 100, prompting a series of state-led interventions including the establishment of Chitwan National Park in 1973, strengthened anti-poaching measures, and the introduction of community-based conservation initiatives (Subedi et al., 2013). These efforts contributed to a steady recovery of the one-horned rhinoceros population, which increased by 16%—from 645 in 2015 to 752 in 2021 (Mandal, 2021; Dudley, 2017; DNPWC, 2021). The rhino population census for Nepal was initially scheduled for March 2025; however, the suspension of USAID funding has led to the project being halted, and the timeline for its resumption remains uncertain. Nepal hosts the second-largest population of greater one-horned rhinos globally and remains one of only two countries globally where the species persists in the wild (International Rhino Foundation, 2022; National Trust for Nature Conservation, 2021). Despite these gains, ongoing threats from poaching and habitat encroachment necessitate sustained conservation vigilance and inclusive community engagement (Subedi et al., 2013; Massé, n.d.). Poaching of the one-horned rhinoceros in Nepal remains a persistent and evolving threat. Rhino horn retains high value in illegal and black markets, particularly in parts of Asia, sustaining transnational wildlife trafficking networks (Sharp, 2003). While these networks are often coordinated by high-level external actors, local community members are frequently recruited for the initial stages, such as tracking, hunting, or transporting rhino parts, often driven by economic vulnerability (Lamsal et al., 2018). Some of these local communities reside in buffer zones near protected areas and face systematic barriers to development, including landlessness and food insecurity. Within this context, members of the Chepang community living in close proximity to Chitwan National Park have been implicated in poaching (Subedi et al., 2013; DNWPC, 2021).

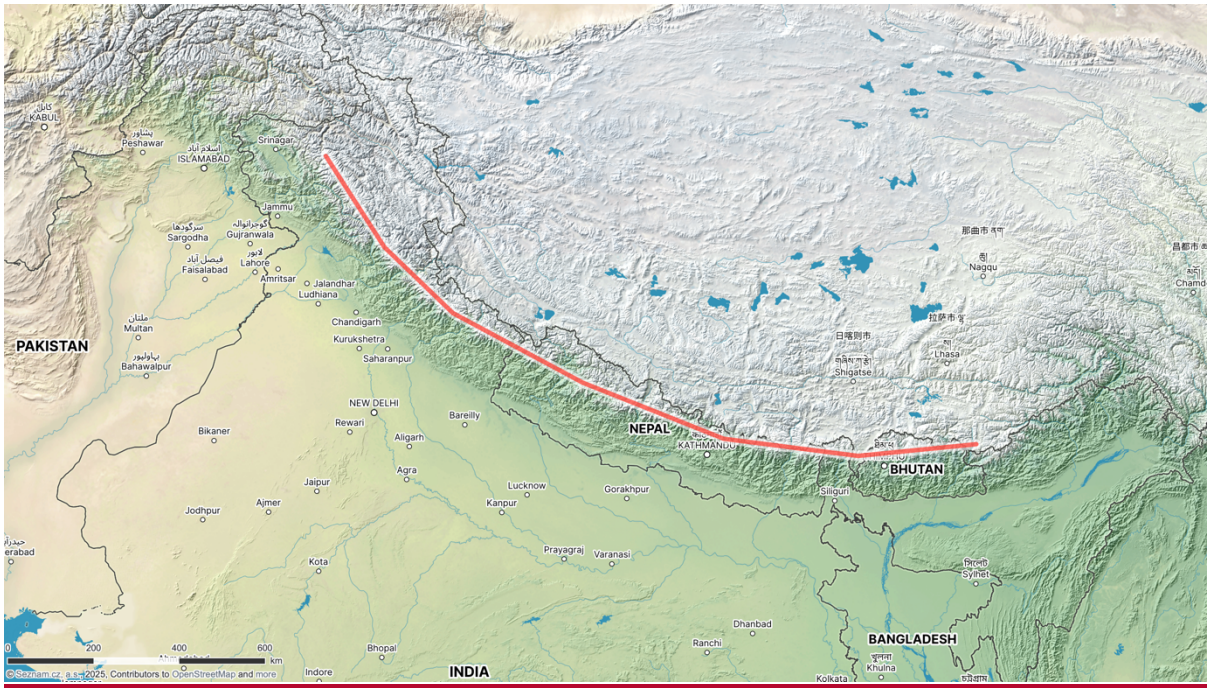
This study aimed to examine the socio-economic drivers of rhino poaching among Chepang local community in Nepal. Through in-depth interviews with 108 Chepang

community members—including those directly or indirectly involved in hunting. We aimed to examine how factors such as poverty, limited access to education and healthcare, lack of land rights, and the broader impact of incarceration on families influenced engagement in past greater one-horned rhinoceros hunting. The paper also examines how the Chepang have historically adapted to their changing circumstances and environments, while highlighting the influence of top-down policy and conservation initiatives on their present situation. In doing so, the study advocates for more inclusive conservation approaches that balance environmental and community welfare goals, and actively involve community members as leaders from the earliest stages of the process.

Figure 2. Study area map highlighting Chitwan National Park (dark green) and the four Chepang-inhabited districts—Gorkha, Dhading, Makwanpur, and Chitwan—shown with contrasting fills. District boundaries are displayed for reference, with a north arrow for orientation. Administrative boundary layers at district level.



Figure 5. Mahabharat range, a mountainous region between the plains and mid-hills stretching from east to west of Nepal



3.3 Materials and Methods

3.3.1 Study area

Chitwan National Park, established in 1973 and designated as a UNESCO World Heritage Site in 1984 is Nepal's first national park and remains a cornerstone of its biodiversity conservation efforts (UNESCO, 1984). Spanning 952 km² in the subtropical lowlands of south-central Nepal, the park encompasses a range of ecosystems - including sal forests, grasslands, wetlands, and riverine habitats- and is bounded by the Rapti, Narayani, and Reu rivers (DNPWC, 2020; Jnawali et al., 2011). As part of the Terai Arc Landscape, Chitwan National Park provides critical habitat for numerous endangered species, such as the greater one-horned rhinoceros (*Rhinoceros unicornis*), Bengal tiger (*Panthera tigris*), Asian elephant (*Elephas maximus*), and gharial crocodile (*Gavialis gangeticus*) (Subedi et al., 2013; DNPWC & WWF Nepal, 2016).

Surrounding the park are buffer zones and community forests inhabited by Indigenous and local communities, including the Chepang, Tharu, Bote, and others, whose interactions with the landscape are shaped by their culture, subsistence needs and evolving conservation frameworks (Spiteri & Nepal, 2008; Paudel et al., 2012, 2018). Chitwan National Park plays a central role in Nepal's rhino conservation efforts, with over 600 of the nation's estimated

752 greater one-horned rhinoceroses residing within its boundaries as of the 2021 census (DNPWC, 2021).

3.3.2 Data collection

This study employed a mixed-method approach, combining primary qualitative data from in-depth interviews with secondary data drawn from government, NGO, and INGO reports. Fieldwork was conducted in a cluster of villages situated within two districts in the buffer zone of Chitwan National Park, Nepal. To safeguard participant identity and due to the sensitivity of the topic, the exact village locations are not disclosed. The sites were purposively selected in consultation with a local not-for-profit organisation with long-standing engagement in Chepang communities, including prior work with individuals incarcerated for involvement in greater one-horned rhinoceros poaching. The selected villages included both households directly affected by rhino hunting and those not involved.

Fieldwork was conducted over a seven-month period between 2022 (September, October, November, December) and 2024 (March, April, May). The primary tool for data collection was semi-structured interview schedules, which included open-ended questions on the financial, psychological, and social impacts of rhino poaching-related imprisonment. Questions also explored participant awareness of wildlife laws and penalties prior to their involvement, as well as broader socio-economic challenges such as poverty, access to education, healthcare, and land rights. In addition, key informant interviews were conducted with stakeholders, including representatives of NGO's, government and army officials, and conservation practitioners, to contextualize community perspectives within larger conservation frameworks. Reports from government agencies (e.g., Department of National Parks and Wildlife Conservation), NGO's, and INGO's provided supplementary secondary data.

The interviews were conducted with participants over the age of 18 from the Chepang and other local communities in the study area by principal investigator, Vasundhara Krishnani in Hindi and/or Nepali, with the support of local translators from the participating villages who translated to local languages when needed. Ethical approval for the study was granted by the Nepal Health Research Council (Approval ID: 413 – 2022).Verbal informed consent was obtained from each participant prior to the interviews. Given the sensitive nature of the subject matter—particularly the participants' potential involvement in illegal wildlife activities—written consent was not taken, respecting community members' reluctance to sign or provide their thumbprints. Interviews were conducted in private spaces to ensure comfort

and confidentiality, and each participant was assigned a unique identifier to ensure anonymity. Participants retained the right to withdraw at any point; if a respondent chose not to continue, the interview was immediately discontinued, and the information was excluded from the study.

Several additional steps were taken to minimise bias and protect participants:

- Trust-building: Interviews were conducted only after sustained engagement in the villages, allowing participants to build rapport with the principal investigator.
- Triangulation: Multiple participant types ["participants incarcerated for poaching", adult family members (no children were included), and "participants not involved in poaching"] were included to capture a more holistic view of the socio-economic dynamics.
- Reflexivity: The researcher maintained a field diary documenting her own positionality, potential biases, and reflexive observations to strengthen analytical transparency.

3.3.3 Participant selection and sampling

A total of 108 participants from the Chepang community were interviewed using purposive and snowball sampling techniques. Potential participants were contacted with the assistance of a local organisation that has been actively working with individuals and families that were involved in rhino poaching cases. From these, snowball sampling was used to identify additional respondents—particularly family members of offenders and community members not directly involved in poaching but living in the same socio-geographic contexts.

This approach was chosen to ensure the inclusion of both perspectives and to navigate the challenges of trust and disclosure given the sensitive nature of the study. Of the total sample, 62 participants (18 years old and above) were directly or indirectly involved in the poaching of rhinos, either as offenders or immediate family members. Participants involved in rhino poaching had served prison sentences ranging from 10 to 15 years and were interviewed only after their release. Individuals who were still incarcerated at the time of the study were not interviewed or included in the sample. The remaining participants were Chepang community members who were not involved in any form in rhino poaching.

3.4 Literature Review

A systematic review of scientific literature was conducted to examine the historical, socio-economic, and political conditions of the Chepang community in Nepal and their intersection with conservation and illegal wildlife trade. Searches were conducted on Google Scholar using keywords such as "Chepang," "Nepal," "illegal wildlife trade," "poaching," "exclusionary conservation," "traditional knowledge," "livelihood change," "marginalisation," and "socio-economic issues". The search yielded 687 records. After screening titles and abstracts, and limiting inclusion to peer-reviewed empirical field studies, 58 studies were selected for in-depth review. Only peer-reviewed studies focusing on Nepal and presenting empirical data on the Chepang community's socio-economic conditions, conservation dynamics, or involvement in illegal wildlife trade were included. To ensure depth and contextual accuracy, preference was given to field-based research that directly engaged with community perspectives or analysed the on-the-ground impacts of conservation and enforcement policies.

3.4.1 Subsistence strategies and cultural practices of the Chepang

Historically, the Chepang were semi-nomadic forest dwellers who depended heavily on hunting, foraging, and shifting cultivation (Gurung, 2006; Sharma, 2014; Rana et al., 2020). Over time, they practiced *khoriya* farming, a form of slash-and-burn agriculture used to grow maize, millet, and bananas, while continuing to collect wild edible plants such as "Kodo" (*Eleusine coracana*), "Githa" (*Dioscorea bulbifera var. sativa*), and "Vyakur" (*Dioscorea bulbifera*) (Gurung, 2006; Rana et al., 2020). Skilled in crafting bamboo tools and weapons, they hunted wild game such as monkeys, deer, wild boar, and birds (Sharma, 2014; Subedi et al., 2022). Although hunting has declined due to legal restrictions, remnants of these practices—particularly bat consumption—persist in some areas and Chepang communities (Subedi et al., 2022). The traditional weapons used for hunting bushmeat such as monkeys, jungle fowl, and wild boar are still crafted by members of the Chepang community (Sharma, 2014; Rana et al., 2020).

