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Under pressure: How human-wild-captive elephant social-ecological system in Laos is teetering due to global forces and sociocultural changes

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Abstract

1. Few empirical studies have described social-ecological systems (SESs) in transition. Some studies focused on external drivers that impact the SES and communities' responses to adapt to changes, including economic, land and conservation policies. Others have considered the effect of social and cultural changes on communities' capacity to sustain their activities. While sociocultural changes are increasingly common through globalization and world-wide economic development, there is an urgent need to better understand and document how these changes affect individual and community agency to adapt or transform a system that is facing a combination of powerful internal and external forces.
2. The human–Asian elephant relationship appears particularly illustrative of a complex SES because of the dual status of the elephant being wild or under human care, and the entanglement of ecological, cultural, social and economic dimensions. The ongoing and rapid political, socio-economic and environmental changes occurring in Laos for the last decades have strongly affected this relationship.
3. We conducted an ethnological survey to assess how the SES has evolved in Laos and its consequences for human-wild-captive elephant interactions and elephant handling practices. We show that in the 1990s, the SES was based on the principles of common access to natural resources and social control over nature and spirits, and led to a form of elephant handling with close interactions between captive and wild elephants. Husbandry practices then could be likened to pastoralism as a mode of production associated with a mode of relation close to seasonal freedom.
4. Since the turn of the present century, the commodification of nature and of increasingly divided access to natural resources led eventually to the segregation of wild elephants and captivity of their working conspecifics. With the intensification of workload, owners switched to a ranching-like economy, based on the accumulation of monetary capital from the employment of elephants in logging or tourism.

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5. We discuss how the combination of external drivers, such as economic liberalization, land and conservation policies, and internal drivers linked to sociocultural changes could affect a SES in transition, leading to a fading interest of the new generation in their family heritage.

KEYWORDS

Asian elephant, commodification of nature, human-animal studies, Laos, shifting regimes, social and cultural values, social-ecological system, wild-captive interactions

1 | INTRODUCTION

Various conceptual approaches have been developed to understand and analyse the processes of transition or transformation in society (Patterson et al., 2017). Among them, social-ecological systems (SESs) are complex and integrated systems in which humans are part of nature (Berkes & Folke, 1998). SESs are dynamic, and changes occur across multiple scales in time, space and organizational levels (Gunderson & Holling, 2002; Liu et al., 2015). In addition, people and their environment interact reciprocally and form complex feedback loops (Liu et al., 2007). In this context, there is a need to study how periods of gradual change interact with abrupt changes, and how human groups are able to adapt or even transform into new development pathways in the face of dynamic change (Folke, 2016). While adaptation refers to the capacity of social actors to learn, combine experience and knowledge and adjust social behaviour to pertain the SES fundamental structure and functions, transformation in contrast refers to a larger intentional change that creates a fundamentally different system when ecological, economic or social structures make the existing system unsustainable (Folke, 2016). Adaptation and transformation are intimately linked within SES; adaptation at one level may lead to a transformation at another level (Pelling & Manuel-Navarrete, 2011).

A growing number of empirical studies have described SES in transition. Early work on SES regime shifts focused on their ecological components (Armitage et al., 2012). Further studies identified the external drivers that impact the SES and the response of communities, including climate change, economic and political regime shifts (Forbes et al., 2009; Ramprasad et al., 2020; Zanotti et al., 2020). However, few empirical studies have considered the effect of social and cultural changes, which are increasingly common through globalization and world-wide economic development, on the agency of individuals and communities to pertain their traditions and activities. For example, co-management initiatives, women and local communities' empowerment have been advocated to foster the internal response of communities to maintain sustainable and healthy SES (Eriksson et al., 2021; Fedele et al., 2017; Reid et al., 2014). Local social and cultural practices also support adaptive and transformative change in the face of changing internal and external forces (Apgar

et al., 2015; Senos et al., 2006). However, at the individual level, actors at the centre of the system may be pulled away by the dynamics of change towards other livelihoods that are either less difficult, more culturally appropriate in a changing society or more remunerative (Ramprasad et al., 2020; White, 2015). For example, the social status of emerging livelihoods and the intergenerational erosion of interest in artisanal fishing led to an ageing population of fishers and difficulties to recruit young ones (Tam et al., 2018).

In a rapidly changing world on both the natural and social sides, there is an urgent need to better understand and document how social and cultural changes affect individual and community agency to adapt or transform a system that is facing a combination of powerful internal and external forces. In this context, we use the case of the human-captive and wild elephant relationship in Laos to shed light on the ongoing changes occurring in this particular SES under both external and internal drivers that are illustrative of a wider situation prevailing world-wide.

The human-Asian elephant relationship is akin to a SES because of the dual status of the elephant being wild or under human care, and the entanglement of ecological, cultural, symbolic, social, economic, emotional and inter-subjective dimensions. Elephants have been trained and used by humans for at least 4,000 years as war animals, mounts of kings or draught animals for transport and forestry (Trautmann, 2015). The capture of wild elephants to supplement the captive population has maintained demographic and genetic links between these two populations until the 1970s (Sukumar, 2011). These links persist to date, particularly through the reproduction of captive females with wild males (Maurer et al., 2017). The plummeting number of Asian elephants is of global concern. From an ecological point of view, the viability of wild and captive elephant populations is threatened by habitat reduction, poaching and capture, increasing conflicts with local human communities and low birth rates (Choudhury et al., 2008). From the humanities point of view, the long-lasting relationship between humans and Asian elephants has been affected by many changes, among others the major social and economic changes occurring recently in range of countries, loss of traditional knowledge, new elephant working practice, and the raising of new actors like welfare and conservation organizations (Locke & Buckingham, 2016).

The SES approach provides a novel and relevant framework for analysing the dynamics of the human-wild-captive elephant system in Laos. Indeed, wild and captive elephants are closely interlinked within the landscape. The disciplinary roots of SES are in ecology, but the approach has been broadened by inclusion of the social sciences (Patterson et al., 2017). Therefore, the SES approach provides a framework suited to the abrupt social, ecological and economic changes that have occurred in Laos over the past few decades.

Through this study, we aim to provide an empirical description of a SES in transition under the influence of powerful external drivers, from economic liberalization to land and conservation policies. We also strive to shed light on the impact cultural and social changes have had on this relationship, leading to a fading interest of the new generation in their family heritage. We believe our case study is illustrative of a wider prevalent situation faced by SES in transition due to globalized economic, social and cultural changes.

We focus specifically on describing the changes in perceptions and practices among Lao elephant owners and mahouts who are at the heart of the human-captive-wild elephant relation using a combination of SES and anthropological approaches based on semi-structured interviews. Acknowledging the prominence of symbolic, historical and intimate dimensions of the relationships, we aim to provide a new insight, using a more systemic approach linking ecological, social, cultural and economic components of the system.

To do so, we first describe the SES that prevailed 20–30 years ago, which was based on the principles of common access to natural resources and social control over nature and spirits. Some anthropological materials collected during the study allow us to highlight the importance of values and symbolism of the species. Secondly, we enquire how, since the opening of the country to the market economy, the rise to dominance of nature commodification and the partitioning of natural resources led to major changes in the SES. Thirdly, we analyse the impacts these changes have had on the elephant handling system using a four-dimensions model based on (a) specific modes of production and (b) taskscape in the sense of Ingold (1974, 2000), (c) the modes of relation between humans and animals following Stépanoff's (2017) categorization and (d) the landscape. Finally, we discuss how the combination of external drivers, such as economic liberalization, as well as land and conservation policies, and internal drivers linked to cultural and social changes has impacted this relationship, leading to a fading interest of the new generation in their family heritage.

2 | SUPPORTING CONCEPTS AND THEORIES

For more clarity, we define in this section several concepts and theories that are mobilized throughout our analysis and discussion. We first introduce some key external drivers of the SES: neoliberalism, commodification of nature and land management policies. Then we present supporting concepts, inspired from studies on pastoralism,

that offer comparative categorizations to build a conceptual model of the human–elephant handling system.

2.1 | External drivers: Neoliberalism, commodification of nature and land management policies

Harvey (2005) defined neoliberalism as the theory of political-economic practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial skills with an institutional framework characterized by strong property rights, free markets and free trade. Neoliberalization includes political-economic practices such as expansion of market valuation to spheres that were formerly unaffected by commerce such as protected forests and ecosystem services (Gómez-Baggethun & Ruiz-Pérez, 2011; Robertson, 2006). Assigning prices and values to natural commodities and allowing their trading within a free market has been called the commodification of natural resources (Liverman, 2004; Robertson, 2006). Concomitantly, government policies promote the partitioning, regulation and even privatization of access to natural resources that had previously been managed as commons (Ingold, 1980). These landscape-dividing policies tend to control and often exclude local people, generating misunderstandings, oppositions or even conflicts with cultural values and the needs of local communities (Brockington & Igoe, 2006; Chan et al., 2007; Infield et al., 2017). Therefore, institutions, policies and information brokers (NGOs, media, researchers) can ultimately affect the relationship between humans and nature (Campbell, 2005; Cumming, 2016; Linnell et al., 2015).

Beginning in the late 1980s, governments in south-east Asia and international institutions undertook major political-economic changes and shifts in line with neoliberalism (Nevis & Peluso, 2018). Changes in land-use patterns, deforestation and loss of biodiversity are among the main drivers of changes in tropical ecosystems (Fisher et al., 2011; Lambin & Meyfroidt, 2011). Since the 1980s, land conversion for agriculture and pasture has replaced or degraded tropical forests and grasslands (Gibbs et al., 2010). Recent studies have demonstrated the importance for large mammals of retaining native habitat within agricultural land (Ferreira et al., 2018; Galán-Acedo et al., 2019). Depending on the structure and configuration of the matrix (agroforestry, polyculture or monoculture), human-modified landscapes provide functional diversity for wildlife foraging, dispersal and reproduction (Ferreira et al., 2018).

