Conflict between Humans and Elephants in Sri Lanka

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List of Abbreviations

- Human–elephant conflict – HEC
- HEC - Human-Elephant Conflict
- USD - United States Dollar
- DWC - Department of Wildlife Conservation
- GIS - Geographic Information System
- IUCN - International Union for Conservation of Nature
- HWC - Human-Wildlife Conflict

Abstract

Due to habitat destruction and agricultural operations, Sri Lanka is experiencing an increase in conflict between humans and elephants. Elephants are increasingly crossing fragmented landscapes, disrupting natural movement patterns, limiting resource access, and increasing the risk of human contacts, causing crop damage and property destruction.

Agricultural activities, particularly those that attract elephants, aggravate human-elephant conflict. Elephants frequently raid farms, causing crop and livelihood damage, resulting in farmer discontent and punitive acts. This has serious repercussions, including injuries and deaths. Conservation efforts are being strained as tensions rise. To solve this, a multidimensional approach that balances the interests of communities and wildlife is required.

Physical obstacles, early warning systems, community-based activities, and improving elephant conservation awareness are all critical. Human-elephant conflict in the region has been minimized thanks to successful conflict reduction programs such as the Udawalawe Elephant Transit Home. Creating elephant corridors and supporting elephant-friendly agricultural techniques can also help prevent human-elephant interactions.

Data science and analytics have the potential to identify conflict hotspots and generate initiative-taking strategies. Researchers can identify locations at high risk of violence by examining data on elephant movements, agricultural patterns, and human settlements, allowing for targeted interventions. Furthermore, real-time monitoring systems can provide early warnings, allowing communities to take preventative measures.

Addressing the conflict between humans and elephants is more than just a conservation issue; it is also a socioeconomic issue with far-reaching consequences. Understanding the dynamics of this conflict and putting in place long-term remedies are critical for preserving Sri Lanka's unique biodiversity and ensuring peaceful cohabitation between humans and wildlife.

Introduction

A compelling narrative of cooperation and strife unfolds daily on the emerald island of Sri Lanka, where sapphire oceans kiss the beach and ancient temples whisper tales of antiquity. The Asian elephant, a gorgeous and cherished species among the verdant landscapes and varied civilizations, stands as a symbol of strength, wisdom, and the delicate balance between man and nature.

Sri Lanka has the world's largest Asian elephant population, with an estimated 6,000 gentle giants traversing the island's diverse environments. These iconic megafaunas, known as 'Gaja' in the local language, are not only revered creatures; they are ecological stewards, altering the very fabric of the island's ecosystems. Their presence pervades Sri Lankan society, from the sacred temples to the complex motifs of traditional art. The Sri Lankan elephant, Elephas maximus maximus, has historically represented both the sacred and the royal. Elephants have always had a place of honor, reflecting the spirit of devotion, grace, and power, from vast religious processions to the busy avenues of ancient towns.

A distinct story emerges when the sun sinks below the horizon, coloring the sky with crimson and gold hues. The existence of these magnificent beasts, as much as they are appreciated, has also sown the seeds of strife between humans and elephants. Human-Elephant Conflict (HEC) is a complicated issue rooted in the intricate dance of nature, history, and the inevitable expansion of human settlements into elephant habitats.

HEC in Sri Lanka is not a new phenomenon; it is a story that has been passed down through centuries. A saga highlighted by the annual extinction of more than 200 elephants and the tragic loss of 70 to 80 human lives. The island's land, which was once shared by humans and elephants, has changed over time. Human development's ever-expanding footprint, combined with changes in land use practices, has heightened interactions between these two species.

The effects of HEC reverberate over the land, casting a long shadow over Sri Lankan communities and the island's diverse ecosystem. The violence is wreaking havoc on rural landscapes that support both agriculture and animals. Crop damage and property ruin, as well as the heartbreaking loss of human life, have become gloomy routines. With the International Union for Conservation of

Nature (IUCN) listing the Sri Lankan elephant as an endangered species, each death bears extra significance.

The first-ever elephant census in Sri Lanka, undertaken by volunteers under the auspices of the Department of Wildlife Conservation (DWC) in 2011, offered a picture of hope and concern. A count of 5,879 elephants in the wild boosted conservation hopes while also highlighting the obstacles that lie ahead. The DWC launched its second island-wide elephant census in 2019, offering current information on the population's status. However, the road to securing the survival of these exquisite creatures remains difficult.