Traditional ecological knowledge also included the use of medicinal plants for treating conditions ranging from minor ailments to chronic illnesses (Kunwar et al., 2006; Rana et al., 2020). The Chepang community still relies on various wild plants for traditional medicine, using them to treat ailments ranging from minor infections such as flu to diabetes and hypertension (Rana et al., 2020; Kunwar et al., 2006). The Chepang identify as "*prakriti*

pujak"—nature worshippers, maintaining spiritual ties with the land through rituals such as "*bhumipooja"*(worship of the land), which seeks agricultural fertility and honours ancestral spirits (Sharma, 2014; Gurung, 2006). The 'chiuri' tree (*Diploknema butyracea*), vital for food, ritual, and livelihood, remains central to the Chepang's cultural identity (Chikanbanjar et al., 2021; Paudel & Sah, 2003; Rana et al., 2020).

3.4.2 Political exclusion and land dispossession

The British-era and subsequent Nepalese national policies have influenced the Chepang land tenure and livelihood systems, particularly through forest nationalisation and shifts in land use governance (Mukul & Byg, 2020). After the Private Forest Nationalization Act of 1957, some of the local community's traditional practices, such as shifting cultivation and foraging, were excluded from formal governance structures that prioritized land ownership (Mukul & Byg, 2020; Ojha et al., 2009; Sharma, 2014). The Forest Nationalization Act of 1957 also resulted in the relocation of several Chepang villages from their ancestral lands (Paudel et al., 2011). Under the Panchayat regime, the state reclassified them as "Praja" or "subjects," reinforcing subjugation and political invisibility (Nepali Times, 2023). Despite the 2015 Constitution's guarantees of equality and inclusion (Government of Nepal, 2015), and the election of two Chepang representatives to the Constituent Assembly in 2017, no Chepang candidates secured a federal seat in the 2022 general elections. During the 2022 local elections, a record 14 Chepang individuals contested positions in Dhading, including ward chair roles—marking a notable rise in grassroots political engagement. However, representation remains limited to more local levels, with broader participation in provincial and federal governance still lacking (Adhikari, 2022; Chepang in Nepal's Politics, 2023).

3.4.3 Poverty and food insecurity

Roughly 90% of Chepang live below the poverty line, earning up to USD 330/year annually (Atreya et al., 2019; RYTHM Foundation, 2021) which severely limits their ability to access education, healthcare, and other essential services. The Chepangs face multifaceted challenges spanning poverty, illiteracy, food insecurity, and gender inequality (Atreya et al., 2019; Khatri, 2017). Their community has one of the highest illiteracy rates in Nepal, with approximately 63% of adults unable to read or write and very low levels of higher education attainment (Khatri, 2017; Piya et al., 2011b). School dropouts are widespread, driven by financial pressures and inadequate educational infrastructure (Setopati, 2023). As a result,

many adults are left out of formal schooling, perpetuating a cycle of poverty and limiting their employment opportunities (Khatri, 2017; Setopati, 2023).

The criminalization of forest-based subsistence practices following the Private Forest Nationalization Act of 1957— including the collection of roots, shoots, and fruits from the forest, collection of firewood and hunting of small animals for meat—forced the Chepang to rely on marginal agricultural land, often hilly and arid, and insufficient for year-round crop production (Gurung et al., 2014; Tamang et al., 2012; Uprety et al., 2016). Consequently, persistent food shortages are widespread (Thapa & Ghimire, 2019; Ojha et al., 2020).

3.4.4 Limited access to basic amenities

Faced with food and income insecurity, many Chepang seek daily wage labour. However, opportunities are scarce in remote areas, and crises like COVID-19 have further exposed their vulnerabilities (Subba et al., 2014; Sharma et al., 2021). Moreover, the absence of alternative livelihood options has contributed to the entrenchment of poverty within these communities (Subba et al., 2014; Sharma et al., 2021). Many Chepang settlements in the Chitwan buffer area lack basic amenities such as healthcare, clean water, and electricity (Bhandari & Bhusal, 2020; UNDP, 2018). Health facilities are remote, and many community members reported losing loved ones enroute to hospitals due to delayed access. Traditional beliefs and limited trust in formal healthcare systems, further contribute to underutilization of modern medical facilities (Uprety et al., 2016; Thapa & Ghimire, 2019).

3.4.5 Gender

Chepang society is patriarchal, limiting women's access to education, formal employment and decision-making power (Subba et al., 2014; WOREC, 2020). Women are more often burdened with household responsibilities and lack representation in public and community spheres (UNDP, 2018). When male family members are incarcerated, women are left to navigate both financial hardship and social stigma alone. The perception of being "vulnerable" or "available" in the absence of their spouses not only contributes to emotional distress but also severely limits their mobility and access to support systems (Khadka & Schuett, 2024). These overlapping burdens reinforce the gendered impacts of incarceration and marginalisation, deepening the vulnerabilities faced by Chepang women and families.

3.5 Results

3.5.1 Research demographics

A total of 108 Chepang individuals (40 female, 68 male) participated in the research. Of these, 62 (20 female, 42 male) were either directly or indirectly involved in the poaching of the greater one-horned rhinoceros in Chitwan National Park in recent decades. The other participants were not involved in poaching, but resided in the same villages and regions, offering critical insights into the broader community context. Individuals directly involved in poaching and their family members were interviewed to gain a holistic understanding of the socio-economic impacts of poaching and incarceration. Among all respondents, 36% were illiterate, and 46% had completed education up to the fifth grade. Notably, 84% of the children whose parents were incarcerated for poaching had dropped out of school due to financial constraints and lack of support.

This section highlights the results of the in-depth interviews that explore motivations behind poaching, its impact on wildlife conservation, and the responses from governmental and non-governmental organizations aimed at addressing these issues.

3.5.2 Motivations for poaching and underlying drivers

1) Lack of Livelihood Alternatives

Findings indicate that the Chepang community continues to face significant challenges in transitioning from a traditional reliance on hunting and subsistence farming to settled agriculture. Respondents cited limited access to fertile land and a lack of agricultural knowledge as major barriers, contributing to persistent food insecurity and economic instability. As one participant explained: *"The land we have is dry and stony. Even if we work hard, the harvest is never enough to feed our families."*

A majority of participants reported having no access to stable employment or regular sources of income. A majority of participants reported having no access to stable employment or regular sources of income. One interviewee remarked: *"There are no jobs in the village. Sometimes we get daily wage work, but it is not regular. Most days, we have nothing"*. In this context, some individuals disclosed turning to poaching as a means to support their families. "*I never wanted to get involved, but when there is no food and children are hungry, you take*

whatever option is in front of you", one respondent admitted. Data suggest that such participation was driven primarily by socio-economic hardship rather than criminal intent, reflecting long-standing marginalisation and the absence of viable livelihood alternatives. Another participant summarized this reality starkly: *"We don't see ourselves as criminals. We did it because we had no other way to survive."*

2) Economic Necessity

Participants overwhelmingly described their involvement in poaching as a survival strategy rather than a pursuit of profit. Many recounted how subsistence farming on degraded, low-quality land failed to sustain their families for the full year. As one man explained: *"Our crops finish within a few months. After that, we have nothing. The land is dry and rocky—we can't grow enough to suffice food all year round."* Several respondents spoke of the desperate measures they took to cope with food shortages *"Sometimes we drink only water to fill our stomachs. The children cry at night because there is no food, and we have to send them to sleep hungry"* recalled one father. Another mother shared*: "We wait for the harvest, but it never lasts the year. After a few months, the grain is gone, and we depend on the forest or daily wage work. If there is no work, we just stay hungry."*

In this context of chronic scarcity, some individuals described turning to poaching when every other option had been exhausted. Many participants revealed that they were deliberately deceived by those recruiting them into poaching. Initially, they were promised substantial payments for their knowledge and labour, but once the work was done, they were given little or nothing. In some cases, when they asked for the promised amount, they were threatened with being reported to authorities. This manipulation left many feeling exploited and betrayed. As one respondent explained: *"At the beginning, they promised us a lot of money, so we agreed. But after the work was done, they said, 'We will pay you later or gave us very little of the agreed amount.' When we asked again, they threatened us—'If you demand more, we will hand you over to the police.' In the end, we were fooled. We risked everything, but got nothing."*

3) Exploitation of Traditional Knowledge

Chepangs possess extensive ecological knowledge of forests and wildlife, attributed to their historical hunter-gatherer lifestyle. Historically reliant on hunting, many Chepangs retain

knowledge of animal behaviour, footprints, and seasonal movements of species such as deer, wild boar, monkeys, and jungle fowl-this expertise makes them adept at navigating dense forests and tracking wildlife (Sharma, 2014; Subedi et al., 2022).

Respondents, including elders and family members, reported that this intergenerational knowledge was frequently exploited by poaching networks which offer modest compensation—often in the form of cash, alcohol, or drugs—in exchange for assistance in tracking and navigating forest terrain. This intergenerational expertise was consistently cited as a key factor contributing to the recruitment of Chepang individuals into poaching activities. One participant's mother shared "*There are many people in need of money, but those from the towns and cities come directly to our Chepang villages because they know we understand the forest. They lure our young men with small amounts of money—nothing compared to what they earn from selling—but families here are poor and desperate, so they agree to any work offered".* Despite their central role in operations, participants noted that the financial returns to Chepang recruits were minimal compared to the high market value of the trafficked wildlife products. A participant recalled *"I was given 5000 rupees(35 USD) to help show the way into the forest and track the rhino. But later, I found out the horn was worth hundreds of thousands. We risked everything, but they got rich."*

Multiple community members emphasized that this forest-based knowledge made some Chepangs more likely than others in the region to be approached and involved in poaching. Women in the community also spoke of the emotional toll of this exploitation, particularly the sense of betrayal and fear that lingered after arrests. One widow explained: *"They used my husband for his knowledge of the jungle and then abandoned him. He went to prison for 15 years, but those who paid him never even showed their faces again."*

4) Limited Legal Awareness

Numerous respondents revealed that they were unaware their actions constituted criminal activity. In some cases, individuals were hired for minor tasks, such as carrying supplies, and later implicated in poaching operations. One participant recalled: *"They told me I would be paid 1,000 rupees a day just to carry bags of rice and supplies into the forest. I didn't ask what it was for—I needed the money, so I agreed."* He explained that he had no knowledge of the group's intentions, but after the main organizer was arrested, authorities listed everyone who had received payment. *"Even though I never hunted or touched a rhino, my name was given, and I was arrested,"* he continued. *"I ended up in prison for 15 years for something I*

didn't even know I was part of." Other participants shared similar experiences, where they were asked to perform tasks without understanding the full context of the group's activities. Because they received payment from those involved in poaching, they too were deemed guilty and apprehended.

One participant described how his own family ties had unintentionally drawn him into the justice system. He explained that although he was aware his brother was engaged in poaching, he did not report it to the authorities because he did not realise this could implicate him as well— *"I knew my brother was involved, but I never thought it was my duty to tell the forest officers. I didn't help him, I just stayed quiet. Later, when he was caught, they arrested me too. Only then did I learn that even keeping silent was considered a crime."*

3.5.3 Impact of involvement in poaching on the community

1) Social Stigma and Isolation

Families of incarcerated individuals faced widespread social exclusion. Participants reported being labelled as "criminals" or "lazy" by others in the village. Women whose husbands were imprisoned often felt unsafe and stigmatized. One woman shared, "*I feel caged even though I'm free. I can't step outside without people looking at me like I'm a criminal*. *Other women whisper that I will try to steal their husbands. I feel like I have no dignity left.*" Men who completed their prison sentences described similar rejection, citing stigma that made reintegration and employment nearly impossible. One participant shared "*I already had so much debt which I had to pay back due to the fine and lawyer fees. I was not getting any job as people had the stigma and even though I served my sentence, I was still treated like a criminal even after I was released from jail. How am I supposed to pay back the loans and take care of my family if I don't have a job*?"