2.2 | Linking social and ecological relations in a conceptual model: Production, Taskscape, TEK and landscape

Using the example of arctic reindeer herders, Ingold (1974) emphasized the relationships between the system of ecological relations linking the human population with herds and pastures, and

the system of human social relations governing access to the land and to animals. The landscape arises alongside what Ingold (2000) called the taskscape, or the entire ensemble of tasks done by humans in the environment, where tasks are the constitutive acts of dwelling. The tasks include technical and social activities and their mutual interlocking. The concept of taskscape encompasses traditional ecological knowledge (TEK). TEK refers to the place-based knowledge that is rooted in local cultures and generally associated with long-settled communities that have strong ties to their natural environments (Antweiler, 1998; Orlove et al., 2010; Sillitoe, 1998). According to Berkes (2008), TEK is the understanding of ecological relationships and systems of managing resources by communities. A resource management system includes an appropriate set of practices, tools and techniques. TEK also includes social attitudes, beliefs and conventions of behaviour.

Based on the human–reindeer system, Ingold (1974) described the conditions driving the changes from a hunting economy to pastoralism and ranching. Ingold's description of hunting, pastoralism and ranching economies refers to different modes of production. The pastoralism mode of production is based on a common access to pasture with an exclusive right of disposal of the owner over his animals and progeny. While in pastoralism owners aim to increase their animal stock through natural reproduction, in a ranching economy owners intend to accumulate monetary capital. Recent research on pastoralism shows that the conventional relation of protective domination in which humans drive, protect and feed their livestock should indeed be characterized according to different levels of animal autonomy, leading to five different modes of relations ranging from seasonal freedom to captivity (Stépanoff et al., 2017). Because local practices that constitute the taskscape impact the landscape in return, the landscape is perpetually under construction (Ingold, 2000).

3 | MATERIALS AND METHODS

3.1 | Study area and species

Laos is a mountainous tropical country located in the Indochinese peninsula. Of its total population, 83% live in rural areas at low densities (Ducourtieux et al., 2005).

Since the revolution in 1975, Lao People's Democratic Republic, or Laos, is ruled under the Lao People's Revolutionary Party. With the end of Soviet aid after 1990, the political framework changed radically with the opening of the country to the market economy and economic liberalization. Within a few years, the regime turned to international assistance, undertook structural reforms of its economy and institutions, particularly financial institutions, and gradually opened up to foreign capital and tourists (Evrard & Pholséma, 1997). Land reform, and more precisely the individualization of land rights and the systematic zoning and mapping of forests, became a precondition for agricultural intensification (Ducourtieux et al., 2005). Concurrently, forest cover declined from 70% of land cover in the 1940s to 41.5% in 2005, with an acceleration since the 1990s

(Robichaud et al., 2009). The main direct drivers of deforestation are the expansion of agriculture—both by individual farmers and by large agribusinesses—and the development of industrial tree plantations and large hydropower, mining and infrastructure projects (Lestrelin, 2010; Ramcilovic-Suominen & Kotilainen, 2020). Shifting cultivation and selective logging are blamed by the government and International NGO for degrading forests, but many scholars dispute this claim (Castella et al., 2013; Lestrelin, 2010; Ramcilovic-Suominen & Kotilainen, 2020). Access to land and natural resources by foreign investors, referred to as 'land grabbing', and neoliberal and extraterritorial modes of governance have driven agrarian transformation and impacted community livelihoods (Baird & Barney, 2017; Schoenberger et al., 2017). The development of agro-plantations, the reduction of shifting cultivation and the privatization of land have affected the dwellings of both wild and captive elephants.

Laos, historically known as Lan Xang, the 'Land of a million elephants', shelters both wild and captive elephants with high levels of interactions between the two populations (Maurer et al., 2017). In Lao language, captive elephants (*Xang ban*) are literally called 'village elephants' where '*ban*' means village or home. In this paper, we choose to adopt emic interpretations that reflect the cognitive and linguistic categories of the natives, as opposed to etic interpretations that are developed by the researcher for purposes of analysis (Harris, 1976). Therefore, we adopt the Lao terminology of 'village elephants' instead of 'domestic elephants' or 'captive elephants' that is used in biology. Wild elephants are called '*Xang pa*' where '*pa*' means forest. Wild and forest being the same word in Lao language, we use the terminology of wild elephants in this article. In Laos, the interpretation of wild and forest is historically illustrated by the opposition between the *muang* (district or city) and the *pa* (forest), a dialectical contrast rather than a strict dichotomy between domestic, civilized settlements and the wild, untamed forests (Singh, 2009). The *pa* is a place of backwardness that lacks social order, but is also a source of desired natural resources. The *muang-pa* dialectic interlinks natural and social worlds emphasizing the social process of the domestication of the wild *pa* into the civilized *muang*. The perception of the forest, and of wild and village elephants, has shaped the relationships between the species, their owners and their caretakers, who are called 'mahouts'.

Up until the end of the 20th century, Laos sheltered large populations of wild and village elephants sharing the same habitat, with 4,000 and 850 individuals respectively (Santiapillai, 1993). In 2010, the wild population numbers from 600 to 800 individuals, living mostly in isolated and fragmented forest areas (Khounboline, 2011). Village elephants are privately owned in Laos. Most village elephants belong to owners from the Sayaboury province (Maurer, 2018). Ownership is shared by 3.6 people on average, usually from the same family (Suter et al., 2013). Time-sharing is the most common arrangement among co-owners. Both working duties and profits are shared according to their agreement (Maurer, 2018). During the 1990s, at the time of the country's opening, families often handled a herd of several (up to 10) elephants (Maurer, 2018). Owners were in charge of caring and working with their elephant. In such cases, the

owner was also a mahout. A minority of owners employed mahouts and did not perform husbandry tasks. For clarity, we use the word 'mahout' for employees who do not own the elephant.

3.2 | Data collection

The study is based on long-term work (15 years) of the first author with elephant owners and mahouts' communities completed in 2015 by 5 weeks of ethnographic survey focused on semi-structured interviews to explore (a) owners' and mahouts' knowledge and perception of the species, (b) handling practices, (c) interactions between wild and captive elephants and (4) the future of mahoutship and elephants in the country (see interview guide in Table S1). Additional questions and topics were addressed in the course of the discussion of specific points of interests or because of the respondent's willingness to talk about a particular subject. Questions were adapted, and some topics were not addressed for respondents who did not own an elephant, such as officials, monks, retired owners or training masters. Some questions or subtopics were not addressed with some respondents because of lack of time or misunderstanding, or reluctance of the respondent to answer. This method was chosen to allow respondents to provide a broad range of answers on complex issues such as their perceptions and practices, with as little influence as possible from the investigator (Huntington, 2000).

Interviews typically lasted for 30 min or more and were usually conducted in the field, next to the elephant's resting place. Sampling was done using a stratified method based firstly on the district of residence, as it appears from the first author's experience that handling practices may show spatial variation. The first author conducted a total of 52 interviews. In the Sayaboury province, he interviewed 13 respondents from Thongmixay district, 11 from Paklay and Phieng, 11 from Hongsa and nine from Ngeun district (Figure 1). He also conducted six interviews in Pathoumphone district in the southern province of Champassak. This district hosts 20 elephants, but sheltered more than a hundred village elephants at the end of the 20th century. Secondly, sampling was stratified according to the respondent's status to capture potential variation in their answers. We prioritized elephant owners over mahouts, as they are predominant in making strategic decisions regarding the management system. The first author interviewed elephant owners (40), mahouts (eight), officials (two) from the Ministry of Agriculture and Forestry at national level and from Sayaboury province and one monk living in a village known for its elephant-keeping tradition. Because elephant handling is mostly a male activity, we had only one female respondent who co-owns an elephant with her brothers. Respondents were of various ethnic origins (Tāi Lao, Tāi Dam, Tāi Leu, Khamou and Hmong). Interviews were conducted in Lao language by the first author, recorded on a Zoom H1 handy recorder, and fully translated into French and English.

In the absence of an ethics committee in charge of anthropological studies at Montpellier University at the time of the study, all methods were carried out in accordance with the legal requirements

and guidelines for anthropological surveys from the institutional protocols for research of the National Centre for Scientific Research (CNRS) (Baude et al., 2006). All informants provided informed verbal consent before participating in the interview. Only respondent first name was asked. Answers were anonymized during analyses.

4 | RESULTS AND ANALYSIS

4.1 | Principles guiding the SES in the 1990s: Common access to natural resources and social control over spirits

Human–elephant relations in the 1990s describe a SES based on two main principles—a common access to natural resources and the social control over nature and spirits. The period of the 1990s, at the time of the country's opening, was expressed by the interviewer with phrases such as: 'in the nineties', 'some 20–30 years ago' or 'when your father and grandfather carried out this activity', depending on the age of the respondent.

Elephants were formerly part of the family heritage (*Xang mola-dok khopkwa*). They were released most of the time and lived in small herds from owners of the same family or from the village. Village elephants were not feed with cultivated fodder but foraged in the forest or bush surrounding the village. Mahouts visited them once a month. Elephants were either completely free (*po*), or partially restricted with hobbles (*catyae*) on the front legs or a chain (*sow*) that the elephant dragged. The choice of the mode of restraint depended on the animal's behaviour and on the distance to crops. Males and 'naughty' elephants were usually restrained with hobbles to avoid their escape, attacks on humans or crop raiding. Such an extensive mode of handling was possible because large forest areas and fallow lands were available where elephants could browse freely and sustain themselves. Elephants were used for occasional domestic work and raised at little or no cost thanks to their free-ranging abilities and free reproduction with their village conspecifics, or through cross-mating with wild males.

The close relationship between elephants and humans is very much alive in some areas of Laos, such as Sayaboury province, and the perception of the species by mahouts and elephant owners is rooted in a long history and tradition of coexistence between humans and elephants.