Elephants continue to cross the area they've inhabited for ages as the sun rises over Sri Lanka, revealing the country's unique landscapes and civilizations. The looming challenge, to which no easy answer exists, is how to find a balance between the preservation of these beautiful species and the well-being of human society. Humans and elephants must coexist, building a path that protects both the natural world and the people who live on this land.

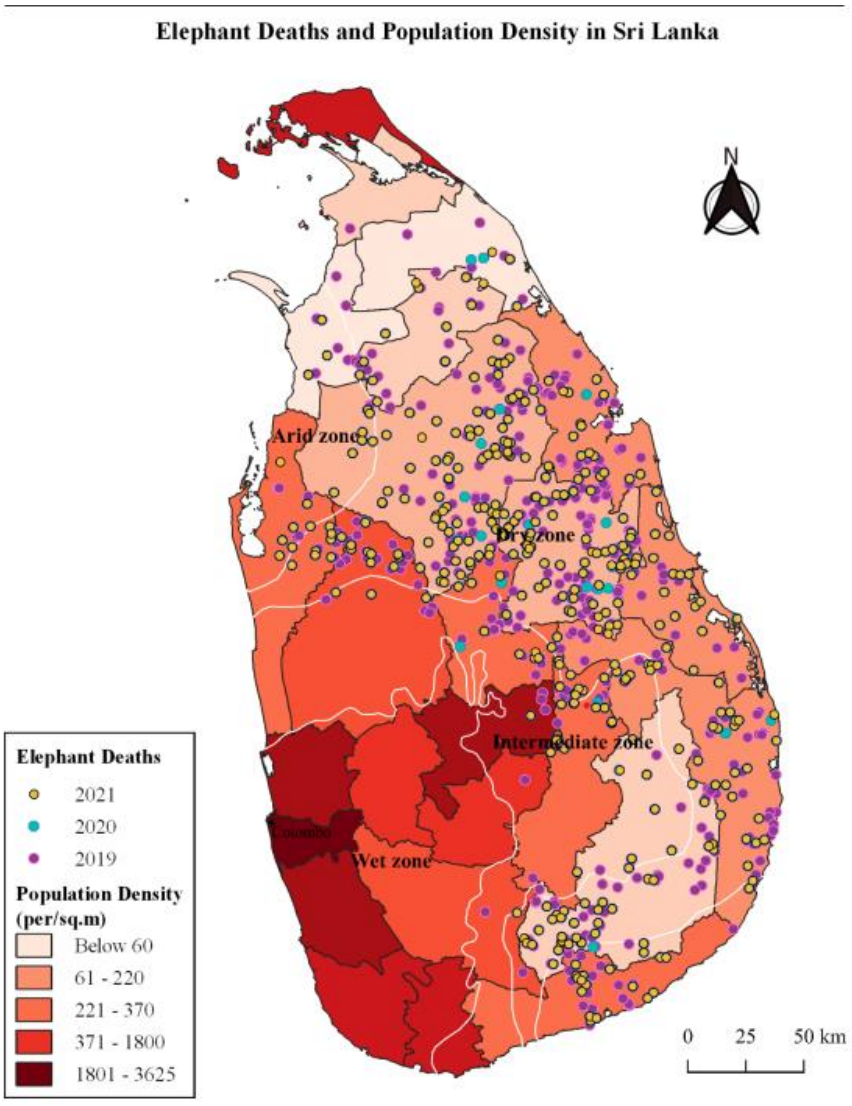

Fig. 1 Sri Lanka population density in 2019 and distribution of elephant deaths between 2019 and 2021. (Central Bank of Sri Lanka, 2019, DWC)

Untold stories, difficulties, and potential answers can be found within this intricate tableau of nature, culture, and conflict. Hope develops from the midst of this fight. Solutions may not come readily, but they are actively pursued. Conservationists, researchers, and communities work together to create an island where the elephant's trumpet can still be heard across the continent and humans and elephants can coexist together.

Methodology

This section describes the methodology used to conduct research on Human-Elephant Conflict (HEC) in Sri Lanka. This study takes a systematic and multifaceted approach, with the goal of providing a comprehensive understanding of HEC, its historical context, and its implications for biodiversity conservation, human well-being, and sustainable development.