The children of incarcerated individuals often bore the heaviest burden, experiencing both economic hardship and social stigma. One 18-year-old participant, who had left school at a young age, explained that both his parents had been imprisoned for poaching. Initially, his withdrawal was due to financial difficulties, but over time ridicule from peers compounded his decision. *"When my parents went to jail, it became very hard to manage without any money. We could not afford my sister and my school fees. But the worst was that other children made fun of me and my sister—they called us children of criminals. They mocked us every day. Finally, I left school. It was easier to stay at home than to listen to them."*.

Another father reflected on the intergenerational toll: *"Because of my prison sentence, my children grew up without education. They had to work in the fields and were treated as if they were criminals too."*

2) Family Disintegration

Long prison sentences disrupted family functions and disintegrated them. Many women felt compelled to leave their paternal families during their husband's incarceration, leaving children to be raised by relatives or fend for themselves. One participant stated, "*My wife left after three years. The children had no one. My brother tried, but he couldn't care for them properly. My children missed school and went hungry- they missed out on education, went days without food, and lived like orphans, even though both their parents were still alive*."

In another tragic case, a participant's father took his own life due to the shame associated with his son's imprisonment. He said, "*My father committed suicide after I was jailed because he felt ashamed. He had served in the Indian army, and it was a disgrace for him to have a son arrested. He ingested poison and died. Shortly after that, my mother fell ill and passed away within a few months*". The participant later shared that he was released early after being found not guilty, as no evidence could be substantiated against him.

One participant recounted an especially tragic experience that underscored the devastating long-term impacts of incarceration. Arrested for rhino poaching, he was sentenced to 15 years in prison when his son was just ten years old. During his imprisonment, his wife left the family after a few years, leaving the child to grow up without either parent. When he was finally released, he learned that his son had recently died in an accident, only months before his return. *"I lost everything in those 15 years,"* he explained. *"I thought at least I would come back to my son, but he was gone. I never even saw him grow into a man."* The pain of this loss was compounded when his daughter-in-law also abandoned the family after his son's death, leaving behind a young granddaughter. *"Now it is just me and the little girl,"* he continued. *"She is all I have left, and I am all she has. After losing my wife and my son, I am raising her alone. I am old, but I cannot give up—I have to take care of her."*

3) Further Poverty and Debt

Incarceration led to compounding economic hardship for nearly all affected households. Legal expenses, fines, and the prolonged loss of primary income earners pushed many families into deeper poverty. Several respondents reported selling land or livestock, taking high-interest loans from local moneylenders, or pawning whatever assets they had.

One participant explained: *"I sold our land to pay legal fees. My wife became depressed and turned to alcohol. We couldn't even afford to buy basic food for the family how could we think about spending money for school supplies for our kids."*. Another respondent described how the family's debt spiralled: *"I borrowed money at high interest to pay the lawyer and court fines. Every month the interest kept increasing. Even after I came back from jail, the loan was bigger than before. We had nothing left, only debt."*

For some, the pressure of repayments resulted in the permanent loss of family property. One father shared: *"We had two buffaloes which gave us milk. I had to sell both to pay the fine. After that, we had no source of income or food. My wife managed by selling some wood she would find in the forest, but for that also she would get caught by the forest department. It was very hard for her and my children"*.

The desperation extended beyond finances to basic survival. A participant recalled: *"During my time in jail, my family survived by taking small loans from neighbours. But when they couldn't pay back, people stopped helping. My children went hungry. Sometimes they had only water with rice to survive."*

Another respondent linked debt with long-term insecurity: *"After prison, nobody gave me work because I was a 'criminal' I had to take loans just to buy food. Now I am old, and the debt is still there. I don't think I can ever repay it."*. One interviewee described how his father's imprisonment left him with no future assets to inherit. To cover legal fees and pay for a lawyer, his father was forced to sell all of the family's land, including the portion traditionally reserved for his son. *"My father sold everything to pay for the case. Even the land that was supposed to be mine, he had to sell. Now I have nothing left to inherit—no land, no house, nothing,"* the young man explained. He went on to say that the loss of land not only deepened their immediate poverty but also stripped him of the security and identity

tied to land ownership: *"Land is the only wealth for people like us. Without it, I feel like I have no future."*

4) Inter-Generational Impacts

The incarceration of male heads of households had profound socio-economic repercussions for their families, with impacts often reverberating across generations. In many cases, children were compelled to discontinue their education due to financial hardship and the increased burden of domestic responsibilities, including agricultural labour and caring for younger siblings. One young man explained how this shaped his life: *"After my father went to jail, I stopped school to work in the fields. I was only 12. Now I am grown, but I can only do labour work because I never finished my studies."* Such disruptions to schooling left many children—particularly sons—deprived of the skills necessary for gainful employment, perpetuating cycles of poverty and marginalisation.

The absence of a paternal figure during incarceration was described by several fathers as having devastating consequences for their sons. One man, who spent more than a decade in prison, reflected on the changes he witnessed after his release: *"When I was taken away, my son was still a young boy. By the time I came back, he was grown but already carrying the damage of my absence- without me there, he had no guidance. He started drinking, mixing with bad company, and stopped caring about school. People in the village said he was going the wrong way, but what could he do? He had no father to look after him."*

Other participant shared how his absence forced his son to shoulder adult responsibilities far too early, leading to frustration and disillusionment. *"My boy became the man of the house when I was jailed. He worked in the fields and looked after his sisters, but he was just a teenager. He carried burdens no child should carry, and it made him bitter. In trying to survive, he lost his childhood."*. These accounts underline how incarceration not only punished fathers but also left sons vulnerable to risk-taking, substance use, and lost educational opportunities—perpetuating cycles of hardship across generations.

For daughters, the consequences were often different but equally troubling. Financial insecurity meant families were unable to continue supporting their education, and early marriages became a survival strategy. As one father explained: *"I was released when my daughter was only 16 years old, but I had to arrange her marriage because I was deeply in*

debt and uncertain about my future. I didn't want her to marry so young, but I couldn't provide for her, so I had no choice."

The burden often fell most heavily on the eldest children, who were forced to become de facto heads of household. One respondent described: *"After my wife left after I was caught, my eldest daughter was only 13, but she became like the mother. She cooked, cleaned, and cared for her younger brother and sister. She never had a childhood."*

These accounts reveal that incarceration did not just punish individuals; it disrupted the educational and social trajectories of an entire generation. Children carried the stigma of being labelled "criminals' sons or daughters," faced bullying at school, or were excluded from community activities. This intergenerational impact entrenched marginalisation, ensuring that even after men served their sentences, their families remained trapped in cycles of poverty, stigma, and lost opportunity.

3.5.4 Chepang knowledge and involvement in rhino poaching

While the primary focus of the research was around the socio-economic experiences of the Chepang community, the narratives collected also underscored the ecological consequences of their relation to involvement in poaching, particularly of the greater one-horned rhinoceros (*Rhinoceros unicornis*). Many participants had direct knowledge of poaching operations that targeted the one-horned rhino within Chitwan National Park, a globally important refuge for the species.

Activities ranged from guiding outsiders through dense forest terrain, tracking rhino movements, or transporting horns and supplies. One respondent explained: "*We were asked to follow the footprints and signs of the rhino because we know the jungle better than anyone. After that, we were given just a little money or alcohol, while others sold the horn for lakhs*." Such testimonies illustrate how intimate ecological knowledge of wildlife behaviour and habitat, accumulated through generations, was systematically exploited by external actors orchestrating illegal wildlife trade.

Importantly, the accounts suggest that the Chepang were rarely the primary beneficiaries of these activities. Instead, they occupied the most vulnerable positions in the poaching chain—taking on high risks of arrest and long prison sentences, while receiving negligible financial

returns. As another participant shared: "*The outsiders made all the profit. For us, it was only risk. We walked at night, hid from the army, carried the load. But we gained nothing except prison.*"

These findings highlight two interlinked challenges. First, the economic desperation and marginalisation of the Chepang community make them particularly vulnerable to recruitment by trafficking networks, which exploit their ecological expertise. Second, while participants understood that poaching was against the law, many reported being unaware of the intensity of the consequences—both legal and social. Several respondents explained that they did not anticipate facing such long prison sentences or the devastating ripple effects on their families. One man reflected: *"I knew it was illegal, but I never thought I would get 15 years in jail. I didn't know the punishment would destroy my whole family."* Others echoed this sentiment, emphasising the gap between their expectations and the actual outcomes of arrest and prosecution. *"I thought maybe a small fine, maybe some days in jail. But they gave me 12 years. My children grew up without me. I never imagined it would be so severe."*

This disconnect between perceived and actual consequences underscores a critical gap in conservation communication and community engagement. Without clear understanding of the risks and repercussions, marginalised groups remain vulnerable to exploitation and continue to bear the heaviest burdens of enforcement-led conservation. Several respondents also described feeling doubly victimised—not only by traffickers who exploited their knowledge, but also by law enforcement practices that disproportionately targeted them. Participants recounted instances where the main organisers of poaching operations were released, while poor villagers were pressured into confessing. As one man explained: *"The real masterminds never go to jail. The police let them go, but they took us. They put our thumbprints on papers we couldn't even read, and said we had confessed. We didn't know what we were signing."*

Others echoed this frustration, emphasising how arrests were sometimes performative—done to demonstrate enforcement success while leaving the bigger networks untouched. *"They needed to show the world that they were catching poachers,"* said another respondent. *"So they showed us, poor people, as the criminals, while the ones who paid us walked free."*. These testimonies illustrate how conservation enforcement, while central to rhino protection, can sometimes reinforce existing inequalities. By prosecuting the most vulnerable rather than dismantling higher-level networks, enforcement risks both undermining social justice and failing to address the structural drivers of poaching.

These factors point to a critical gap in outreach and education within existing conservation frameworks. While enforcement measures have successfully increased rhino populations in Nepal, insufficient investment in community engagement risks perpetuating local participation in poaching. By failing to address these knowledge gaps and socio-economic drivers, conservation initiatives may inadvertently sustain the very vulnerabilities that illegal trade networks exploit.

3.6 Discussion

The involvement of the Chepang community in poaching of the one-horned rhinoceros in Nepal is a complex issue driven by economic necessity, lack of alternatives, and broader socio-economic challenges. This study offers critical insights into the socio-economic conditions that drive the involvement of the Chepang community in one-horned rhinoceros poaching in Nepal. By foregrounding the voices and lived experiences of 108 participants—62 of whom were directly or indirectly involved in poaching—this research illuminates how marginalisation, historical disenfranchisement, and systemic poverty have created conditions where illegal wildlife trade emerges not necessarily as a deliberate criminal enterprise, but often as a desperate survival strategy (Cooney et al., 2016; Duffy et al., 2015)

The findings underscore that poaching among the Chepang is not solely a matter of enforcement failure but is deeply rooted in broader socio-political and economic injustices. The Chepang, historically hunter-gatherers, have been disproportionately affected by the erosion of traditional livelihoods, restricted access to forests following the implementation of protected areas, and the failure of conservation initiatives to include communities in the region (Paudel et al., 2018). These challenges, compounded with geographic isolation, limited access to quality education and healthcare, and a lack of viable livelihood alternatives (Paudyal et al., 2009).

The Chepang community has historically encountered social and structural barriers that have affected their access to development opportunities, including education, healthcare, and land tenure (Bennett et al., 2008; Subba et al., 2014). Studies highlight the intersection of poverty, limited formal education, inadequate healthcare services, and gender disparities as key challenges faced by the community. Factors such as unequal land ownership systems, underrepresentation in political processes, and limited inclusion in national development programs have contributed to their continued socio-economic marginalisation (Dhakal et al.,

2020; UNDP, 2018; WOREC, 2020). Development and conservation initiatives that do not consider culturally specific needs and contexts may inadvertently reproduce existing inequalities.

This research contributes to a growing body of critical conservation literature that situates poaching within broader structural conditions. While enforcement and surveillance remain necessary tools (Neumann, 2004; Duffy, 2014), the findings indicate that enforcement alone is unlikely to deliver durable outcomes. Punitive responses such as imprisonment can have well-documented collateral effects—household income loss, school dropouts, early marriages, and increased vulnerability to exploitation (Dobbie et al., 2019; Wildeman, 2014)—which may, in turn, sustain the conditions under which illegal trade persists. A more effective approach pairs proportionate enforcement with prevention: reducing socio-economic exclusion, expanding livelihood options, and supporting rehabilitation and reintegration, so that incentives to re-offend decline and conservation goals are more likely to be met.