Lao people distinguish wild (forest) elephants (*Xang pa*) from their captive (village) conspecifics (*Xang ban*), but 71% of respondents considered that village and wild elephants were the same species (*sanit*: kind, sort or species when related to animals). Interestingly, the further away respondents live from areas where wild elephants currently occur, the more they considered village and wild elephants as different species. When we asked what these differences were, we noticed 24 answers referring to physical attributes with no clear consensus, such as the head and/or the ear being either bigger or smaller. Otherwise, 20 answers were related to coexistence with humans (wild do not live with humans, wild do not work, wild do not

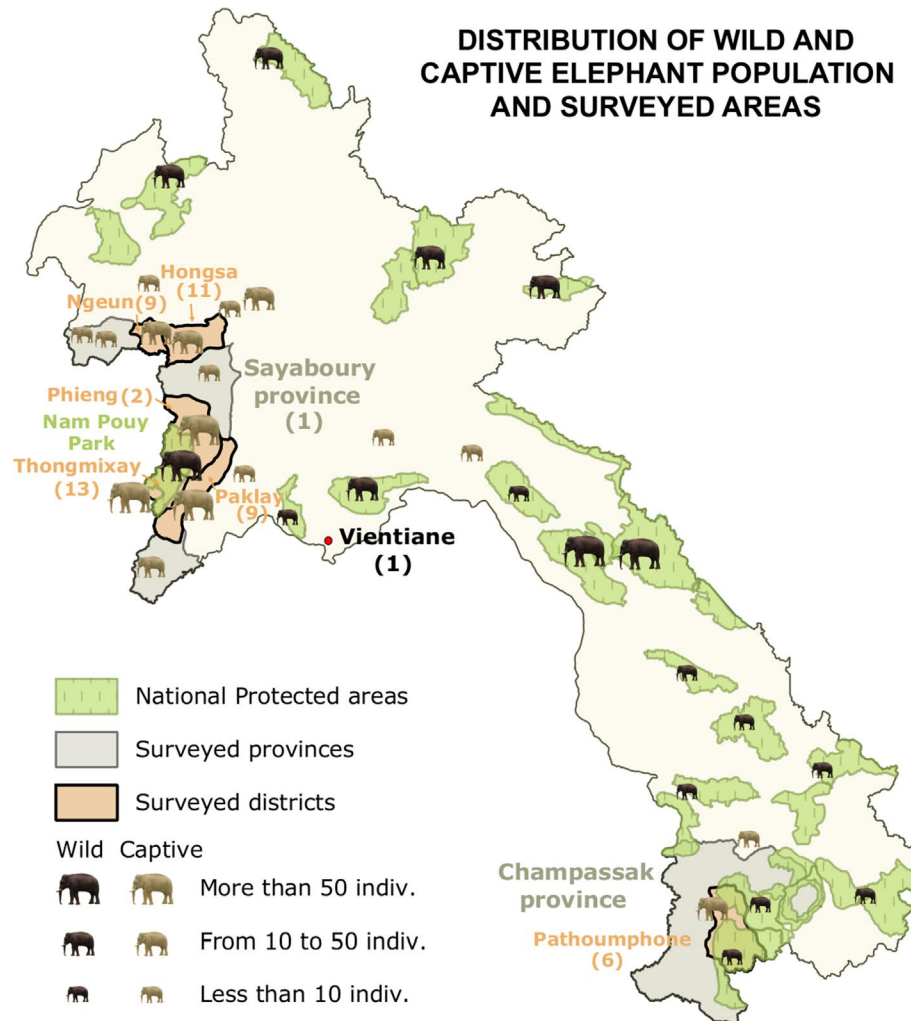


FIGURE 1 Distribution of wild and village elephant populations in Lao PDR and surveyed areas. Numbers in brackets indicate the number of interviews conducted in this area. Adapted from Maurer et al., Scientific Reports 2017

have scars, etc.) and 19 answers concerned behavioural differences (wild elephants attack or run away in the presence of humans).

Two elephant owners from Hongsa and Thongmixay referred to a Lao tale about the origin of wild elephants:

In ancient times there were only village elephants. An elephant was born and could not be caught. He fled into the forest. [...] This elephant remained free for three months and could not be caught. He became a wild elephant [...] and bred in the forest. [...] So, we captured some wild elephants, brought them back and raised them. They know the language like our elephants. (#44, Hongsa)

This popular cosmogony illustrates the dualist view between the civilized world, where humans were sent with their domestic companions, and the forest or wilderness that shelters afterwards some fugitives. More specifically, these stories illustrate the paths between the village (*ban*) and the wild or the forest (*pa*). Elephant owners do

not conceive of either 'village' or 'wild' as an immutable status. Among 24 answers, 13 indicated that wild elephants can become village elephants after capture and training, with the exception of big or aggressive elephants that cannot be easily captured and tamed. Seven respondents also added that a wild elephant needed to be released from its wild spirits to become a village one.

Actually, an individual elephant's status is not inherited from its progenitors. Indeed, even if the owner of a female elephant can claim ownership of its progeny, the calf is considered a village elephant only from the moment it is trained and lives with humans, whether its father is a wild or a village elephant. Finally, the taming of a village-born elephant appears to be a mix of breaking-in techniques and rituals aimed at clearing the elephant from its wild spirits:

A calf that hasn't been taught yet doesn't belong to us. It still belongs to the forest... It is wild. The spirits of the forest (*phi pa*) are not those of the village (*phi ban*). If the shaman doesn't hit hard enough to scare them away, the elephant dies. [...] Once the shaman

has taken care of the spirits, it's okay, it's a village elephant. (# 35, Hongsa)

After its taming, the village calf seeks the protection of the spirits of the house (*phi heuan*) such as the owner's family (Lainé, 2018a). The domestic status is transient and the path to domestication is reversible. Indeed, 11 respondents confirmed known cases of village elephants returning back to the wild. Decades ago, village elephants were released in the forest over long periods of time and could meet with wild ones. It was not uncommon for them to escape and follow their wild congeners, especially gestating females. The latest known case of a village elephant never retrieved was 5 years ago. For eight respondents, such escaped village elephants become fully wild and forget the language of humans, whereas six respondents considered that they still remember the language. Two respondents also noticed that their wild spirits came back. The ownership that is transmitted from the mother to its calf is therefore only prerequisite for an elephant to be considered as a village one. The status of forest or village elephant is eventually a question of perpetuating the control over spirits. Elephant masters are engaged in a perpetual attempt to harness and control the wild nature of their elephants, which illustrates the dialectic between the wild and the domestic, between untamed natural resources and village prosperity described by Singh (2012).

According to our analysis, by the end of the 20th century, the interactions between elephant owners, wild and village elephants were based on the principles of cohabitation, habitat and resources being shared, with an attempt by the community to control the resources (Figure 2).

4.2 | A new state of the SES based on commodification and divided access to natural resources

The two last decades have seen major changes in these ecological and socio-economic factors.

Since the 1990s and the opening of the country to the market economy, Laos has been engaged in a major social, economic and ecological transition under a process of neoliberalization. These changes have induced a major shift in the foundational paradigm of human–elephant relationships and strongly impacted village elephant husbandry practices, as well as management and perception of wild elephants, as detailed hereafter (Figure 3).

The development of timber quotas during the first decade of the 21st century motivated some people to invest in an elephant. Nine respondents indicated that they bought their elephant with the intention of working for the logging industry:

There used to be a lot of timber quotas and you could quickly earn money. That's why I bought an elephant, besides there's not much expenses [to handle an elephant]. (#27, Paklay)

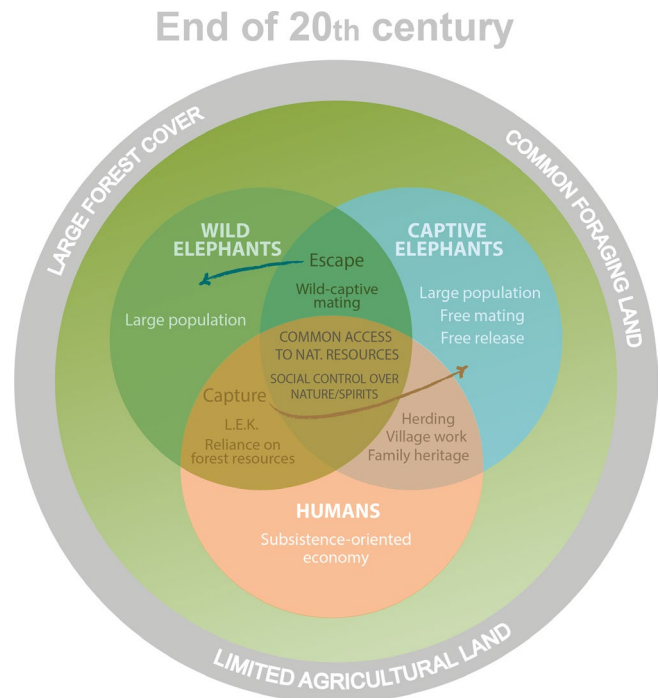


FIGURE 2 Interactions between humans and elephants occurring in Laos in the 1990s. We characterize the social-ecological system in the 1990s by a landscape dominated by large forests and common fallow lands, and three main poles (human, village elephant and wild elephant) with substantial interactions

Six respondents even sold and bought several animals, changing radically the status of the elephant from a full member of the family to a production investment. Thereupon, elephants were priced on a market basis depending on variations in supply and demand (Maurer et al., 2017).

Since the 1990s, the development of the forestry industry for export has disrupted elephant handling practices. From being employed in occasional village work, elephants became beasts of burden employed full-time by the timber industry. Their workload slightly increased during the last two decades until the recent decrease in timber quotas instituted by the government, which left many elephants jobless. Thirteen respondents confirmed that their workload decreased during the last 2 years before our study. Most elephants now perform a variety of tasks, depending on opportunities and periods of the year (Table 1).