Historical Context Analysis:

The study begins by delving into the historical context of human-wildlife interactions. Recognizing that humans have been interacting with wildlife for tens of thousands of years, this analysis delves into the complex relationships that exist between humans and wild animals, both as predators and prey. It recognizes the role of early human activities in potentially contributing to the extinction of prehistoric megafauna such as mammoths and mastodons.

Obstacle to Biodiversity Conservation:

The study acknowledges that HEC is frequently viewed as a barrier to biodiversity conservation, especially when it involves charismatic and endangered species like tigers, wolves, elephants, or rhinos. These conflicts' effects on affected communities and individuals are highlighted. It should be noted, however, that the widely held belief that HEC is worsening lacks robust evidence for all species and regions.

Variability of HEC:

Recognizing the variable nature of HEC, the study acknowledges that human-wildlife encounters vary in terms of frequency, severity of impact, and overall character. Human-wildlife conflict (HEC) is defined as the result of competition and conflict between humans and non-domesticated wild animals, motivated by mutual threat and adverse impacts on both parties and their resource bases. According to the study, HEC includes a diverse array of animals, including large terrestrial and amphibious species, reptiles, abundant agricultural pests, feral animals, and marine species.

Term Usage and Framing:

The study considers the terminology used in the context of HEC, acknowledging the debate over whether the term "human-wildlife conflict" (HWC) is appropriate. It is widely acknowledged that wildlife is fundamentally incapable of engaging in conflict in the same way that human societies do. The study also emphasizes that humans perceive HEC differently, and different values are ascribed to wildlife, resulting in conflicts among individuals with differing perspectives. Nonetheless, the study chooses to keep the terms HWC and HEC because they are commonly used to describe this phenomenon.

Importance of Frames and Narratives:

The methodology emphasizes the significance of frames and narratives in understanding conservation policies and interventions involving human-wildlife interactions. The framing of these encounters has a significant impact on the recommended interventions and solutions. When

problems are framed as "human-wildlife conflict," for example, technical solutions are preferred, whereas framing them as "illegal resource use" (e.g., poaching) frequently leads to calls for enforcement. The paper acknowledges that frames and narratives are important concepts to consider when developing policies for human-wildlife interactions.

Objective of the Paper:

The primary goal of this study is to examine potential explanations for HEC in Sri Lanka. Tracing underlying narratives and connecting various types of conservation interventions and mitigation strategies are examples of this. The study intends to thoroughly examine and evaluate various aspects of HEC in Sri Lanka, while acknowledging that several narratives exist in the literature. These narratives may at times contradict one another, but they also complement one another, providing multiple perspectives and explanations for HEC in the country.

Collaborative Project:

This study is part of a larger collaborative project looking into the various factors, dynamics, and policies that contribute to human-elephant conflict in Sri Lanka. The research contributes to a comprehensive understanding of HEC by examining these factors and narratives, as well as insights into potential mitigation strategies and conservation policies.

Finally, the methodology used in this study incorporates historical analysis, terminology and framing considerations, and a focus on narratives and their impact on policy recommendations. This systematic and multifaceted approach aims to provide a comprehensive understanding of HEC in Sri Lanka, thereby contributing to more effective mitigation and biodiversity conservation strategies.

Findings and Results

The human-elephant conflict (HEC) in Sri Lanka is a complex and multifaceted challenge that necessitates innovative and data-driven solutions. A thorough examination of the historical context, current status, and traditional conflict resolution approaches reveals the critical need for long-term conflict resolution.

In 2022, Sri Lanka experienced a staggering number of elephant deaths, totaling 439. Unbelievably, HEC was directly responsible for a significant portion of these deaths. The use of lethal methods such as gunshot wounds and explosives, which were responsible for 60 and 59 elephant deaths, respectively, highlights the severity of the conflict. In addition, 51 elephants died from electrocution, highlighting the dangers posed by the overlap of elephant habitats and human infrastructure. Human lives were also affected, with 70-80 fatalities reported each year.