The rationale behind undertaking this research was to address the critical gap in existing conservation and policy frameworks that often overlook the socio-cultural and political contexts of Indigenous and marginalised communities. By centring the experiences of the Chepang, this study argues for the need for a paradigm shift in conservation policy—one that recognises the importance of including considerations such as socioeconomic equity for Indigenous peoples and engagement in conservation in achieving long-term biodiversity protection (Dressler et al., 2010; Symes et al., 2018). Engaging local communities as active stakeholders and leaders in conservation decision-making can foster a sense of ownership and responsibility, enhance compliance with regulations and increase the effectiveness of conservation initiatives (Budhathoki, 2004; Roe & Booker, 2019; World Bank group, 2022). This collaborative approach not only enhances the effectiveness of conservation efforts but also ensures that these initiatives are culturally sensitive and tailored to the specific needs and circumstances of local populations (Cooney et al., 2016; Bachracharya et al., 2006).

While Nepal's conservation of the greater one-horned rhinoceros has been celebrated globally, the findings of this study underscore the socio-political vulnerabilities that threaten long-term protection. Continued involvement of economically marginalised communities such as the Chepang in poaching activities reveals that conservation gains remain fragile without socially inclusive strategies. Although the species' numbers have rebounded through

strong anti-poaching efforts, a singular focus on enforcement is insufficient. Our results support the need for conservation strategies that address the underlying economic and structural drivers of wildlife crime. These must include investments in education, livelihood diversification, and inclusive governance to reduce the risk of relapse into poaching and secure the rhino's future in the wild.

Ultimately, the findings reinforce the urgent need for integrated conservation interventions that are tailored to the local context and those which address the root causes of vulnerability. Investments in education, healthcare, sustainable agriculture, and alternative livelihood opportunities must go hand-in-hand with conservation goals. Only by addressing the socio-economic marginalisation of communities such as the Chepang can conservation efforts be both ethical and effective—benefiting not only local populations but also the endangered species that share their landscapes.

There is a pressing need for conservation frameworks to be reconceptualised through a rights-based and inclusive lens, particularly when they affect Indigenous and local communities (Nepal, 2002; Negi & Azeez, 2022b). Policies that criminalise poaching without addressing underlying socio-economic drivers risk further marginalising vulnerable groups while failing to protect endangered species in the long term (Cooney et al., 2016; Roe et al., 2020). Therefore, future conservation strategies should be developed in collaboration with local communities like the Chepang, incorporating their knowledge systems, aspirations, and needs. Interventions such as community-based conservation programs, skill development, secure land tenure, and ecotourism initiatives can provide sustainable alternatives to poaching while fostering local stewardship of wildlife (Bennett et al., 2021; Oldekop et al., 2015).

Further research is also necessary in order to explore the long-term effects of incarceration on Indigenous communities, especially in relation to social mobility, mental health, impact on future of community youth and community cohesion. Longitudinal studies could provide deeper insight into the efficacy of livelihood interventions and education initiatives, while comparative research across other marginalised groups involved in the illegal wildlife trade would help in crafting broader, more efficient and equitable conservation models across regions with similar setting.

Chapter 4

Quantifying the Socio-Economic Drivers of Rhino Poaching: A Case Study of the Chepang Community in Nepal



Nepal Army Patrolling in Chitwan, Nepal. Photo Credit: Vasundhara Krishnani

4.1 Abstract

1. Nepal's population of the greater one-horned rhinoceros (*Rhinoceros unicornis*), a vulnerable species under the IUCN Red List, has faced persistent poaching pressure due to the high illegal wildlife trade demand for rhino horn.
2. The Chepang community, an Indigenous group in Nepal, provides a case study for examining how socio-economic conditions intersect with environmental conservation dynamics.
3. The study aimed to examine the socio-economic factors impacting the local Chepang community surrounding Chitwan National Park, focusing on involvement in rhino poaching, the consequences of incarceration, and broader impacts on livelihoods and households, within the wider context of illegal wildlife trade and both its social and conservation implications.
4. A total of 236 participants were interviewed. Of these, 108 individuals belonged to the Chepang community, and the rest belonged to other tribal and local communities in Nepal. A total 98 out of the 236 participants were directly or indirectly involved in illegal wildlife trade of the one-horned rhinoceros in Nepal. An interviewee was classified as "directly involved" if imprisoned for such a wildlife crime or when having a close family member imprisoned. Otherwise, the interviewee was classified as "not directly involved"
5. Utilizing quantitative data collected from villages around Chitwan National Park, the research highlights the precarious situation faced by some Chepangs, characterized by high illiteracy rates and limited access to essential services. The findings reveal a complex relationship between the socio-economic pressures faced by the Chepang community and involvement in illegal wildlife trade of the threatened one-horned rhinoceros in Nepal.
6. The study finds that long-term incarceration affects family structures, the prospects of local youth, and the economic stability of the community, exacerbating existing vulnerabilities. By analysing these interconnections, this research can help provide insights into the need to implement potential interventions that could support sustainable development and reduce reliance on illegal wildlife trade among the Chepang community and enhance conservation engagement.

4.2 Introduction

Nepal is home to the greater one-horned rhinoceros (*Rhinoceros unicornis*), a species listed as vulnerable by the IUCN and central to the nation's conservation identity (IUCN, 2023). From fewer than 100 individuals in the 1960's, the population rose to 752 by the 2021 national census, with over 90% residing in Chitwan National Park—a UNESCO World Heritage Site and the country's primary conservation stronghold (DNPWC, 2021). This recovery is credited to strong government action, community-based protection, and collaboration between park authorities and Buffer Zone User Committees (Budhathoki, 2004; Thapa et al., 2013). Between 2011 and 2020, Nepal recorded several years of zero rhino poaching (WWF Nepal, 2020). However, since 2021, poaching has resurged, driven by transnational trafficking networks that exploit forest-edge poverty and enforcement gaps. The species is primarily targeted for its horn, which is highly valued in illegal markets, particularly in China and Vietnam, for use in traditional medicine and as a status symbol (Wong, 2019; Milliken & Shaw, 2012). These transnational trafficking networks often recruit marginalized local communities for frontline roles, underscoring the need to address socio-economic vulnerability as a key component of conservation strategy (Katuwal et al., 2022; DNPWC, 2023).

The Chepang are an Indigenous ethnic group in Nepal, with an estimated population of approximately 70,000 individuals residing primarily in the mid-hill districts of Chitwan, Makwanpur, Dhading, and Gorkha (CBS, 2021). Historically semi-nomadic, their livelihood systems were based on hunting, gathering, shifting cultivation, and foraging—activities closely tied to both subsistence and cultural identity. The enactment of the National Parks and Wildlife Conservation Act in 1973, alongside the establishment and expansion of protected areas such as Chitwan National Park, introduced formal restrictions on forest access and hunting (DNPWC, 1973). These policy shifts significantly altered the resource-use landscape for forest-dependent communities, contributing to long-term economic vulnerability (Paudel et al., 2019; Subedi et al., 2013). The transition from a semi-nomadic lifestyle to a more sedentary existence has presented ongoing challenges for the Chepang community. Chepang communities typically inhabit marginal, rain-fed lands with low productivity, limited infrastructure, and minimal access to services—resulting in chronic food insecurity and high levels of poverty (Tamang et al., 2014; Adhikari & Hobley, 2015). National

statistics indicate that over 90% of Chepang households live below the poverty line, with many surviving on less than USD $1 per day (National Statistics Office, CBS, 2021; Action Aid Nepal, 2020).

Within this context of structural marginalization and limited livelihood alternatives, some individuals from the Chepang community have been observed to be involved in the illegal wildlife trade, including the poaching of the greater one-horned rhinoceros (*Rhinoceros unicornis*). Various contributing factors have been put forward to account for this, including proximity to protected areas, limited livelihood alternatives, and ecological knowledge passed down through generations (Gurung, 2009; Subedi et al., 2013). Studies suggest that individuals from marginalized communities are often engaged in lower-tier roles within larger wildlife trafficking networks—such as tracking, transport, or local coordination—while higher-level actors remain less visible in enforcement efforts (Katuwal et al., 2022; DNPWC, 2021). The legal consequences of wildlife crime can have broader socio-economic repercussions. Incarceration may lead to household income loss, disruption of family systems, and reduced access to education or health services for dependents (Paudel et al., 2019). These secondary effects may compound existing vulnerabilities in already marginalized populations, emphasizing the need for context-sensitive conservation approaches that consider both ecological goals and social equity.

We undertook a quantitative assessment of socio-economic dynamics based on data collected from 236 individuals living near Chitwan National Park—108 of whom identified as members of the Chepang community. The analysis focuses on patterns of involvement in illegal wildlife trade, the socio-economic effects of imprisonment, and broader indicators of community well-being. By providing an evidence-based understanding of these intersections, the study seeks to inform more inclusive and context-sensitive conservation strategies in Nepal.

4.3 Materials and Methods

4.3.1 Study site

Chitwan National Park, established in 1973 and designated as a UNESCO World Heritage Site in 1984 is Nepal's first national park and remains an important cornerstone of the country's biodiversity conservation efforts (UNESCO, 1984) (Figure 2). Spanning 952 km² in the subtropical lowlands of south-central Nepal, the park encompasses a range of ecosystems - including sal forests, grasslands, wetlands, and

riverine habitats- and is bounded by the Rapti, Narayani, and Reu rivers (DNPWC, 2020; Jnawali et al., 2011). As part of the Terai Arc Landscape, Chitwan National Park provides critical habitat for numerous iconic and endangered megafauna, such as the greater one-horned rhinoceros (*Rhinoceros unicornis*), Bengal tiger (*Panthera tigris*), Asian elephant (*Elephas maximus*), and gharial crocodile (*Gavialis gangeticus*) (Subedi et al., 2013; DNPWC & WWF Nepal, 2016).

Surrounding the park are buffer zones and community forests inhabited by local and Indigenous communities, including the Chepang, Tharu, Bote, and others, whose interactions with the landscape are shaped by their culture, subsistence needs and evolving conservation frameworks (Spiteri & Nepal, 2008; Paudel et al., 2018). Chitwan National Park plays a central role in Nepal's rhino conservation efforts, with over 600 of the nation's estimated 752 greater one-horned rhinoceroses residing within its boundaries as of the 2021 census (DNPWC, 2021).

I undertook the study in a cluster of villages located in two districts in the buffer zone surrounding Chitwan National Park in Nepal. Due to the sensitive nature of the topic and to protect the identities of participants, the exact locations of these villages are not disclosed here. These sites were purposively selected in consultation with a local non-governmental organisation that has long-standing engagement with Chepang communities and has previously engaged with community members incarcerated for involvement in the poaching of the greater one-horned rhinoceros (*Rhinoceros unicornis*). The selected villages were known to host both affected and unaffected households in relation to rhino hunting.

4.3.2 Data collection

Fieldwork spanned seven months ranging two periods—September to December 2022 and March to May 2024. Closed-ended questionnaire surveys were administered to Chepang community members aged 18 and above, sampling across eight distinct groups within Chitwan District. Ethical approval was obtained from the Nepal Health Research Council (Approval ID: 413-2022). Surveys were conducted by Vasundhara Krishnani in Hindi and/or Nepali, with local translators from participating villages providing interpretation into local languages when required.

Snowball sampling was used to identify 49 individuals incarcerated for poaching. Potential participants were contacted with the assistance of a local organisation that has been actively working with individuals and families that were involved in rhino poaching cases.

Participants incarcerated for rhino poaching were 18 years old and above, had served prison sentences ranging from 10 to 15 years. They were each interviewed only after their release; individuals who were still incarcerated at the time of the study were not interviewed or included in the sample. A single family member of each individual thus identified was also identified and interviewed: a family member being either a spouse, sibling or a child.

Random sampling was used to identify another 69 individuals not incarcerated for poaching, who were each similarly interviewed along with a single family member. A sample of 236 Nepalese tribesmen comprising 118 family pairs were thus interviewed (Table 2). The respondents were all living in the same socio-geographic contexts. Each member of a family pair was interviewed away from each other.