Some village elephants have been reconverted in the tourism industry, especially around Luang Prabang, a UNESCO heritage city, located far from their native region. However, tourism does not have the capacity to employ all village elephants. Approximately 100 elephants are employed by the tourism sector, some of them temporarily, as tourism is a seasonal activity. Private companies also buy village elephants to operate their businesses, turning a family heritage into a means of production. Nowadays, owners who do not make an income from their elephant workforce consider selling, exporting or renting them to foreign countries for tourism or circus purposes:

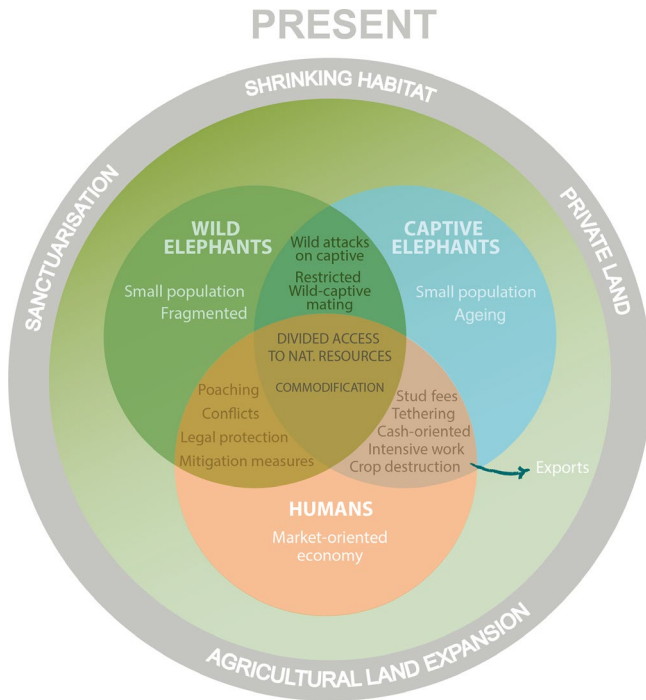


FIGURE 3 Interactions between human and elephants under the current state of the social-ecological system (SES). The current SES is based on the principles of a divided access to natural resources and the commodification of these resources. The nature of interactions is evolving towards more segregation between humans, wild and village elephants

TABLE 1 Type of work done among 48 elephants, and their workload. Figures indicate the number of elephants. Most elephants have mixed activities, varying with season or with opportunities

Occupation	Yearly workload	
Mostly inactive	3	More than 8 months 17
Breeding	7	4–8 months 16
Logging	27	Less than 4 months 8
Occasional logging	1	
Village work	17	
Tourism	8	
Occasional tourism	4	
Tourism abroad	2	

Right now my elephant is in China. I hired a young man from the village to take care of it and I visit them every three months. In Hongsa, there are 11 elephants that left together. (#41, Hongsa)

The process of commodification has also strongly impacted breeding practices. The long gestation of females and the long period before calves are weaned are not compatible with an intensive workload. Therefore, owners of female elephants have to make an economic choice between selling their calf after weaning or earning

an alternative income from logging during the 3-year gestation and weaning period (Maurer et al., 2017). During the last two decades, most owners have preferred the incomes generated by their elephant work, resulting in a drastic decrease in the village elephant population. However, the constant rise in elephant prices has recently led a growing number of owners to conclude that it is more profitable to breed their elephants. Thus, seven respondents declared breeding their female elephant for the purpose of selling the calf. During the survey, we met eight respondents with pregnant females, six of them living in Thongmixay district close to Nam Pouy National Park and two from Hongsa and Ngeun districts. Thongmixay elephant owners dislike males and prefer to sell them (and male calves) to other districts, making their living from breeding their females with wild males. Elephant owners from northern Sayaboury province (Hongsa and Ngeun) still perpetuate a tradition of breeding their females with village males but face difficulties in finding village mates. Indeed, male elephants are not available due to their working commitments and their owners now ask expensive stud fees. With the payment of stud fees, commodification has extended to village elephant gametes. Nowadays, most elephant owners said that they had not successfully bred their elephants during the last decade, including 30 owners who said they had never bred their elephants. These changes in breeding practices stem not only from the commodification of elephants, but also arose because of a shift from a common to a divided access to natural resources.

Commodification has been accompanied by the division and privatization of natural resources. Such territorialization is best illustrated in Laos by the privatization of land and the establishment of national protected forests that prevent the free release of elephants in protected areas as well as in forest and common forage lands surrounding the villages.

With the expansion of agricultural lands (rice fields, gardens, commercial crops or tree plantations) and the systematic mapping and privatization of forest land, suitable forage lands are difficult to find. Elephants are pushed further away from the village. The reduction of grazing areas is becoming a major issue for elephant owners. More elephants are now inactive, but owners cannot release them. As a result, elephants are always chained, and release is not possible, usually because they are too many gardens and fields around that could be damaged, which would create conflicts with local communities. The permanent tethering of village elephants isolated one from each other also impairs their mating (see Figure S2 Map of elephant-keeping areas in Ban Naven).

However, 19 respondents still release their elephants during a part of the year. In Champassak district, females are released in wetlands during the monsoon period. Thongmixay district also offers favourable conditions for such releases. This district is located in a remote area, landlocked between the forests along the Lao-Thai border and Nam Pouy National Park. As shown on the map drawn by local respondents (Figure 4), village elephants regularly encounter their wild congeners, allowing pairing with wild mates.

Facing similar challenges, respondents choose different alternatives. Some have chosen to optimize their incomes through tourism or breeding, while many owners did not find suitable ways to feed and keep their elephants, neither breeding them nor finding employment

in logging or tourism. Lao mahouts and elephant owners have been dispossessed from accessing forest areas because of land privatization or state-led legal protection. As a result, the village elephant population appears not to be self-sustaining and many owners have tried to sell their elephants, even abroad. In addition, the young generation does not seem interested in such hard work, and owners' children prefer to live in cities and are dismissive of their parents' heritage:

Young people don't like this job, it's hard to go into the forest. They all went to school; they went away from here and they don't want to come back. They want to be employed. I'm old now, if a buyer comes in, I'll sell my elephant to him. (#07, Champassak)

4.3 | Impact of SES changes on the elephant handling system

We describe the elephant handling system using four interconnected dimensions: the mode of production and the taskscape, in the sense of Ingold (1980), the mode of relations between the mahouts and their animals, in the sense of Stépanoff (2017), and the landscape (Table 2).

4.4 | Mode of production: From pastoralism to ranching-like economy

During the 1990s, the economy of elephant handling could be seen as a form of pastoralism, where pastoralism is defined as a mode of

production. Ingold (1980, p. 237) listed prerequisites for a pastoralism economy, namely: 1. Animals are convertible into basic raw materials, 2. capable of self-reproduction, 3. identifiable with forbears and progeny, 4. of relatively low reproductive potential, 5. tolerant of crowding and 6. capable of supporting itself in nature. All of these criteria were satisfied in the Lao elephant handling system, with the first condition being adapted to the specificity of village elephants, where animals are convertible into basic domestic services as draught animals. According to Ingold, the pastoralism mode of production is based on a common access to pasture with an exclusive right of disposal of the animals by the owner. The system observed in Laos during the 1990s conformed to such a mode of production, being closer to agropastoralism as elephant owners also cultivated rice. Families were engaged in a spiral of accumulation (Ingold, 1980) through the natural reproduction of their herd, aimed at providing a workforce for domestic use in a subsistence economy. A market for elephants existed under this economy, but this market concerned mainly the sale of the incremental increase in animal stock, where the owner could resort to a one-off sale of an animal or its calf to cover specific needs.

The elephant handling system has evolved in recent years to a ranching-like economy following the processes of commodification and partitioning of natural resources. This mode of production is based on the existence of a market, not only for elephants and their workforce, but also for all factors of production such as mahout labour and forage land. The owner is then engaged in a spiral of accumulation of monetary capital, where the ultimate goal is not to increase the animal stock but the profits (Ingold, 1980). The owner should optimize his number of elephants according to market prices and available resources, especially

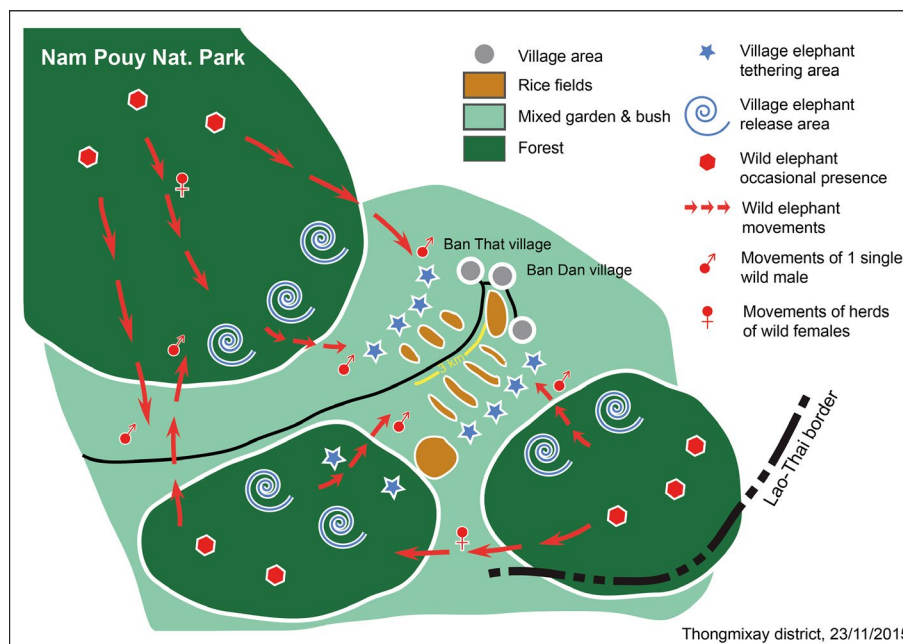


FIGURE 4 Map of elephant-keeping areas in Thongmixay district. Village elephants are either kept attached next to the village fields or released in surrounding forests where they can occasionally meet wild elephants. Arrows show the movement of herds of wild females or of a single wild male that comes every year to mate with village female elephants. The distance of 3 km between rice fields (in yellow) gives an idea of the map scale

TABLE 2 Conceptual model of recent changes in the elephant handling system. The elephant handling system is characterized using four interconnected dimensions: the mode of production, the taskscape (in the sense of Ingold, 1980), the mode of relations between the mahouts and their animals (in the sense of Stépanoff, 2017) and the landscape

Mode of production	Taskscape	Mode of relations	Landscape
Prevailing elephant handling system in the 1990s			
<i>Common access/spirit control</i>			
1. Occasional use 2. Domestic use 3. Elephant = family heritage	1. Tasks performed by the family 2. Family transmission of LEK	1. Free ranging 2. Free reproduction 3. Intermittent human control	1. Forest > agricultural land 2. Common foraging in fallow lands 3. Free access to forest
Accumulation of animal capital = Pastoralism	Multifunctional diversity of actors	Alternation of seasonal freedom and watching mode	Multifunctional landscape = Land sharing
↓	↓	↓	↓
Current prevailing elephant handling system			
<i>Divided access/commodification</i>			
1. Intensification of workload 2. Logging industry, tourism industry, reproduction 3. Elephant = market	1. Tasks performed by investors, hired mahouts, veterinarians, ... 2. Disappearance of LEK	1. Tethering and/or feeding (tourism) 2. Controlled reproduction 3. Permanent guarding	1. Agricultural land > Forest 2. Restricted access to private land 3. Access to protected areas is banned
Accumulation of monetary capital = Ranching	Functional specialization of socio-economic actors	Alternance of watching and captivity (captivity in tourism)	Functional specialization of landscape = Land sparing

The defining principles of each dimension are indicated in bold for the period before 1990 and nowadays.

human (mahout) labour costs and foraging lands. Following the formal partitioning and privatization of land, foraging land becomes a limiting factor. As a result, population dynamics of village elephants under the ranching economy relies more on socio-economic parameters than on the elephants' reproductive potential, and the population of elephants is eventually minimized (Maurer et al., 2017).