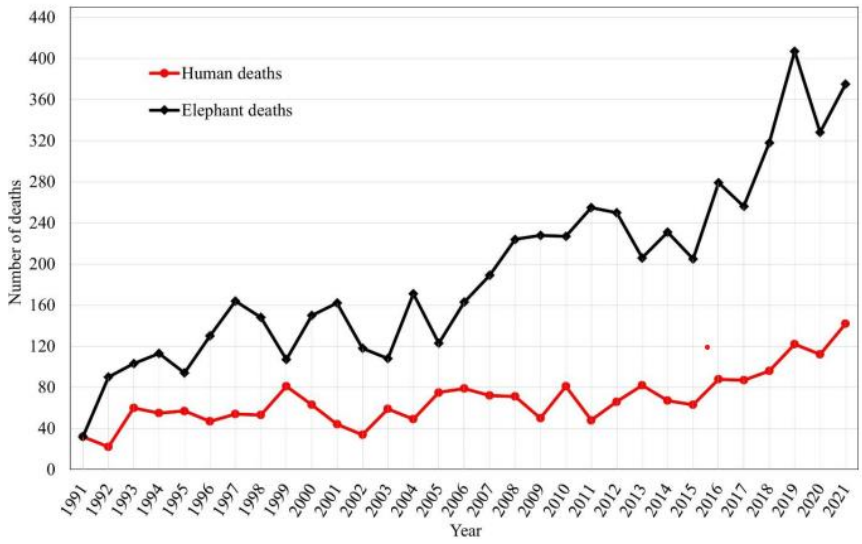

Fig. 3 Human and elephant deaths in Sri Lanka from 1991 to 2021 (DWC)

The rising cost of HEC has placed a significant financial burden on the Sri Lankan government. Compensation payments for crop damage and property destruction caused by elephants will total USD 946,553.34 in 2022. This staggering sum serves as a stark reminder of the importance of effectively addressing the conflict, not only to protect human lives and livelihoods, but also to foster long-term coexistence with the elephant population.

To deter elephants from entering human settlements and agricultural areas, traditional mitigation measures such as thorn branches, wooden fences, beehive fences, elephant watchtowers, guardhouses, and trenches have been used. However, these methods face obstacles such as high costs, ongoing maintenance, and limited effectiveness. A standardized framework for implementation is lacking, emphasizing the need for more streamlined approaches to effectively address HEC.

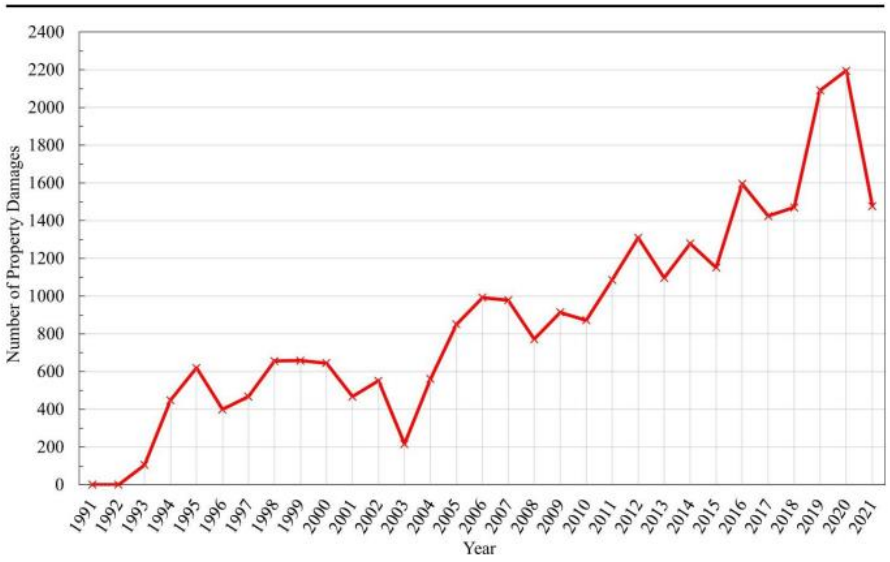

Fig. 5 Number of properties damaged in Sri Lanka from 1991 to 2021 (DWC)

Despite these efforts, Sri Lanka lacks up-to-date, detailed information and precise data on forest cover changes. Establishing the relationship between elephant habitats, land cover, and land use changes is critical for HEC mitigation. A standardized framework for monitoring and identifying HEC risk zones and hotspots is urgently needed.

The study proposes integrating satellite data fusion with GIS modeling to address these gaps and develop effective mitigation strategies. This method has the potential to provide useful information about the spatial distribution of conflict hotspots. Satellite imagery can be used to create accurate land use and land cover maps that, when combined with GIS modeling, can aid in the identification of HEC risk zones and hotspots. This data can be used to prioritize intervention areas and effectively allocate resources.