This approach was chosen to ensure the inclusion of both perspectives and to navigate the challenges of trust and disclosure given the sensitive nature of the study.

Table 2. Respondent groups (A–H) used in the study—stratified by community identity (Chepang vs. other), legal status (imprisoned under wildlife laws vs. not involved), and relationship (individual vs. family member)

Group	Description
A	Chepang community individuals incarcerated poaching
B	Family members of the Chepang community members incarcerated for poaching
C	Chepang community members not involved in poaching
D	Members from other communities not belonging to the Chepang community incarcerated for poaching
E	Family members of other community members not belonging to the Chepang community incarcerated for poaching
F	Members not involved in poaching belonging to other communities
G	Family member of Chepang community participant not involved in poaching
H	Family member of participant not involved in poaching belonging to other community

Verbal informed consent was obtained from each participant prior to the interviews. Given the sensitive nature of the subject matter—particularly the participants' involvement in illegal wildlife trade—written consent was not collected, respecting community members reluctant to sign or provide thumbprints. Interviews were conducted in private spaces to ensure comfort and confidentiality, and each participant was assigned a unique identifier to

ensure anonymity. Participants retained the right to withdraw at any point; if a respondent chose not to continue, the interview was immediately discontinued, and the information was excluded from the study.

4.3.3 Questionnaire design: Thematic modules on socio-economic conditions, conservation, and governance

The survey instrument was designed as a structured set of close-ended questions, administered to all participants, and organised into multiple thematic sections (Table S1). In total, it comprised several sub-questionnaires targeting specific aspects of participants' socio-economic conditions, experiences, and perceptions. For the purposes of this study, analysis focuses on 11 distinct sub-questionnaires, each corresponding to a particular thematic domain—such as cultural identity, well-being, conservation, and governance. The broader instrument also included modules assessing the financial, psychological, and social impacts of imprisonment related to rhino poaching, as well as participants' awareness of wildlife laws and penalties prior to involvement in poaching. Additional sections addressed structural socio-economic challenges—such as poverty, food insecurity, and access to education—alongside demographic information (age, gender, education, caste/ethnicity, religion, employment status, household composition, and land ownership) to contextualise responses.

The questionnaire was designed to quantify the interviewee's perception of (or attitude towards) a specific concept. Each questionnaire consisted of series of individual questions collectively designed to quantify a specific concept. For each question, the interviewee responded by ticking one of five boxes arranged across a five-point Likert scale (Table S2). Each individual question was worded in such a way that a positive attitude should manifest itself as a tendency to tick boxes further to the right, i.e., to produce more positive Likert responses. A negative attitude, on the other hand, will manifest itself as a tendency to tick boxes further to the left, i.e., to produce more negative Likert responses.

To facilitate the analysis of the collected data, each questionnaire was coded in Microsoft Excel. This coding process involved organizing the responses into a structured format suitable for statistical analysis. The resulting dataset was then imported into R. Each interviewee was categorised according to the levels of the explanatory variable "GROUP" (Table S3).

These eight levels of "GROUP" anticipate the two binary variables (also listed at the right of Table 2 above):

1) Chepang: belonging to the Chepang community (Chepang=Yes) or not (Chepang=No)

2) WC_association: either having an association with wildlife crime (WC_association=Yes), or not (WC_association=No); NB: the association can be either "direct" (*i.e.*, the individual is the actual accused) or "indirect" (through family connection with an accused). Under this classification, an interviewee was classified as "directly involved" if either imprisoned for wildlife crime, or having a family member so imprisoned. Otherwise, the interviewee was classified as "not directly involved".

The two binary variables "Chepang" and "WC_association" create a 2 x 2 factorial experimental design, i.e., interviews are categorized by the four possible combinations of these two binary variables:

a) "Chepang=No" and "WC_association=No" ;
b) "Chepang=No" and "WC_association=Yes" ;
c) "Chepang=Yes" and "WC_association=No" ;
d) "Chepang=Yes" and "WC_association=Yes" ;

Such a factorial design enables us to investigate independent main effect of each individual binary variable separately, as well as interaction effect between them.

4.3.4 Derivation of perception scores and statistical modelling

The R function eigen was used to extract the eigenvalues and eigenvectors. The histogram of eigenvalues was examined to verify that the first few components account for most of the variation. The first eigenvector was examined to verify that it consisted predominantly of large positive elements, and it was then used to compute the first principal component. This principal component provided a single quantitative measure of each individual's overall response pattern; it quantifies the general tendency, across all questions within that questionnaire, to select answers toward one end of the scale: either toward the right or the left. In other words, an individual who tends to tick consistently towards the right of the Likert scale will receive a large positive principal component score, whereas an individual who tends to tick consistently towards the left will receive a large negative principal component score. In relation to the "specific concept" targeted by a questionnaire, the first principal component was interpreted as the "attitude" or "perception" of the interviewee

towards that concept. The variance of PC1 is the sample variance of the first principal component scores across all individuals. Each score is a linear combination of the original correlated data *(i.e., the questionnaire Likert responses)* gathered on an individual. The first principal component score, by definition, has the largest variance among all possible such linear combinations, meaning it spreads individual scores across the widest possible spectrum.

For each questionnaire, the first principal component score was regressed against the binary variables "Chepang" and "WC_association". The regression was done using the R program 'geeglm'. This particular program was chosen due to its capacity for performing the regression whilst simultaneously modelling within-family correlations. Multivariable regression methods of statistical analysis almost invariably engender an assumption of independence among individuals. For the present analysis, however, this assumption cannot hold. We recognise co-members of the same family as correlated. Use of geeglm not only avoided this independence assumption, but also enabled us to quantify the concordance of family pairs when they fill out a questionnaire, i.e., their tendency to tick Likert boxes in the same direction, globally speaking, across the items of a questionnaire.

4.3.5 Statistical modelling of within-family concordance of questionnaire responses

We used geeglm to fit a regression model of factors associated with within-family concordance in questionnaire responses. The predictors were three binary variables: "Chepang" and **"**WC_association" (as defined above), and "Kinship"**,** coded "Yes" when the pair were genetically related (sibling or parent–offspring) and "No" when the pair were a husband–wife pair. Using geeglm, these predictors were regressed on the degree of within-family concordance**.**

4.4 Results

A total of 236 adults participated in the study. Of these, 90 were women (38%) and 146 were men (62%). In terms of community identity, 109 respondents (46%) identified as Chepang, while 127 (54%) identified with other local communities.

4.4.1 Education levels of participants

Among participants not involved in poaching education levels were similar between Chepang and other communities, with primary education being most common (52% and 46%

respectively). Illiteracy was reported by 22% of Chepang participants not involved in poaching and 24% of other community participants not involved in poaching. Only 9-13% in each group had attained higher secondary education or above. A chi-square test indicated no statistically significant difference in education distribution between the groups ($\chi^2 = 0.96$, $p = 0.81$; Table 3).

Among participants incarcerated for poaching illiteracy was higher overall, reported by 39% of Chepang participants incarcerated for poaching and 50% of other community participants incarcerated for poaching. Primary education remained the most common level (55% for Chepang participants incarcerated for poaching and 44% for other community participants incarcerated for poaching) while higher secondary education or above was rare (3% for the Chepang participants incarcerated for poaching, none in other community participants incarcerated for poaching). Differences in education levels between participants incarcerated for poaching groups were also not statistically significant ($\chi^2 = 6.58$, $p = 0.086$; Table 4).

Table 3. Education levels of participants not involved in poaching by community

Education Level	**Chepang participant not incarcerated for poaching (%)**	**Other Community participant not incarcerated for poaching (%)**
Illiterate	22	24
Primary	52	46
10th grade	8	11
Higher secondary or above	18	19

Chi-square test: $\chi^2 = 0.96$, p = 0.81 — No significant difference in education levels between Chepang and other community participants not involved in poaching.

Table 4. Education levels of participants incarcerated for poaching by community.

Education Level	**Chepang participant incarcerated for poaching (%)**	**Other Community participant incarcerated for poaching (%)**
Illiterate	39	50
Primary	55	44
10th grade	3	6

Higher secondary or above	3	0

Chi-square test: $\chi^2 = 6.58$, $p = 0.086$ — No statistically significant difference, though the p-value is closer to the 0.05 threshold, suggesting a possible trend toward variation.

4.4.2 Perception of participants: Qualitative analysis

A total of 236 individuals from Indigenous and local communities in Nepal participated in the study, comprising 118 matched family pairs. Each participant responded to 11 themed questionnaires designed to quantify their perceptions on topics related to cultural identity, well-being, conservation, and governance. Responses were analysed in relation to two key variables: (1) whether or not the participant identified as belonging to the Chepang community, and (2) whether or not the individual or their immediate family had been involved in wildlife crime. Although the data was collected from individual respondents, analyses were conducted at the family level, with individual responses aggregated into family categories defined by ethnicity and association with wildlife crime.

4.4.3 Perceptual differences across community and rhino trade association

Across the range of perceptions measured through the questionnaires, there is an association between the mean perception and the probability of association with illegal wildlife trade. The next stage of the analysis examines whether these relationships differ between Chepang and non-Chepang respondents. Specifically, it explores whether the nature or strength of these associations is distinct for the Chepang community. Do Chepang respondents have unique factors influencing their involvement in wildlife crime? When members of the Chepang community engage in such activities, are their underlying reasons different from those of non-Chepang individuals?

From a statistical perspective, this represents a test of an interaction effect. The null hypothesis states that the binary variable *Chepang* does not interact with the binary variable *WC_association* in influencing mean perception scores. A statistically significant test statistic for the interaction effect would indicate that the strength of the association between a given perception and involvement in wildlife crime differs between Chepang and non-Chepang families. In other words, the effect depends on whether the respondent belongs to the Chepang community. The results pertaining to this question fall into two distinct categories (Table 5 and Figure 6).

Table 5. Interaction test of community identity (Chepang) × wildlife-crime association (WC_association) on mean perception scores. Results are grouped by whether the interaction term is non-significant (Group 1)—indicating similar Chepang and non-Chepang associations—or significant (Group 2)—indicating differential associations by community identity. Reported statistics are F values with associated P values for the Chepang × WC_association term for each perception domain.
Interpretation: Significant interactions (Group 2) imply that the strength/direction of the relationship between the perception and involvement in wildlife crime differs between Chepang and non-Chepang families; non-significant interactions (Group 1) imply no detectable difference.

Perception targeted by questionnaire	**Interaction test statistic**
Group 1 (No significant interaction)	
Physical Well Being	$F_{1,1} = 0.0758$, $P > 0.7833$
Mental and Environmental Well-being	$F_{1,1} = 0.0061$, $P > 0.9378$
Impacts of Law Enforcement at the Community Level (Long Term)	$F_{1,1} = 0.0267$, $P > 0.8703$
Drivers of Involvement in Illegal Wildlife Trade	$F_{1,1} = 0.1307$, $P > 0.718$
Impacts of Incarceration for participants incarcerated for Illegal Wildlife Trade	$F_{1,1} = 0.4523$, $P > 0.5019$
Community Outlook on Livelihoods, Services and Conservation Participation	$F_{1,1} = 1.4538$, $P > 0.2291$

Perception targeted by questionnaire	**Interaction test statistic**
Group 2 (Significant interaction)	
Access to Resources, Cultural identity, and Livelihood Transitions	$F_{1,1} = 7.1985$, $P < 0.0078$
Community Level Impacts of Conservation projects in the region	$F_{1,1} = 47.5413$, $P < 0.0001$
Outcomes of Conservation Projects in the region	$F_{1,1} = 13.6727$, $P < 3e\text{-}04$
Individual Benefits and Awareness linked to Conservation projects in the region	$F_{1,1} = 9.0125$, $P < 0.003$
Community Support and Engagement by Government	$F_{1,1} = 11.7864$, $P < 7e\text{-}04$

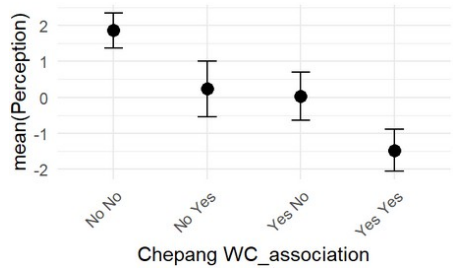
In Group 1, the interaction effect was not statistically significant., *i.e.*, the association between a given perception and involvement in wildlife crime is not significantly different between Chepang and non-Chepang. In Group 2, however, the strength of association between a given perception and involvement in wildlife crime, is significantly different between Chepang and non-Chepang. The Chepang display a different association between a given perception and involvement in wildlife trade.