Before, elephants were cheap. There was no work at that time. Since people are making a lot of money from elephant work, their prices have gone up. The price of elephants rocketed since 2000 because their numbers have decreased. (#32, Phieng)

My elephant works all year round. He has no rest period because his owner has his own wood business. So the elephant drags logs for him all the time. (#23-Mahout, Paklay)

4.5 | Taskscape: From multifunctional diversity to functional specialization

In the 1990s, all tasks were performed by the owner and his family—from capturing the elephant, to training, working, caring and blessing

the animal. Elephants were used for light village work such as transporting people, firewood or rice bags or dragging of logs for house construction. Otherwise, they were released in the surrounding forests and visited occasionally by one of the co-owners or family member. TEK were transmitted from father to son. In case of need, the owner sought the help from a specialist such as the *Mo Xang* (elephant ceremony master), the *Mo feuk xang* (elephant training master) or the *Mo Ya* (medicine master) as described by Lainé (2017a, 2018a). This short account summarizes the complexity of the taskscape at that time, which can be characterized by the multifunctional diversity of the actors in the framework of SES.

Nowadays, elephant handling and management tend to become part of a production chain. Timber operations require two mahouts. One rides the elephant on its neck (*khuan xang*, elephant mahout), while his assistant (*khuan tin*, walking mahout) remains on the ground. The latter handles the chains and facilitates the elephant's work. Work lasted for 3–4 hr a day, with 4 resting days a month based on the lunar calendar (*van sin*). For weeks or months, humans lived in temporary forest camps made of small bamboo huts, next to their elephant. Most elephants do not perform many tasks (transportation, logging, breeding) but are rather specialized in one of them, such as logging in Paklay-Phieng, breeding in Thongmixay or tourism in Hongsa-Luang Prabang. The owner becomes a manager, or even an investor without any experience in elephant handling, like many tourism companies. The elephant

is no longer raised by the owner or one of his sons, but by an employee. Mahouts employed in the tourism sector are mostly young and inexperienced (Suter et al., 2013). They lack the traditional knowledge to care for, and control their animal. Vanitha et al. (2009) showed that elephants handled by non-traditional mahouts in South India cause higher rates of casualties and deaths among the public (or of their own mahout). Knowledge of traditional medicine and elephants' reproductive behaviour are also replaced by veterinary skills, especially in tourism camps (Dubost et al., 2019; Lainé, 2017b; Suter, 2014). Conflict management with wild elephants is delegated to forest department officials. Similar to other Asian countries, traditional knowledge and the art of mahoutry are dying out rapidly (Lair, 2002; Vanitha et al., 2009). The taskscape is thus undergoing a recent process of functional specialization of the socio-economic actors.

4.6 | Mode of relations: From seasonal freedom to captivity

Pastoralism is usually associated with a relationship of domination of humans over animals. In view of the relative autonomy of village elephants, it is questionable that this condition applied here. Indeed, alternative forms of herd management based on animal autonomy and an alternance of separation and control periods have been described for reindeer herding in northern Asia (Stépanoff et al., 2017), and these systems share similarities with elephant handling in Laos. The mode of relations defined by Stépanoff that best corresponds to the case of village elephants in the 1990s was an alternance of *seasonal freedom* and *watching* modes.

The privatization of forests and agricultural lands has impacted the way of life of mahouts and village elephants alike. At the very least, this situation compels village elephant owners to adopt a more intensive form of husbandry, as observed for other animals in Mongolia (Marchina, 2017) and to tether their elephants. Mahouts keep their elephants tied to a tree to prevent them from destroying neighbouring crops. Every day, mahouts have to move their elephant to a new location and let them drink. In the absence of work and income, this task is carried out at a loss, motivating many owners to sell their elephants.

Before the region was developed, there were no plantations, no market gardens, and elephants could be released for one or two months. Now it is no longer possible. There are rubber plantations, they would destroy everything, and we would have to pay. Now we have to tie up the elephants an hour's walk from the village. (#39, Hongsa)

This mode of handling is like the watching mode defined by Stépanoff (2017), where food extraction remains under animal agency while the choice of foraging areas and reproduction are under human control. The development of tourism camps holding

village elephants is particularly illustrative of the changes in the mode of relations. Elephants are often kept in stables and fed with cultivated fodder. They are under continuous supervision of their mahouts. Stépanoff defined as captivity a mode of husbandry where reproduction and feeding are under exclusive human control. But permanent guarding and fodder supplementation induce high costs that are hardly bearable during the low tourism season or in the event of crises that affect tourist frequentation (Duffy & Moore, 2010). Ultimately, reproduction is controlled through the payment of stud fees. Ingold (1980) also mentioned that a ranching economy entails a strict control over reproduction and the selection of specific traits while pastoralists favour the animal's wild qualities. Indeed, males and aggressive elephants are highly disliked in tourism, contrary to their suitedness for logging.

4.7 | Landscape: From a multifunctional landscape to functional specialization

In the 1990s, the landscape was a combination of forest and fallow lands from rotational agriculture where village elephants were released. Secondary forests and fallow lands also constituted an important part of the habitat of wild elephants, especially since the ranges of individual wild elephants extend well beyond protected areas (Evans et al., 2018; Fernando & Leimgruber, 2011). Landscape was characterized by its multifunctionality, being the habitat for both wild and village elephants but also a resource for humans' livelihood through the collection of forest products, hunting or capture.

Since the late 1980s, agricultural intensification and land allocation policies have gradually led to the disappearance of secondary forests and fallow lands of shifting cultivation (Ducourtieux et al., 2005). Following the process of division of natural resources described above, elephant owners have been dispossessed from accessing forest resources in common lands, reinforced by the ban to access protected areas imposed by the government and NGOs, who want to keep this habitat exclusively for wildlife conservation.

It is forbidden to tie up elephants from Nakhanyang to Muang Thongmixay. Because, if people were allowed to enter the park, then they would do something else, like hunting. (#28, official, Paklay)

Many village elephants have also been moved to semi-urban areas accessible for tourists, far from their natural habitat and their wild congeners. This situation impedes the interactions between wild and village elephants, notably mating opportunities. Similar to taskscape, the landscape is undergoing a recent process of functional specialization. Such land segregation is akin to the concept of land sparing, which consists in sparing land surface with conservation priorities through the intensification of high-yield crop farming (Perfecto & Vandermeer, 2008; Phalan et al., 2011).

5 | DISCUSSION

The relationship between humans and elephants has lasted for millennia based on a tight interlink between wild and village elephants (Trautmann, 2015). The combination of ecological, cultural and socio-economic dimensions makes the system even more complex. The rapid political, socio-economic and environmental changes occurring in Laos over the last few decades have strongly affected the conditions of this relationship. Our analysis highlights the socio-economic and ecological factors driving changes in elephant handling and husbandry practices in Laos. Wild and village elephants were formerly closely linked at both landscape and livelihood levels, but are now found more and more in different places, managed by specialized social actors. The way of handling elephants that prevailed in the 1990s can still be found among some owners or districts, but is now being replaced by new practices, especially following the development of the elephant tourism industry. Our case study is illustrative of a wider prevalent situation faced by SES in transition due to globalized economic, social and cultural changes.

A growing number of empirical studies have described SES in transition. Many studies identified the external drivers that impact the SES and the response of communities to adapt to these changes. For instance, Forbes (2009), using the example of nomadic Nenets reindeer herding people in Siberia, shows that SESs adapt to changes at multiple scales, including changes in climatic, economic and geopolitical regimes. The end of the Soviet era led to sharp declines in human communities, reindeer husbandry and economic activities in many surrounding areas of the Yamal Peninsula. But the Nenets of the Yamal Peninsula have been able to maintain a large population and economic activities, including reindeer husbandry, by adopting a flexible system combining free access to pastures and migration routes with private herd ownership.

In another context, Castella et al. (2013) described the impact of land segregation policies and new economic regime in northern Laos on the harvesting of non-timber forest products (NTFPs), leading to a decline in the diversity and resilience of the SES. As market access and demand increased, villagers focused on harvesting a small number of species with high economic value. The intensity of their collection then depended on price fluctuations. Castella et al. observed a process of domestication of some high-value NTFP species, intensively exploited by villagers, and their disinterest for other low-value species. The decrease in functional diversity of the NTFPs due to their intensive exploitation and the economic specialization of villagers has reduced the capacity of social actors to adapt to regime shifts.

The human–elephant SES in Laos is facing an unprecedented challenge to cope with a combination of powerful external and internal forces. Our study builds on a broad and multifaceted portrayal of the various forces influencing a SES in transition that could enlighten prevalent situation world-wide, way beyond elephants in Laos. External factors such as market forces as well as land and conservation policies became main drivers of the system. But our study also pointed out internal drivers affecting the capacity of communities to

adapt to changes, such as the eroding willingness of the new generation to carry on with the harsh living conditions of their fathers and the consecutive loss of ecological knowledge.

5.1 | Characterizing a SES in transition

Despite a large body of literature theorizing SES in transition, it has been challenging to apply these paradigms to empirical cases because of the intricacy of the system's components and the multiscalar nature of changes (Pelling & Manuel-Navarrete, 2011). Adaptation at one level may lead to a transformation at another level of the system (Ramprasad et al., 2020). Defining the system boundaries and its normative dimensions allows to overcome the tensions whether a social-ecological change is a transformation or adaptation (Zanotti et al., 2020). Our conceptual model aims at defining the system boundaries and investigating the nature and scale of changes. Literature on the relations between Asian elephants and humans, particularly their caretakers, has mostly focused on the symbolic and inter-subjective dimensions. To bring a new insight, we built a model inspired from studies on pastoralism, with a specific interest in reindeers, that offer comparative categorizations. We concede that pastoralism and ranching may sound inappropriate in reference to elephants, but we refer to them as modes of production in the sense of Ingold. From the viewpoint of this system boundary, all four dimensions (production, taskscape, relations and landscape) involved fundamental changes to the core system functions and characteristics, akin to the transformation of the SES. However, this process of transformation is dynamic and still at work. Communities chose various strategies and could further adapt their strategies in face of dynamic changes.