Furthermore, the integration of satellite data and GIS modeling has the potential to be used to develop early warning systems. These systems can notify communities of elephant presence, allowing them to take appropriate precautions and reduce negative interactions between humans and elephants. Early warning systems can be especially effective in areas with high elephant populations and human settlements.

The study concludes by emphasizing the complexities of HEC in Sri Lanka, as well as the need for comprehensive, data-driven strategies to mitigate the conflict, protect both human and elephant populations, and foster long-term coexistence. The use of satellite data and GIS modeling appears to be a promising approach to addressing this pressing issue.

Discussion

We examine the complex issue of human-elephant conflict (HEC) in Sri Lanka in this report by drawing on two insightful discussions from existing literature. These debates shed light on various aspects of the problem and provide useful insights into the causal explanations and narratives surrounding HEC. Our analysis synthesizes these discussions to provide a comprehensive understanding of the problem.

Causal Explanations for HEC

The first discussion looks at the various causes of HEC in Sri Lanka. It identifies seven major narratives that aid in understanding the factors that contribute to this ongoing challenge. Poaching, population growth and habitat loss, crop raiding and socioeconomic grievances, problem elephants, agricultural modernization, and conservation policies are all discussed.

One important takeaway from this discussion is that HEC is a multifaceted problem with no single dominant explanation. These narratives frequently intersect and interact, making it difficult to attribute the problem to a single cause. For example, while crop raiding and socioeconomic grievances are acknowledged as significant drivers of HEC, compensating rural communities is insufficient. The implementation on the ground appears to be flawed, and the efficacy of such strategies should be reconsidered.

Furthermore, the discussion emphasizes the need for comprehensive mitigation strategies that take into account the various factors that contribute to HEC. Translocating so-called "problem elephants" has been found to be an inefficient solution because it oversimplifies the problem and is considered costly. Furthermore, the importance of male elephants in conflicts may be overstated, as female-led herds can cause significant damage as well.

Evaluation of Mitigation Strategies

The second discussion focuses on the assessment of mitigation strategies used to combat HEC in Sri Lanka. It highlights the gap between existing mitigation strategies such as deterrence, fencing, and translocation and the experiences of HEC-affected villagers. The inadequacy of these strategies may exacerbate HEC, emphasizing the need for a critical examination of the narratives guiding elephant conservation policy in Sri Lanka.

The impact of political and economic factors on habitat fragmentation and loss is a key finding from this discussion. Habitat fragmentation is caused by complex historical development processes such as large-scale irrigation and resettlement programs, not just human or elephant population growth. This emphasizes the importance of considering HEC's political and economic dimensions in addition to ecological factors.

Furthermore, the discussion emphasizes the importance of calling traditional conservation policies into question. While political ecologies criticize the commodification of "nature experiences" in international tourism and the enclosure of commons, these narratives may not fully account for

HEC occurring outside of protected areas. As a result, it is critical to reevaluate conservation policies and consider their effects on both nature and local communities.

Synthesizing the Discussions

We gain a comprehensive understanding of HEC in Sri Lanka by combining these discussions. The problem's multifaceted nature is obvious, with various causal explanations and mitigation strategies in play. Because of this complexity, addressing HEC requires a comprehensive approach that considers the issue's ecological, economic, and social dimensions.

In our report, we argue that addressing HEC necessitates a rethinking of existing strategies and a shift toward more comprehensive, long-term, and context-specific solutions. These solutions should consider human-elephant coexistence in shared landscapes, rethink the role of protected areas, and emphasize the importance of sustainable agricultural practices. Ultimately, the goal is to promote more harmonious coexistence between humans and elephants in Sri Lanka while addressing HEC's pressing challenges.

Conclusion

In Sri Lanka, the complex interplay between human activities and elephant behavior has given rise to the pressing issue of human-elephant conflict (HEC). This in-depth report delves into HEC's historical, ecological, and socioeconomic dimensions, shedding light on the factors that contribute to this complex challenge. With its incredible elephant density, Sri Lanka is home to a sizable portion of the world's elephant population. However, this precious coexistence has been strained by a variety of factors, including habitat loss, degraded forage, and population growth-driven expansion of human settlements and agricultural activities.