The study found two distinct patterns in how perceptions relate to involvement in wildlife crime (Table 5; Figure 6). For Group 1 perceptions—physical and mental well-being, community-level impacts of law enforcement, perceived drivers of illegal wildlife trade, impacts of incarceration, and community outlook—interaction tests showed no evidence that community identity moderated the association with involvement. For Group 2 perceptions—access to resources, cultural identity, livelihood transitions, conservation project outcomes, individual benefits, and government engagement—interaction terms were significant, with associations evident among non-Chepang respondents but attenuated or null among Chepang respondents.

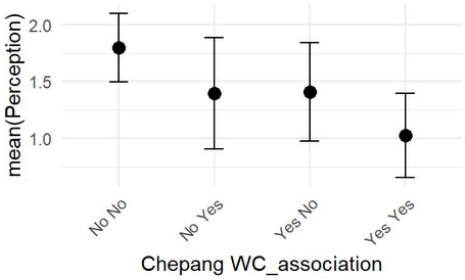
Figure 6. Mean perception across the four categories formed by crossing the binary variable "Chepang" with the binary variable "WC_association". The four categories are: i) "No, No: not Chepang, not associated with wildlife crime"; ii) "No, Yes: not Chepang, associated with wildlife crime" iii) "Yes, No: Chepang, not associated with wildlife crime", and iv) "Yes, Yes: Chepang, associated with wildlife crime". The perception quantified is stated above each graph. In Group 1, the association between the given perception and the involvement in wildlife crime is the same regardless of being Chepang or not. In Group 2, the Chepang display a significantly different association between the perception and the involvement in wildlife crime.

Group 1

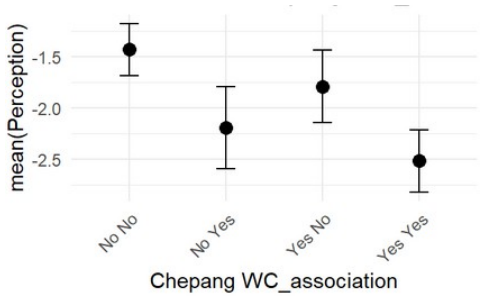
Perceived Physical Well-being



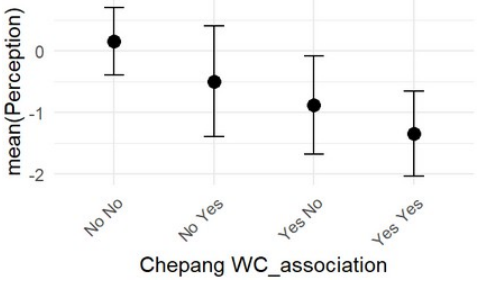
Perceived Mental and Environmental Well-being



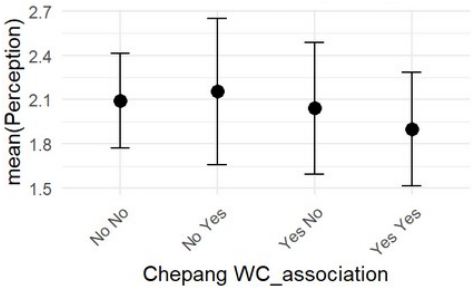
Perceived Impacts of Law Enforcement at the Community-Level (Long-term)



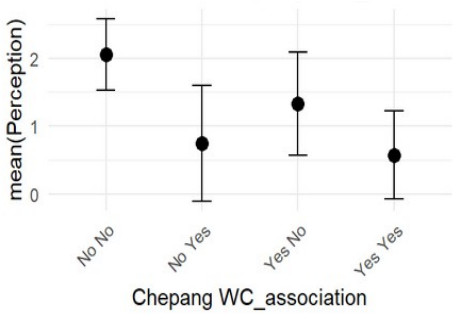
Perceived Drivers of Involvement in Illegal Wildlife Trade



Perceived Impacts of Incarceration for participants incarcerated for Illegal Wildlife Trade

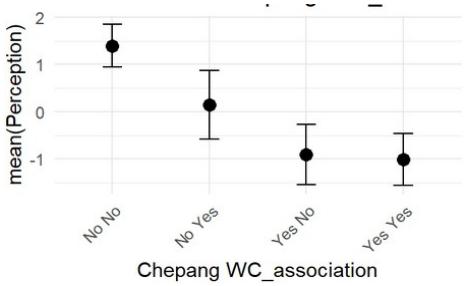


Perceived Community Outlook on Livelihoods, Services, and Conservation Participation

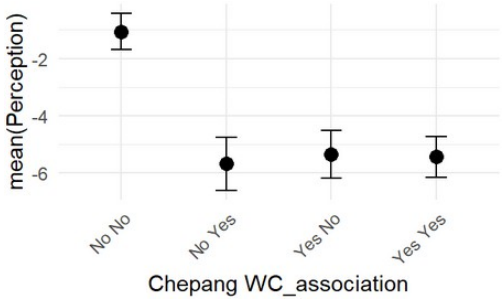


Group 2

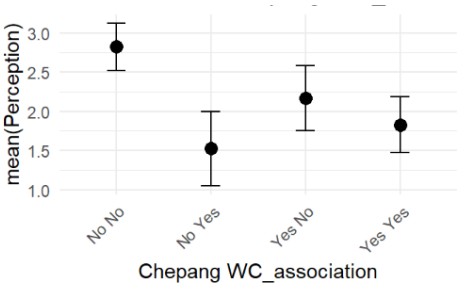
Perceived Access to Resources, Cultural Identity, and Livelihood Transitions



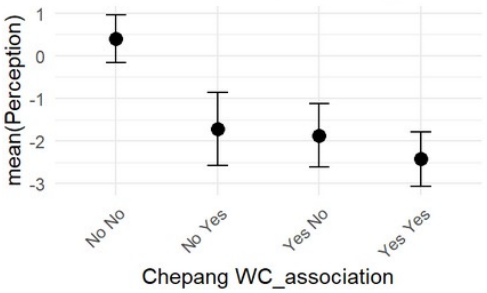
Perceived Community-Level Impacts of Conservation Projects in the region



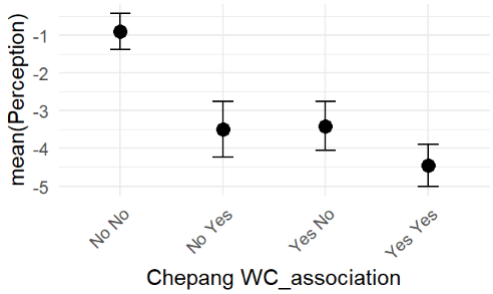
Perceived Outcomes of Conservation Projects region



Perceived Individual Benefits and in the Awareness Linked to Conservation Projects in the region



Perceived Community Support and Engagement by Government



4.4.4 Concordance estimates of perceptions within families

To quantify within-family concordance in questionnaire responses, we used generalized estimating equation (GEE) models implemented through the 'geeglm' function in the R package 'geepack'. Parameters of concordance quantify the degree of similarity in responses between members of the same household, across each thematic category of the questionnaire.

GEE modelling was selected because it accounts for the non-independence of observations within households and provides robust parameter estimates for correlated data structures. The GEE methodology has also been extended to estimate parameters related to concordance between correlated observations (Zhao and Prentice, 1990). Briefly, each pairwise cross-product of regression residuals is treated as a datum in its own right, and regressed against a set of corresponding pair-wise predictors, e.g., the kinship level of the pair, or whether (or not) they are both Chepang. The resulting regression parameters are called estimates of "concordance" rather than correlation because a pairwise cross-product of residuals is informative about covariance of the data pair.

Three binary predictor variables were included in each model: (1) 'Chepang' (Yes/No), indicating whether the household belonged to the Chepang community; (2) 'WC_association' (Yes/No), indicating whether the household had any prior association with wildlife-related legal offences through a family member; and (3) 'Kinship', coded 'Yes' for genetically related pairs (parent–offspring or siblings) and 'No' for husband–wife pairs. These variables were regressed against the concordance score to assess factors associated with the degree of within-family agreement.

Separate GEE models were fitted for each thematic category of questionnaire items (e.g., perceived access to resources, perceived well-being, perceptions of conservation impacts, perceptions of law enforcement, and perceived drivers of involvement in illegal wildlife trade). The resulting parameter estimates, confidence intervals, and significance values are presented in Table 6.

Table 6 presents the "Intercept" (baseline within-family concordance) and coefficients for "Kinship", "Chepang", and "WC_association" (binary predictors), with standard errors and significance levels reported for each questionnaire. The "Intercept" coefficient is the

mean concordance for families classified as: Kinship = "No", Chepang = "No", WC_association = "No".

Table 6. GEE estimates for within-household concordance in questionnaire responses (Intercept, Kinship, Chepang, WC_association).

Perceptions targeted by questionnaire	**GEE regression predictor of concordance**			
	Intercept	**Kinship**	**Chepang**	**WC_association**
Perceived access to resources, cultural identity, and livelihood transitions	1.4636 *****	−0.3101 (ns)	−0.7821 *****	−0.1270 (ns)
Perceived physical well-being	1.3151 *****	−0.4569 *	−0.2068 (ns)	−0.3143 (ns)
Perceived mental and environmental well-being	0.9343 *****	−0.4165 (ns)	−0.1392 (ns)	0.3655 (ns)
Perceived community-level impacts of conservation projects in the region	2.0645 *****	−0.1641 (ns)	−1.2768 *****	−1.0384 *****
Perceived outcomes of conservation projects in the region	1.2143 *****	−0.5560 **	0.0537 (ns)	−0.2650
Perceived individual benefits and awareness linked to conservation projects in the region	1.6454 *****	−0.5418 ***	−0.5500 ***	−0.6477 *****
Perceived impacts of law enforcement in the region at a community level (long-term)	1.0727 *****	0.0030 (ns)	−0.2120 (ns)	−0.1857 (ns)
Perceived drivers of involvement in illegal wildlife trade	1.1261 *****	0.1009 (ns)	−0.8289 *****	0.4177 *
Perceived impacts of incarceration for illegal wildlife trade on participants incarcerated for poaching	0.8602 *****	0.8617 *	−0.5821 ***	−0.4386 (ns)
Perceived community support and engagement by government	1.7222 *****	−0.4981 *	−0.6815 ****	−0.5922 ****
Perceived community's outlook on livelihoods, services and conservation project participation	0.9270 *****	−0.3455 (ns)	−0.1648 (ns)	0.2940 (ns)
******* P<0.0001 **** P<0.001 *** P<0.005 ** P<0.01 * P<0.05 (ns) not significant**				

The "Intercept" term represents the baseline (grand mean) level of concordance between members of a family pair. The other terms, "Kinship", "Chepang" and "WC_ association" represent deviations from this baseline associated with a "YES" value for the respective binary variable.

1. Intercept (baseline): The "Intercept" term is positive and highly significant across all questionnaires (Table 6). This indicates that, irrespective of which questionnaire,

members of a family pair are always positively concordant when filling out a questionnaire: if one member of a family pair reports positive attitudes, the other family member also tends to report positive attitudes. Conversely, if one member of a family pair reports negative attitudes, the other member also tends to report negative attitudes.

2. Kinship (Table 6, column 3): The coefficient estimates are generally negative or non-significant. A negative coefficient signals that "Kinship" has a weakening effect upon the degree of concordance. This indicates that genetically related family members tend to be slightly less concordant that husband-wife pair.
3. Chepang (Table 6, column 4): The coefficient estimates are generally negative or non-significant. A negative coefficient signals that being a Chepang has a weakening effect upon the degree of concordance. It means that Chepang family pairs tend to be less concordant than non-Chepang pairs.
4. WC_association (Table 6, column 5): The coefficient estimates are generally negative or non-significant. Association with illegal wildlife trade has a weakening effect upon the degree of concordance. This indicates that family pairs associated with illegal wildlife trade tend to be less concordant than family pairs not associated with illegal wildlife trade.