Beyond our diagnosis of a transition state, it seems crucial to understand how external drivers, such as economic liberalization, land and conservation policies, as well as internal drivers linked to cultural and social changes have impacted the system core functions. At the individual level, could these dynamics of change pull away actors that are at the centre of the system towards more desirable livelihoods out of their traditional activities?

5.2 | Market forces are driving the fate of the human–elephant relation

Neoliberalism and the concomitant commodification of natural resources, including the privatization of common pastures, market instruments for the conservation of protected areas or the payment of stud fees, profoundly affected the SES and triggered radical changes in elephant handling practices. Since those changes have been brought to Laos, market forces became a main driver of the human-wild-captive elephants' SES. The fate of village elephants becomes highly contingent on prices and market trends. Economic criteria, such as elephant prices and availability of work in tourism or logging, have become major drivers of population dynamics through their

impact on fecundity rates. While fecundity is expected to rise again gradually in response to the rapid increase in the price of elephants, long-term equilibrium remains threatened by demand fluctuations, financial crises or economic stochasticity in the short term (Maurer et al., 2017). Lair (2019) argued that a global economic crisis is the main threat to Thailand's 2,700 tourism elephants. Building on the cases of the 2002 and 2004 SRAS epidemics, he noticed that tourism employers were unable to pay for elephant food and to maintain mahout payrolls. As the Covid-19 crisis just began to impact tourist numbers, media reported that a thousand elephants threatened by starvation migrated from tourist sites forced shut down because of the pandemic to their home villages (Thai elephants' mass migration to village brings new stress, *Phys. Org.*, June 2020). It is somewhat early to foresee the full consequences of this global pandemic and the ensuing economic crisis on village elephants. But it seems hazardous to base survival on the ability of self-regulating markets to find a long-term equilibrium (Martin et al., 2016; Sullivan, 2011) for a species that depends on complex socio-ecological factors. Once, the elephant was a family heritage, but now it is restricted to a national heritage marketized for its tourism potential. A diversified economy and livelihood among elephant owners can surely contribute to their community adaptive capacity (Gunderson, 2010). The growing specialization of the elephant economy makes the community more vulnerable and more dependent on fluctuating markets and external shocks.

5.3 | Land and conservation policies influence community response to changes

The process of landscape functional specialization has reduced the diversity of habitats and thereby the adaptability of the SES. Elephants favour a habitat with an intermediate disturbance regime, these habitats being mainly outside protected areas (Evans et al., 2018; Fernando & Leimgruber, 2011). Less than a quarter of Asian-protected forests provide favourable habitat for elephants, because protection areas are generally concentrated in primary and old-growth forests. Forest areas exploited for timber extraction, as well as landscape mosaics from rotational agriculture, provide particularly favourable habitat for elephants but are not integrated into conservation programmes. Most Asian countries have initiated land-sparing policies. This conservation approach does not match the ecological requirements and habitat preferences of wild elephants. Many other species also rely on secondary or disturbed forests. A growing body of literature shows the importance of human-modified landscapes as habitat for endangered species, including large mammals such as carnivores (Ferreira et al., 2018), primates (Galán-Acedo et al., 2019) and elephants (Evans et al., 2020). Village elephants also formerly shared these same habitats. The sanctuarization of forest and wild elephants in protected areas and the isolation of village elephants could eventually lead to genetic impoverishment and inbreeding depression for both populations (Hedges et al., 2008; Maurer, 2018).

Landscape governance reforms are urgently needed to manage multifunctional landscapes that could benefit not only wild and village elephants but also villagers' livelihoods. In Laos, land-planning policies, including conservation strategies, are illustrative of a top-down approach from the government, international institutions and NGOs that restrains project co-construction with local communities and rarely integrates their values and knowledge. These issues, which are related to power relations and control of resources, have been widely scrutinized in relation to land-use planning, shifting cultivation and ecosystem services (Baird & Barney, 2017; Lestrelin et al., 2012; Ramcilovic-Suominen & Kotilainen, 2020). Similarly, in Kerala, India, the conjunction of state-led forest protection and the development of agrarian capitalism supported by tenure systems and land reforms led to violent conflicts between local communities and wild elephants (Münster & Münster, 2012). As elephants transgress the frontier, villagers turn to NGOs and the forest department to mitigate the conflict and raise protections against elephants. In addition, humans are excluded from the forest, moulding new ontologies and values. Tourism companies and welfare or conservation NGOs also promote various values and ethics regarding village elephants that contradict or oppose cultural values and local needs (Jax et al., 2013; Lainé, 2018b). But the ability of communities to organize themselves and retain their ecological knowledge is fundamental to their resilience and fosters their adaptive response to changes (Barnes et al., 2017).

5.4 | Mahout/owner' agency to pertain their activities under new conditions

The number of owners and mahouts decreases nationwide, as well as the number of elephants. The situation in which there were many owners/mahouts, usually from the same family, owning several elephants, is being increasingly replaced by one owner for one or several elephants, each elephant being cared for by one full-time mahout. The functional diversity—the role and functions that species or social actors play in the system—is reduced. Some owners would prefer to maintain their former practices but face new socio-ecological conditions that make this difficult. Many owners are selling or renting their elephants abroad, especially in China. If most owners declared they like their job and way of life, they also prefer their sons to avoid enduring such harsh living conditions in the forest under the rain. Their descendants also value working on a computer in an office rather than in the forest.

As a result, the decline in father-to-son transmission undermines traditional ecological knowledge. The loss of know-how and the absence of technical innovations (Ingold, 1980) threaten the long-term sustainability of this new intensive and specialized mode of husbandry. Traditional medicine is replaced by veterinary skills (Dubost et al., 2019; Lainé, 2015). Veterinarians are also supervising reproduction, especially in tourism camps, amid plummeting rates in fecundity. We illustrate how elephant husbandry in Laos has become more contingent on specialized actors such as tourism companies,

veterinarians, government officials and NGOs. We can wonder if this functional specialization of socio-economic actors could reduce the system's resilience in Laos, as shown in other contexts (Forbes et al., 2009; Grêt-Regamey et al., 2019).

Overall, the decline in mahout and owner numbers can be explained by a combination of factors such as the decrease in elephant population, new handling practices and growing economic and regulations constraints pushing them to leave their activity. We also shed light on additional internal drivers more connected to change in social and cultural values that found echoes in a cultural and economic globalized world. For instance, similar processes have been described for the SES of artisanal fisheries in Norway (Johnsen & Vik, 2013) or Chile (Tam et al., 2018). Attitudes and behaviours among fishers appear to have shifted with economic development, favouring education, professions of higher status and greater economic security (Tam et al., 2018). The lack of recruitment and loss of interest from the young generation is threatening the sustainability of the system from the inside.

There is an urgent need to promote collaborative governance, community-based management, knowledge integration among multiple stakeholders and address the young generation desires and expectations to allow elephant owner and mahout communities to adapt to both gradual change and unforeseen disasters.

6 | CONCLUSION

Simple dichotomies between nature and society, local and global, and economy and ecology prevent us from handling the complexity of interrelations existing 'in-between' and favours the processes of 'purification' (Latour, 1991). In Laos, the social control over nature is replaced by a clear demarcation and purification process between the village and the forest poles. Thus deforestation can be regarded by Lao people as a sign of social improvement, since civilized and prosperous (*chaleun*) areas are expanding (Singh, 2009). However, the long-term survival of wild elephants may be compromised by repeated poaching of wild elephants and encroachment of their habitat, genetic isolation, increasing hostility towards the species and the alarming rise of conflicts between humans and elephants. The ontological dichotomy between the wild and village animals is getting stronger. Wild individuals are perceived more and more as different species, living in different habitats.

Meanwhile, a broad range of stakeholders—mahouts and elephant owners, the Lao society, tourism companies, welfare organizations, conservation NGOs, governmental and international institutions—are promoting their own agendas, values and knowledge without proper dialogue and coordination.

Forbes (2009) argues that 'relationships are as fundamental as places and things. Conservationists made a strategic error in assuming that our work is more a legal act than a cultural act, in assuming that we can protect land from people through laws, as opposed to with people through relationships. Laws codify values; they do not create them'. The emerging literature on relational values provides

new perspectives that resonate with the complex challenge of conserving Asian elephants, whether they are wild or under human care, a cultural icon or a family heritage. Relational values, which relate to individual and collective well-being, encompass relationships and interactions between people and nature, including relationships between people through nature (Chan et al., 2016). Relational values link cultural practices and places, or what we call here the landscape, where people can experience and care for nature. Conservation programs have been criticized for not integrating sufficiently the needs, values and knowledge of local people. Chan et al. (2016) advocate for rethinking conservation strategies through the lens of relational values. Such an approach could help cultivate relationships between stakeholders and more effectively engage local communities, building on their cultural identities, knowledge, stewardship and social responsibility.

While facing new challenges, the long-lasting relationship between humans and Asian elephants will either adapt or transform into new pathways. But the shape of this future coexistence will depend above all on the relationships that will be woven between people, places and elephants.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTIONS

G.M., O.G. and N.L. conceived the ideas and designed methodology; G.M. collected and analysed the data; G.M. and N.L. led the writing of the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

DATA AVAILABILITY STATEMENT

Informed consent given by respondents does not allow for the interviews to be made public.