The statistics in this report demonstrate the alarming severity of HEC in Sri Lanka. Over the last three decades, there has been a staggering increase in both human and elephant deaths, with communities employing a variety of lethal methods to protect their livelihoods and crops from elephant raids. Such clashes have compelled authorities to invest in a variety of mitigation strategies, ranging from traditional barriers to novel approaches such as elephant watchtowers and beehive fences.

While existing narratives frequently emphasize the population growth-habitat loss argument and the conservation and social justice narrative, the report emphasizes the importance of taking into account the broader political-economic dimensions of agrarian change and conservation policy. It identifies a critical gap in the literature regarding the socioeconomic vulnerability of affected communities and emphasizes the importance of additional research to assess the profound and traumatic effects of HEC on these vulnerable groups.

To effectively address the multifaceted nature of HEC, the report recommends implementing a comprehensive theoretical framework that includes not only ecological causes related to animal behavior and habitat loss, but also the broader socioeconomic factors involved. This framework should take into account the complex ecological interactions that are at work, such as the impact of climatic events on food scarcity, the feedback mechanisms caused by elephant killings, and the impact of human land-use decisions on crop selection and farm size.

The report emphasizes the importance of proactive HEC management and encourages scientists, wildlife managers, policymakers, government officials, and local communities to work together. It suggests combining satellite data with GIS modeling to identify HEC risk zones, allowing for more effective protection measures for both humans and elephants.

The following recommendations are made to effectively mitigate HEC in Sri Lanka:

1. Habitat Protection and Restoration: Prioritize habitat conservation and restoration efforts to ensure elephants have enough food, water, and space. This includes preserving existing forests, restoring degraded habitats, and constructing corridors to allow elephants to move more freely.

2. Community-based conservation entails involving local communities in conservation efforts by providing alternative livelihoods, promoting elephant-friendly agricultural practices, and establishing community-led patrols to monitor elephant movements.
3. Develop and implement effective conflict management strategies such as early warning systems, deterrents such as electric fences, and trained elephant response teams.
4. Education and Awareness: Raise HEC awareness among local communities and the general public, encouraging empathy and understanding for elephants.
5. Conduct ongoing research to better understand the dynamics of HEC, identify effective mitigation strategies, and track the effectiveness of interventions.
6. Strengthen the policy and regulatory framework governing HEC by establishing clear guidelines for human-elephant coexistence and enforcing regulations to protect both human and elephant populations.
7. Collaboration with international organizations and experts to share best practices, exchange knowledge, and access funding for HEC mitigation efforts.

By putting these recommendations into action, Sri Lanka can work toward a more harmonious coexistence between humans and elephants, ensuring the long-term conservation of this magnificent species while protecting the lives and livelihoods of its people.

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Appendices

Table 1. Major causal explanations for HEC in Sri Lanka. *Source:* Own compilation.

Narrative	Main Causal Explanation	Examples in Literature
Colonial legacy as historical cause	Colonial hunting and land-use change in British Ceylon led to elephant population decrease and habitat loss	Tennent (1860); Lorimer and Whatmore (2009); Jayewardene (1994b)
Poaching	Remote demand fuels criminal poaching operations	Santiapillai et al. (1999)
Population growth and habitat loss	Human population growth drives encroachment on elephant ranging grounds; elephants and humans prove to be incompatible	Jayewardene (1994a); Santiapillai (1996); Santiapillai and Wijeyamohan (2016)
Crop raiding and socio-economic grievances	Elephant crop raiding impacts household economic security, leading to defensive measures lethal to elephants	Bandara and Tisdell (2002); Santiapillai et al. (2010); Fernando (2000); Fernando et al. (2019)
Problem elephants	Male elephant individuals" problematic behaviours primarily cause conflicts	Haturusinghe and Weerakoon (2012); Ekanayaka et al. (2011)
Agricultural modernisation—failed cohabitation	Changes in agricultural productions systems or loss of traditional ecological knowledge promote conflicts	Anuradha et al. (2019); Lorimer (2010); de Silva and Srinivasan (2019); Ranaweerage (2012)
(Neoliberal) conservation and social justice	Rigid conservation practices in protected areas, designed to attract tourists, disenfranchise local people and facilitate escalating conflicts	Benadusi (2015); de Silva and Srinivasan (2019)