4.5 Discussion

Illegal wildlife trade is widely recognised as not only as a biodiversity problem but also a social, economic, and governance challenge, particularly in landscapes adjoining protected areas in low- and middle-income countries (Symes et al., 2018; United Nations Office on Drugs and Crime, 2024; IPBES, 2019). Participation is shaped less by attitudes alone than by opportunity structures—such as access to land and resources, livelihood transitions, the credibility and reach of public institutions, and the perceived fairness of conservation costs and benefits (Agrawal & Redford, 2009; Duffy et al., 2015). Consequently, effective strategies pair proportionate enforcement with prevention measures that strengthen livelihood security, enable meaningful community engagement, and address governance gaps that facilitate trade (Roe, 2019; UNODC, 2024). Indigenous and forest-dependent communities often experience these pressures most directly while holding limited decision-making power; incorporating their knowledge and priorities can improve legitimacy and conservation outcomes (IPBES, 2019).

4.5.1 Perceptual differences across community and wildlife crime association

This study examined how perceptions across multiple socio-economic, cultural, and governance-related themes relate to an individual's involvement in wildlife crime, and whether these relationships differ between the Chepang and other local communities. Across both groups of respondents, Chepang families consistently reported lower scores, particularly in areas linked to governance, conservation, and access to resources. Importantly, even Chepang non-offenders frequently reported greater disadvantage than non-Chepang offenders, indicating that structural deprivation exists independently of direct wildlife crime involvement. These findings highlight the entrenched marginalisation of the Chepang community. Education levels were generally low across all participants, but Chepang families—offenders and non-offenders alike—showed particularly severe deficits in food security and livelihood stability. Such disadvantage is consistent with prior studies documenting chronic poverty and exclusion among Indigenous and forest-dependent groups in Nepal (Tamang et al., 2012; Adhikari & Hobley, 2015). The results also suggest that structural vulnerability, rather than perception shifts alone, shapes patterns of involvement in wildlife crime. While non-Chepang families' participation appeared sensitive to changes in perceptions about governance and conservation (Group 2), the weaker associations for Chepang families imply that broader socio-economic deprivation reduces the relevance of such factors in shaping decision-making.

4.5.2 Modelling of predictors of family concordance

The results in Table 6 pertain to family concordance, defined as the tendency for members of the same household to provide similar responses to a given questionnaire. Using generalized estimating equations (GEE), we modelled predictors of family concordance. Results from these models are reported in Table 6 for the binary predictors "Kinship", "Chepang", and "WC_association".

The first column of Table 6 shows that the "Intercept" term is always positive and highly significant across questionnaires. This indicates that, irrespective of the questionnaire, family members tend to be positively concordant, that is, (i) if one family member holds positive perceptions, the other will also tend to hold positive perceptions, whereas; (ii) if one family member holds negative perceptions, the other will also tend to hold negative perceptions. These patterns suggest a family level "mindset": some families exhibit a predominantly negative mindset, while others a predominantly positive mindset. The word "mindset" is used to remove the attachment to any particular topic (questionnaire) that is being addressed. As shown in Table 6, wildlife crime is associated with a negative perception across all questionnaires, i.e., the relationship holds regardless of the specific perception measured. In other words, a family holding a negative mindset is more

often associated with wildlife crime. The results also indicate that Chepang families are more likely to exhibit a negative mindset. Taken together, these findings implicate a negative family mindset as a potential precursor to involvement in wildlife crime and show that Chepang households are more disposed to such a negative mindset. These results may partially account for the greater involvement in wildlife crime among the Chepang community.

Regarding the binary predictors of family concordance, the third column of Table 6 shows that "Kinship" generally had little or no effect on family concordance; where an effect was detected, it was negative (i.e., genetically related family members were slightly less concordant than husband-wife pairs). The fourth column shows that being Chepang had a negative effect on family concordance, indicating that Chepang families may be less concordant than non-Chepang families in their perceptions on a given topic.

The final column of Table 6, shows that incarceration for wildlife crime significantly weakened family concordance for the following perceptions: i) Perceived Community-Level Impacts of Conservation Projects in the region, ii) Perceived Individual Benefits and Awareness Linked to Conservation Projects in the region, iii) Perceived Community Support and Engagement by Government. For other perceptions, incarceration for wildlife crime had no significant effect upon family concordance.

4.5.3 Implications for conservation and illegal wildlife trade prevention

The persistent disadvantage of the Chepang makes them particularly susceptible to recruitment into low-tier roles within trafficking networks. Their geographic proximity to Chitwan National Park and their forest-based skills—derived from a history as hunter-gatherers, including knowledge of animal signs and forest navigation in predator-rich environments—make them valuable to higher-level actors who remain insulated from risk. As a result, Chepang individuals are disproportionately represented among those arrested for rhino poaching, while more powerful actors largely escape prosecution.

For conservation practice, the weaker associations observed for Group 2 among Chepang respondents suggest that interventions focused solely on changing perceptions of conservation or governance are unlikely to be effective unless paired with structural measures that reduce poverty, strengthen food security, and expand livelihood opportunities**.** Conversely, the consistency of Group 1 patterns across communities suggests that broader community-based strategies could target shared drivers of wildlife crime. Overall, these results underscore that the Chepang's position within the broader socio-economic landscape is not defined solely by illegal wildlife trade involvement.

Rather, the data indicate persistent structural marginalisation, which may reduce the relevance or effectiveness of perception-based interventions alone. Recognising and addressing these layered vulnerabilities is essential for both equitable community development and effective conservation action.

4.6 Limitations and Scope

This study's findings are specific to the surveyed communities and rely on self-reported data, which may be influenced by social desirability or recall biases. However, the matched family-pair design and inclusion of both participants incarcerated for poaching and participants not involved in poaching strengthen the validity of the observed patterns. The results offer evidence-based insights into community-level disparities that can inform more socially attuned conservation interventions in the region.

4.7 Suggestions

4.7.1 Implications for policy and practice

Based on the results of this study, policy interventions should prioritise equitable access to education, healthcare, and livelihoods for Chepang communities. Similarly, conservation strategies must integrate local ecological knowledge while addressing structural vulnerabilities that make these communities susceptible to recruitment into poaching networks. Additionally, initiatives aimed at improving agricultural knowledge and practices could empower the community economically and socially. In conclusion, this study underscores the critical need for focused attention on the Chepang community. By recognizing and addressing their unique challenges, stakeholders can work towards fostering greater equity and improving the overall well-being of this marginalized group. Future research should continue to explore these issues in depth to inform effective interventions that can bring about meaningful change for the Chepang people.

4.7.2 Implications for conservation strategies

To effectively address these challenges, conservation strategies must incorporate the perspectives and needs of the Chepang community. This includes recognizing their traditional knowledge as an asset in conservation efforts rather than viewing them solely as marginalized individuals in need of assistance. Collaborative approaches that empower the Chepang through education, capacity building, and economic opportunities can enhance their participation in conservation initiatives while addressing their socio-economic vulnerabilities. Furthermore, policies should aim to secure land rights for the Chepang, ensuring they have a stake in the management of forest resources. By fostering a sense of ownership and responsibility towards their environment, the Chepang can become active participants in conservation efforts rather than passive victims of exploitation.

This study provides quantitative evidence that the Chepang community experiences deeper structural disadvantage than other groups in the study area, with disparities evident even among participants not involved in poaching. Perceptions tied to access to resources, conservation benefits, and governance—identified as significant interaction themes—function differently for Chepang respondents, indicating that conventional deterrents or benefits influencing non-Chepang communities may be less effective for them.

Persistent poverty, limited livelihood alternatives, restricted resource access, and the exploitation of traditional ecological skills—including forest navigation and tracking derived from hunter-gatherer and shifting-cultivation practices—create conditions in which poaching becomes one of the few viable, albeit risky, economic strategies. Industrialized trafficking networks tap into these community assets, using Chepang expertise for ground-level operations while avoiding prosecution themselves.

Addressing the socio-economic marginalisation of the Chepang must therefore be central to any long-term rhino conservation strategy. Targeted interventions that combine livelihood diversification, equitable access to conservation benefits, and integration of Chepang members into conservation governance could reduce their vulnerability to exploitation and, in turn, diminish the supply chain that fuels illegal wildlife trade. Focusing on this community is not only a matter of social justice but a practical necessity for ensuring durable conservation outcomes for the greater one-horned rhinoceros and for fostering equity in conservation practice.

4.8 Supplementary Material

Table S1. Questionnaire design: Thematic modules on socio-economic conditions, conservation, and governance

No.	Variable	Operational indicators of the variable
Thematic Domains (Participants' Perceptions of)		
1.	Access to resources, cultural identity, and livelihood transitions	Access to land, education, employment opportunities, medical facilities, nutrition, connection to the environment, connection to cultural roots, sense of belonging/inclusion, adoption of western medical practices and movement out of traditional lands.
2.	Physical well-being	Having enough food, dietary diversity, availability/access to clean water, sanitation facilities, exposure to diseases, medical facilities.
3.	Mental and environmental well-being	Overall mental health well-being, connection to the environment, and connection to the community.
4.	Community-level impacts of conservation projects in the region	Viable alternate livelihoods, training programs, infrastructure, medical facilities, community involvement, promotion of local culture, support of traditional activities, inclusion in decision making process, economic benefits for community through eco-tourism.

5.	Outcomes of conservation projects in the region	Impact on biodiversity in the region, reduced incidences of poaching, wildlife abundance, promotion of local cultural heritage.
6.	Individual benefits and awareness linked to conservation projects in the region	Understanding of goals and objectives of conservation project, financial support, ability to meet everyday expenses, familiarity about wildlife conservation laws.
7.	Impacts of law enforcement in the region at a community level (long-term)	Effectiveness in preventing wildlife crime, decreased involvement of community in illegal wildlife trade, justice and legal support for people involved in poaching, financial support for legal aid for community members, awareness about laws and rights of community members.
8.	Drivers of involvement in illegal wildlife trade	Reasons for people's involvement in illegal wildlife trade such as possession of skills, poverty, lack of awareness, lack of education, peer pressure
9.	Impacts of incarceration for illegal wildlife trade on participants incarcerated for poaching	Long term effects of imprisonment due to illegal wildlife trade including- punishment based on social status, chances of paid employment, guilt/regret, isolation, family and children affected.
10.	Community support and engagement by government	Support to transition to alternate livelihoods, consulted/informed regarding changes, informed regarding conservation measures in Chitwan National Park, encourage to

		participate in conservation activities, implemented poverty alleviation programs, provided education opportunities, support for family and children.
11.	Community's outlook on livelihoods, services and conservation project participation	Financial viability with current livelihoods, prospects for children's education, positive attitude towards people involved in illegal wildlife trade, prospective job opportunities for communities, availability of health./medical support, sanitation resources, food resources and involvement in conservation projects.
Socio-Economic Data		
12.	Occupation before prison/15 years ago	The participants incarcerated for poaching were asked their occupation before prison which would have approximately been 15 years ago and the participants not involved in poaching were asked their occupation 15 years ago .
13.	Income before prison/15 years ago	The participants incarcerated for poaching were asked their income before prison which would have approximately been 15 years ago and the participants not involved in poaching were asked their income 15 years ago.
14.	Land ownership before prison/15 years ago	The participants incarcerated for poaching were asked how much land they owned before prison which

		would have approximately been 15 years ago and the participants not involved in poaching were asked how much land they owned 15 years ago.
15.	Food availability before prison/15 years ago	The participants were asked to choose between the 3 choices mentioned to gauge food availability before prison for participants incarcerated for poaching and 15 years ago for participants not involved in poaching • We had more than enough food to eat. • Sometimes the adults in my house did not have enough to eat. • The children and the adults in my house did not have enough to eat.
16.	Did their children have to leave school because of lack of funds?	
17.	Did their economic situation impact their marriage?	
18.	Which community according to you majorly gets involved in poaching?	
19.	Main reason for their involvement in poaching?	
20.	Noticed any change in law enforcement for illegal wildlife trade?	
21.	Is the current income sufficient to suffice you and your family?	