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REFERENCES

- Antweiler, C. (1998). Local knowledge and local knowing: An anthropological analysis of contested 'cultural products' in the context of development. *Anthropos*, 93(4–6), 469–494.
- Apgar, M. J., Allen, W., Moore, K., & Ataria, J. (2015). Understanding adaptation and transformation through indigenous practice: The case of the Guna of Panama. *Ecology and Society*, 20(1). <https://doi.org/10.5751/ES-07314-200145>

- Armitage, D., Béné, C., Charles, A. T., Johnson, D., & Allison, E. H. (2012). The interplay of well-being and resilience in applying a social-ecological perspective. *Ecology and Society*, *17*(4). <https://doi.org/10.5751/ES-04940-170415>
- Baird, I., & Barney, K. (2017). The political ecology of cross-sectoral cumulative impacts: Modern landscapes, large hydropower dams and industrial tree plantations in Laos and Cambodia. *Journal of Peasant Studies*, *44*(4), 884–910. <https://doi.org/10.1080/03066150.2017.1289921>
- Barnes, M., Bodin, O., Guerrero, A., McAllister, R., Alexander, S., & Robins, G. (2017). The social structural foundations of adaptation and transformation in social-ecological systems. *Ecology and Society*, *22*(4), 16. <https://doi.org/10.5751/ES-09769-220416>
- Baude, O., Blanche-Benveniste, C., Calas, M.-F., Cappeau, P., Cordereix, P., Goury, L., Jacobson, M., de Lamberterie, I., Marchello-Nizia, C., & Mondada, L. (2006). *Corpus oraux*. Guide des bonnes pratiques 2006 (CNRS Ed.). Presses Universitaires.
- Berkes, F. (2008). *Sacred ecology* (2nd ed.). Routledge.
- Berkes, F., & Folke, C. (1998). Linking social and ecological systems: Management practices and social mechanisms for building resilience. *Ecological Economics*, *28*.
- Brockington, D., & Igoe, J. (2006). Eviction for conservation: A global overview Daniel Brockington and James Igoe. *Conservation and Society*, *4*(3), 424–470. <https://doi.org/10.1126/science.1098410>
- Campbell, B. (2005). Changing protection policies and ethnographies of environmental engagement. *Conservation and Society*, *3*(2), 280–322.
- Castella, J. C., Lestrelin, G., Hett, C., Bourgoin, J., Fitriana, Y. R., Heinimann, A., Laurent, J., & Pfund, J.-L. (2013). Effects of landscape segregation on livelihood vulnerability: Moving from extensive shifting cultivation to rotational agriculture and natural forests in Northern Laos. *Human Ecology*, *41*(1), 63–76. <https://doi.org/10.1007/s10745-012-9538-8>
- Chan, K. M. A., Balvanera, P., Benessaiah, K., Chapman, M., Díaz, S., Gómez-Baggethun, E., Gould, R., Hannahs, N., Jax, K., Klain, S., Luck, G. W., Martín-López, B., Muraca, B., Norton, B., Ott, K., Pascual, U., Satterfield, T., Tadaki, M., Taggart, J., & Turner, N. (2016). Why protect nature? Rethinking values and the environment. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(6), 1462–1465. <https://doi.org/10.1073/pnas.1525002113>
- Chan, K. M. A., Pringle, R. M., Ranganathan, J., Boggs, C. L., Chan, Y. L., Ehrlich, P. R., Haff, P. K., Heller, N. E., Al-Khafaji, K., & Macmynowski, D. P. (2007). When Agendas Collide: Human welfare and biological conservation. *Conservation Biology*, *21*(1), 59–68. <https://doi.org/10.1111/j.1523-1739.2006.00570.x>
- Choudhury, A., Lahiri Choudhury, D. K., Desai, A., Duckworth, J. W., Easa, P. S., Johnsingh, A. J. T., Fernando, P., Hedges, S., Gunawardena, M., Kurt, F., Karanth, U., Lister, A., Menon, V., Riddle, H., Rübel, A., & Wikramanayake, E. (2008). *Elephas maximus*. *The IUCN Red List of Threatened Species*, 8235, 16. <https://doi.org/10.2305/IUCN.UK.2008.RLTS.T7140A12828813.en>
- Cumming, G. S. (2016). The relevance and resilience of protected areas in the Anthropocene. *Anthropocene*, *13*, 46–56. <https://doi.org/10.1016/j.ancene.2016.03.003>
- Dubost, J.-M., Lamxay, V., Krief, S., Falshaw, M., Manithip, C., & Deharo, E. (2019). From plant selection by elephants to human and veterinary pharmacopeia of mahouts in Laos. *Journal of Ethnopharmacology*, *244*(June). <https://doi.org/10.1016/j.jep.2019.112157>
- Ducourtieux, O., Laffort, J. R., & Sacklokhham, S. (2005). Land policy and farming practices in Laos. *Development and Change*, *36*(3), 499–526. <https://doi.org/10.1111/j.0012-155X.2005.00421.x>
- Duffy, R., & Moore, L. (2010). Neoliberalising nature? Elephant-Back tourism in Thailand and Botswana. *Antipode*, *42*(3), 742–766. <https://doi.org/10.1111/j.1467-8330.2010.00771.x>
- Eriksson, H., Blythe, J. L., Österblom, H., & Olsson, P. (2021). Beyond social-ecological traps: Fostering transformations towards sustainability. *Ecology and Society*. <https://doi.org/10.5751/ES-12198-260113>
- Evans, L. J., Asner, G. P., & Goossens, B. (2018). Protected area management priorities crucial for the future of Bornean elephants. *Biological Conservation*, *221*, 365–373. <https://doi.org/10.1016/j.biocon.2018.03.015>
- Evans, L. J., Goossens, B., Davies, A. B., Reynolds, G., & Asner, G. P. (2020). Natural and anthropogenic drivers of Bornean elephant movement strategies. *Global Ecology and Conservation*, *22*, e00906. <https://doi.org/10.1016/j.gecco.2020.e00906>
- Evrard, O., & Pholséma, V. (1997). De La Révolution à l'après Socialisme: Les Temps de La Construction Nationale En RDP Lao. In D. Gentil & P. Boumar (Eds.), *Le Laos Doux et Amer: Vingt-Cinq Ans de Pratiques d'une ONG* (pp. 15–36). Karthala.
- Fedele, G., Locatelli, B., & Djoudi, H. (2017). Mechanisms mediating the contribution of ecosystem services to human well-being and resilience. *Ecosystem Services*, *28*, 43–54. <https://doi.org/10.1016/j.ecoser.2017.09.011>
- Fernando, P., & Leimgruber, P. (2011). Asian elephants and dry forests. In W. J. McShea, S. J. Davis, N. Phumpakphan, & A. Pattanavibool (Eds.), *The ecology and conservation of seasonally dry forests in Asia* (pp. 151–163). Smithsonian Institution Scholarly Press.
- Ferreira, A. S., Peres, C. A., André Bogoni, J., & Cassano, C. R. (2018). Use of agroecosystem matrix habitats by mammalian carnivores (carnivora): A global-scale analysis. *Mammal Review*, *48*(4), 312–327. <https://doi.org/10.1111/mam.12137>
- Fisher, B., Edwards, D. P., Giam, X., & Wilcove, D. S. (2011). The high costs of conserving Southeast Asia's lowland rainforests. *Frontiers in Ecology and the Environment*, *9*(6), 329–334. <https://doi.org/10.1890/100079>
- Folke, C. (2016). Resilience. *Oxford Research Encyclopedia of Environmental Science*, 1–63. <https://doi.org/10.1093/acrefore/9780199389414.013.8>
- Forbes, B. C., Stammler, F., Kumpula, T., Meschytyb, N., Pajunen, A., & Kaarlejärvi, E. (2009). High resilience in the Yamal-Nenets social-ecological system, West Siberian Arctic, Russia. *Proceedings of the National Academy of Sciences of the United States of America*, *106*(52), 22041–22048. <https://doi.org/10.1073/pnas.0908286106>
- Forbes, P. (2009). Reciprocity: Toward a new relationship. In R. L. Knight & C. White (Eds.), *Conservation for a new generation. Redefining natural resources management* (pp. 221–234). Island Press.
- Galán-Acedo, C., Arroyo-Rodríguez, V., Andresen, E., Arregoitia, L. V., Vega, E., Peres, C. A., & Ewers, R. M. (2019). The conservation value of human-modified landscapes for the world's primates. *Nature Communications*, *10*(1), 152. <https://doi.org/10.1038/s41467-018-08139-0>
- Gibbs, H. K., Ruesch, A. S., Clayton, M. K., Holmgren, P., Foley, J. A., Ramankutty, N., & Achard, F. (2010). Tropical forests were the primary sources of new agricultural land in the 1980s and 1990s. *Proceedings of the National Academy of Sciences of the United States of America*, *107*(38), 16732–16737. <https://doi.org/10.1073/pnas.0910275107>
- Gómez-Baggethun, E., & Ruiz-Pérez, M. (2011). Economic valuation and the commodification of ecosystem services. *Progress in Physical Geography*, *35*(5), 613–628. <https://doi.org/10.1177/0309133311421708>
- Grêt-Regamey, A., Huber, S. H., & Huber, R. (2019). Actors' diversity and the resilience of social-ecological systems to global change. *Nature Sustainability*, <https://doi.org/10.1038/s41893-019-0236-z>
- Gunderson, L. (2010). Ecological and human community resilience in response to natural disasters. *Ecology and Society*, *15*(2), 29. <https://doi.org/10.5751/ES-03381-150218>
- Gunderson, L. H., & Holling, C. S. (2002). *Panarchy: Understanding transformations in systems of humans and nature*. Island Press.
- Harris, M. (1976). History and significance of the EMIC/ETIC distinction. *Annual Review of Anthropology*, *5*, 329–350. <https://doi.org/10.1146/annurev.an.05.100176.001553>