22.	Are they content with their current livelihood?	
23.	Alternate livelihood options they want to be involved in?	
This section pertains solely to respondents who indicated past incarceration for wildlife-crime offences.		
24.	Impact of imprisonment	Impact of imprisonment on their family, marriage, children's education, job prospects post release, social status in the community, mental health, any positive impact, dissuaded to get involved in illegal wildlife trade
25.	Knowledge about rules and regulations regarding illegal wildlife trade	
26.	Fine/Fees for their involvement in illegal wildlife trade	
27.	Help/Support they received after their release from prison	Legal help after being convicted, financial help, if family received any help, support to restart life after release.

Table S2. Five-point Likert scale and coding scheme used in the perception questionnaires (−2 = very negative, −1 = negative, 0 = neutral, +1 = positive, +2 = very positive) to quantify attitudes toward each targeted concept.

very negative	negative	neutral	positive	very positive
-2	-1	0	+1	+2

Table S3. Sample stratification by respondent groups (A–H), showing counts (n), community identity (Chepang = Yes/No), and wildlife-crime association (WC_association = Yes/No). *Note:* 'WC_association = Yes' denotes respondents/households with a member incarcerated for poaching; 'No' denotes no such association.

Group	n	Description	Chepang	WC_association
A	31	Chepang participant incarcerated for poaching	Yes	Yes
B	31	Family member of Chepang participant incarcerated for poaching	Yes	Yes
C	23	Chepang participant not incarcerated for poaching	Yes	No
D	18	Non-Chepang participant incarcerated for poaching	No	Yes
E	18	Family member of non-Chepang participant incarcerated for poaching	No	Yes
F	46	Non-Chepang participant not incarcerated for poaching	No	No
G	23	Family member of Chepang participant not incarcerated for poaching	Yes	No
H	46	Family member of Non-Chepang participant not incarcerated for poaching	No	No

Chapter 5

Thesis Discussion



Sunset in a village in Nepal. Photo Credit: Vasundhara Krishnani

5.1 Overview

This chapter synthesizes principal findings of the thesis and positions them within broader scholarship on illegal wildlife trade, conservation governance, and social equity. The analysis addresses a central paradox: despite stringent legal penalties in Nepal and periods of effective rhinoceros protection, participation in ground-level poaching persists among some households, particularly within the Chepang community. Integrating insights from the systematic review (Chapter 2), qualitative case study (Chapter 3), and quantitative perception analysis (Chapter 4), the chapter argues that participation is more convincingly explained by structural conditions and governance relationships than by inherent criminal predisposition (Cooney et al., 2016; Brockington et al., 2008; Duffy, 2014; Duffy et al., 2019). The study contributes in two principal ways. First, it advances a bottom-up, community-centred account that explicitly incorporates the perspectives of individuals incarcerated for poaching and, critically, their families—an under-represented lens in the literature. Second, it establishes a comparative framework (Chepang vs. non-Chepang; households with vs. without experience of imprisonment under wildlife laws) that delineates domains of perceptual convergence and divergence in a systematic manner.

5.2 Interpreting Key Findings in Relation to the Literature

The thesis identifies three robust empirical patterns that advance current understanding of illegal wildlife trade drivers and community–conservation dynamics.

1) *Structural marginalisation and vulnerability*

Disparities in education, land tenure security, year-round food sufficiency, and access to state services are evident even among Chepang households not involved in poaching. These background conditions create a context in which recruitment by intermediaries can occur through small cash payments or in-kind inducements; traditional ecological knowledge and tracking skills—once linked to subsistence—become appropriated for ground-level roles in poaching networks. This aligns with comparative evidence from South Asia and sub-Saharan Africa that local actors typically occupy lower tiers of the trade, while value capture and strategic coordination sit with higher-level brokers and transnational networks (Duffy et al., 2015; Cooney et al., 2016).

2) *Distinct perception groups*

Quantitative interaction tests show that, for a set of themes (Group 1)—physical well-being, mental and environmental well-being, perceived impacts of law enforcement, perceived drivers of illegal wildlife trade, perceived impacts of imprisonment under wildlife laws, and community outlook—the association between perceptions and wildlife-crime association does not differ by community identity (Chepang vs. non-Chepang). In contrast, for a second set of themes (Group 2)—perceived access to resources, cultural identity and livelihood transitions, perceived community-level impacts and outcomes of conservation projects, perceived individual benefits and awareness from conservation projects, and perceived community support and engagement by government—the strength of association differs significantly by identity, with Chepang respondents generally showing weaker alignment between these perceptions and non-involvement in illegal wildlife trade. This partitioning indicates that some dimensions of experience are broadly shared across communities near protected areas, while others are identity- and history-sensitive, reflecting distinct governance relationships and socio-economic baselines.

3) *Household level concordance*

The strong positive baseline concordance across questionnaires (Table 6) indicates that attitudes relevant to conservation and governance cluster at the household level, aligning with work that situates participation in illegal markets within shared routines, constraints, and perceived costs/benefits rather than isolated individual attitudes (Cohen & Felson, 1979; Duffy, St John, Büscher, & Brockington, 2016). The association between negative household mindsets and wildlife-crime involvement is consistent with studies linking structural disadvantage and perceived institutional shortcomings to participation in illegal wildlife trade. Reviews emphasise that poverty, exclusion from benefits, and mistrust of governance can make illicit options more thinkable, particularly when legal livelihoods are insecure (Agrawal & Redford, 2009; Duffy et al., 2016; Roe & Booker, 2019). Our finding that this association holds across household perception domains reinforces the argument that prevention requires more than enforcement—that addressing underlying socio-economic and governance conditions is necessary alongside proportionate policing (Roe et al., 2020).

5.3 Family-Level Lens

A distinctive contribution of this thesis is its systematic inclusion of families of individuals incarcerated for poaching. This lens yields three insights that are often absent from enforcement-centred analyses:

1) *Household impacts of imprisonment under wildlife laws*

Imprisonment under wildlife laws of a male household member was associated with increased financial precarity (e.g., high-interest borrowing), interruptions to children's schooling, and greater caregiving burdens within the household. Qualitative accounts further indicated family fragmentation, including marital separation, temporary fostering or placement of children with relatives, and episodes of housing instability. Women whose husbands were in prison for extended periods of time, reported heightened perceptions of personal insecurity, reduced mobility, and differential treatment by neighbours, employers, and overall discomfort. These effects were most pronounced where men's absence removed the primary wage earner and where extended family support was limited.

2) *Social stigma and community relations*

Qualitative accounts from both Chepang and non-Chepang neighbours describe stigma and distancing, compounding material hardship with social exclusion. This has implications for post-release reintegration and for the social viability of conservation partnerships.

3) *Perceptions and engagement*

Families experiencing imprisonment under wildlife laws were not uniformly opposed to conservation aims; many expressed support for species protection coupled with requests for viable livelihood pathways and fairer access to programme benefits. This underscores that attitudes toward conservation and enforcement are not binary and may shift with credible opportunities and inclusive governance.

5.4 Mechanisms Linking Governance, Livelihoods, and Recruitment

Interpreting the qualitative and quantitative results together suggests several plausible mechanisms:

1) *Governance fit and salience*

Where conservation interventions are perceived as externally designed, benefits unevenly distributed, or grievance-insensitive, their salience for marginalised groups weakens. This aligns with the observed Group 2 interactions: perceptions of access, identity, and conservation benefits function differently for Chepang respondents.

2) *Opportunity structures and inducements*

In settings of seasonal wage scarcity and insecure land tenure, small, immediate payments, alcohol, or other inducements can make short-term participation in ground-level tasks appear viable and tempting. The asymmetry between low local returns and high international commodity value aligns with global network evidence (Duffy et al., 2015).

3) *Knowledge appropriation*

Intermediaries leverage local ecological knowledge (hunter-gatherer knowledge for tracking, terrain familiarity etc.) to reduce uncertainty and enforcement risk in the first mile of illegal supply chains, without meaningfully improving local welfare. This dynamic reinforces why "deterrence only" has uneven reach when background vulnerabilities persist (Duffy, 2014; Duffy et al., 2019).

5.5 Implications for Conservation Policy and Practice

The findings argue for complementarity between enforcement and community-inclusive strategies rather than a substitution of one for the other.

1) *Targeted livelihood diversification*

Prioritise interventions that address gaps (e.g., nutritional all year-round crops, animal husbandry, dairy farming, forest-compatible enterprises, skill training for non-forest employment). Selection should be co-designed with communities and evaluated for sustained income effects.

2) *Equitable benefit-sharing and access*

Ensure that buffer-zone and programme benefits (e.g., employment, tourism revenues, infrastructure) reach the most marginalised households, with transparent criteria and grievance mechanisms to reduce perceptions of elite capture.

3) *House-hold level interventions*

household-level prevention that addresses livelihood security and credible access to benefits (so that negative mindsets—and their associations with crime involvement—are less likely to form), and (ii) post-enforcement support that mitigates household destabilisation following incarceration, particularly in governance-facing perceptions where we observe weakened concordance

4) *Participation and representation in governance.*

Support meaningful representation of Chepang members in user groups, buffer-zone committees, and co-management forums. Involvement in monitoring (community ranger/eco-guard roles), ecological restoration, and human–wildlife conflict response can align livelihood security with stewardship.

5) *Post-imprisonment under wildlife laws reintegration*
   Facilitate pathways to reintegration (skills certification, micro-enterprise grants, social protection linkages) to reduce re-engagement in wildlife-related offences risk and support household recovery.
6) *Measurement and learning*
   Pair programme roll-out with simple, credible evaluation designs (e.g., phased implementation with comparison groups; pre-post perception tracking) to learn what works, for whom, and under what conditions.

5.6 Methodological Reflections and Limitations

The study's mixed-methods design—incorporating a perception-based quantitative component alongside qualitative interviews—allowed triangulation across data types and respondent categories (Chepang and non-Chepang; households with and without imprisonment under wildlife laws experience). Nonetheless, limitations remain. First, reliance on self-report introduces potential recall and social-desirability biases. Second, the study is geographically bounded to communities near Chitwan National Park; external validity should be inferred cautiously. Third, while this interaction analyses provides rigorous evidence of differential associations by identity, it does not establish causal mechanisms for those associations. It can be interpreted, however, as experimental evidence supporting proposed causal mechanisms that are inferred from a qualitative narrative. Proof that the proposed causal mechanism operates, however, would require further empirical data. These limitations do not diminish the central contributions but indicate avenues for refinement.

5.7 Contributions to Knowledge

This thesis makes three main innovative contributions: (1) It centres bottom-up perspectives of an Indigenous community, the Chepang community, in conflict with conservation regulations and, individually, their families—an evidence gap in the literature on illegal wildlife trade (2) It demonstrates, with quantitative interaction tests, that

perceptions around access, identity, and governance function differently by community identity, providing an explanation for variable efficacy of standard deterrence and benefit programmes (3) It proposes a practical, testable policy strategy that links enforcement to livelihood, governance, and reintegration measures, offering a pathway for durable conservation outcomes that do not reproduce marginalisation (Cooney et al., 2016; Duffy, 2014; Duffy et al., 2019).

5.8 Conclusion

The overall implications of this research are that long-term successful conservation of one-horned rhinoceros in Nepal requires aligning strong protection with socially, economically and culturally attuned strategies that reduce structural vulnerability of tribal and local communities in the region. The Chepang community case illustrates how identity-specific histories and governance relationships mediate the perceived relevance and effectiveness of conservation measures. Interventions that combine livelihood diversification, equitable benefit-sharing, participation in governance, and post-imprisonment under wildlife laws reintegration, alongside targeted enforcement, are best positioned to reduce recruitment into poaching networks and to strengthen community stewardship. By explicitly incorporating community and family-level experiences and a comparative identity lens, this thesis offers a framework that can be adapted to other high-biodiversity regions where conservation success depends on closing the gap between protection and equity.

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