- Harvey, D. (2005). *A brief history of neoliberalism*. Oxford University Press.
- Hedges, S., Fisher, K., & Rose, R. (2008). Range-wide mapping workshop for Asian elephants (*Elephas maximus*), Cambodia, October 2008. Phnom Penh.
- Huntington, H. P. (2000). Using traditional ecological knowledge in science: Methods and applications. *Ecological Applications*, 10(5), 1270–1274.
- Infield, M., Entwistle, A., Anthem, H., Mugisha, A., & Phillips, K. (2017). Reflections on cultural values approaches to conservation: Lessons from 20 years of implementation. *Oryx*, 52(2), 1–11. <https://doi.org/10.1017/S0030605317000928>
- Ingold, T. (1974). On reindeer and men. *Man*, 9(4), 523–538. <https://doi.org/10.2307/2801122>
- Ingold, T. (1980). *Hunters pastoralists and ranchers. Reindeer economies and their transformations*. Cambridge University Press.
- Ingold, T. (2000). The temporality of the landscape. In T. Ingold (Ed.), *The perception of the environment: Essays in livelihood, dwelling and skill* (pp. 189–208). Routledge.
- Jax, K., Barton, D. N., Chan, K. M. A., de Groot, R., Doyle, U., Eser, U., Görg, C., Gómez-Baggethun, E., Griewald, Y., Haber, W., Haines-Young, R., Heink, U., Jahn, T., Joosten, H., Kerschbaumer, L., Korn, H., Luck, G. W., Matzdorf, B., Muraca, B., ... Wichmann, S. (2013). Ecosystem services and ethics. *Ecological Economics*, 93(September), 260–268. <https://doi.org/10.1016/j.ecolecon.2013.06.008>
- Johnsen, J. P., & Vik, J. (2013). Pushed or pulled? Understanding fishery exit in a welfare society context. *Maritime Studies*, 12(1), 1–20. <https://doi.org/10.1186/2212-9790-12-4>
- Khounboline, K. (2011). Current status of Asian elephants in Lao PDR. *Gajah*, 35, 62–66.
- Lainé, N. (2015). Isoler pour mieux conserver? *Ecologie & Politique*, 50(1), 147. <https://doi.org/10.3917/ecopo.050.0147>
- Lainé, N. (2017a). Bo Mee Xang Pa Kor Bo Mee Xang (sans Éléphants de Forêt, Il n'y a plus d'éléphants). *Péninsule*, 75(2), 28.
- Lainé, N. (2017b). Travail Interespèces et Conservation: Le Cas Des Éléphants d'Asie. *Ecologie et Politique*, 54, 45–64.
- Lainé, N. (2018a). Asian elephant conservation: Too elephantocentric? Towards a biocultural approach of conservation. *Asian Bioethics Review*, 10(4), 279–293. <https://doi.org/10.1007/s41649-018-0070-z>
- Lainé, N. (2018b). Elephant tuberculosis as a reverse zoonosis. *Medicine Anthropology Theory*, 5(3), 157–176. <https://doi.org/10.17157/mat.5.3.379>
- Lair, R. (2002). A regional overview of the need for registration of domesticated Asian elephants. In I. Baker & M. Kashio (Eds.), *Giant on our hands: Proceedings of the international workshop on the domesticated Asian elephant* (pp. 8–13). FAO Regional Office for Asia and the Pacific.
- Lair, R. (2019). A looming crisis for Thailand's domesticated elephants? *Journal of the Elephant Managers Association*, 30(2), 95–97.
- Lambin, E. F., & Meyfroidt, P. (2011). Global land use change, economic globalization, and the looming land scarcity. *Proceedings of the National Academy of Sciences of the United States of America*, 108(9), 3465–3472. <https://doi.org/10.1073/pnas.1100480108>
- Latour, B. (1991). *Nous n'avons Jamais Été Modernes. Essai d'anthropologie Symétrique*. La découverte.
- Lestrelin, G. (2010). Land degradation in the Lao PDR: Discourses and policy. *Land Use Policy*, 27(2), 424–439. <https://doi.org/10.1016/j.landusepol.2009.06.005>
- Lestrelin, G., Castella, J. C., & Bourgoin, J. (2012). Territorialising sustainable development: The politics of land-use planning in Laos. *Journal of Contemporary Asia*, 42(4), 581–602. <https://doi.org/10.1080/00472336.2012.706745>
- Linnell, J. D. C., Kaczensky, P., Wotschikowsky, U., Lescureux, N., & Boitani, L. (2015). Framing the relationship between people and nature in the context of European conservation. *Conservation Biology*, 29(4), 978–985. <https://doi.org/10.1111/cobi.12534>
- Liu, J., Mooney, H., Hull, V., Davis, S. J., Gaskell, J., Hertel, T., Lubchenco, J., Seto, K. C., Gleick, P., Kremen, C., & Li, S. (2015). Systems integration for global sustainability. *Science*, 347(6225). <https://doi.org/10.1126/science.1258832>
- Liu, J., Mooney, H., Hull, V., Davis, S. J., Gaskell, J., Hertel, T., Lubchenco, J. et al (2015). Systems integration for global sustainability. *Science*, 347(6225). <https://doi.org/10.1126/science.1258832>
- Liverman, D. (2004). Who governs, at what scale and at what price? Geography, environmental governance, and the commodification of nature. *Annals of the Association of American Geographers*, 94(4), 734–738. <https://doi.org/10.1111/j.1467-8306.2004.00428.x>
- Locke, P., & Buckingham, J. (2016). *Conflict, negotiation, and coexistence: Rethinking human elephant relations in South Asia*. P. Locke & J. Buckingham (Eds.). Oxford University Press.
- Marchina, C. (2017). 'Common property beyond this fence': Land privatisation and the adaptation of pastoralism among the Aga Buryats. In I. Stolpe, J. Nordby, & U. Gonzales (Eds.), *Mongolian responses to globalisation processes* (pp. 45–71). EB-Verlag.
- Martin, J.-L., Maris, V., & Simberloff, D. S. (2016). The need to respect nature and its limits challenges society and conservation science. *Proceedings of the National Academy of Sciences of the United States of America*, 113(22), 6105–6112. <https://doi.org/10.1073/pnas.1525003113>
- Maurer, G. (2018). Conservation de l'éléphant d'Asie (*Elephas maximus*) Par l'Étude Des Interactions Entre Humains, Populations Sauvages et Semi-Captives d'éléphants: Une Approche Intégrée Des Dimensions Démographiques, Génétiques, Économiques et Socioculturelles. Université Montpellier.
- Maurer, G., Rashford, B. S., Chanthavong, V., Mulot, B., & Gimenez, O. (2017). Wild-captive interactions and economics drive dynamics of Asian elephants in Laos. *Scientific Reports*, 7(1), 14800. <https://doi.org/10.1038/s41598-017-13907-x>
- Münster, U., & Münster, D. (2012). Human-animal conflicts in Kerala: Elephants and ecological modernity on the agrarian frontier in South India. *RCC Perspectives*, 5, 41–45.
- Nevens, J., & Peluso, N. L. (2018). *Taking Southeast Asia to market: Commodities, nature, and people in the neoliberal age*. Cornell University Press.
- Orlove, B., Roncoli, C., Kabugo, M., & Majugu, A. (2010). Indigenous climate knowledge in Southern Uganda: The multiple components of a dynamic regional system. *Climatic Change*, 100(2), 243–265. <https://doi.org/10.1007/s10584-009-9586-2>
- Patterson, J., Schulz, K., Vervoort, J., van der Hel, S., Widerberg, O., Adler, C., Hurlbert, M., Anderton, K., Sethi, M., & Barau, A. (2017). Exploring the governance and politics of transformations towards sustainability. *Environmental Innovation and Societal Transitions*, 24, 1–16. <https://doi.org/10.1016/j.eist.2016.09.001>
- Pelling, M., & Manuel-Navarrete, D. (2011). From resilience to transformation: The adaptive cycle in two Mexican Urban Centers. *Ecology and Society*, 16(2). <https://doi.org/10.5751/ES-04038-160211>
- Perfecto, I., & Vandermeer, J. (2008). Biodiversity conservation in tropical agroecosystems: A new conservation paradigm. *Annals of the New York Academy of Sciences*, 1134, 173–200. <https://doi.org/10.1196/annals.1439.011>
- Phalan, B., Onial, M., Balmford, A., & Green, R. E. (2011). Reconciling food production and biodiversity conservation: Land sharing and land sparing compared. *Science*, 333(6047), 1289–1291. <https://doi.org/10.1126/science.1208742>
- Ramcilovic-Suominen, S., & Kotilainen, J. (2020). Power relations in community resilience and politics of shifting cultivation in Laos. *Forest Policy and Economics*, 115(January), <https://doi.org/10.1016/j.forpol.2020.102159>
- Ramprasad, V., Joglekar, A., & Fleischman, F. (2020). Plantations and pastoralists: Afforestation activities make pastoralists in the Indian

- Himalaya vulnerable. *Ecology and Society*, 25(4), 1–12. <https://doi.org/10.5751/ES-11810-250401>
- Reid, R. S., Fernández-Giménez, M. E., & Galvin, K.A. (2014). Dynamics and resilience of rangelands and pastoral peoples around the globe. *Annual Review of Environment and Resources*, 39, 217–242. <https://doi.org/10.1146/annurev-environ-020713-163329>
- Robertson, M. M. (2006). The nature that capital can see: Science, state, and market in the commodification of ecosystem services. *Environment and Planning D: Society and Space*, 24(3), 367–387. <https://doi.org/10.1068/d3304>
- Robichaud, W. G., Sinclair, A. R. E., Odarkor-lanquaye, N., & Klinkenberg, B. (2009). Stable forest cover under increasing populations of Swidden cultivators in Central Laos: The roles of intrinsic culture and extrinsic wildlife trade. *Ecology & Society*, 14(1). <https://doi.org/10.5751/ES-02873-140133>
- Santiapillai, C. (1993). Gajah. *Gajah*, 10, 10.
- Schoenberger, L., Hall, D., & Vandergeest, P. (2017). What happened when the land grab came to Southeast Asia? *Journal of Peasant Studies*, 44(4), 697–725. <https://doi.org/10.1080/03066150.2017.1331433>
- Senos, R., Lake, F. K., Turner, N., & Martinez, D. (2006). Traditional ecological knowledge and restoration practice. In D. Apostol & M. Sinclair (Eds.), *Restoring the Pacific Northwest: The art and science of ecological restoration in Cascadia* (pp. 251–283). Island Press.
- Sillitoe, P. (1998). The development of indigenous knowledge: A new applied anthropology. *Current Anthropology*, 39(2), 223–252. <https://doi.org/10.1086/204722>
- Singh, S. (2009). Governing anti-conservation sentiments: Forest politics in Laos. *Human Ecology*, 37(6), 749–760. <https://doi.org/10.1007/s10745-009-9276-8>
- Singh, S. (2012). *Natural potency and political power: Forests and state authority in contemporary Laos*. University of Hawai'i Press. https://doi.org/10.1111/aman.12136_25
- Stépanoff, C. (2017). The rise of reindeer pastoralism in Northern Eurasia: Human and animal motivations entangled. *Journal of the Royal Anthropological Institute*, 23(2), 376–396. https://doi.org/10.1111/1467-9655.12612_1
- Stépanoff, C., Marchina, C., Fossier, C., & Bureau, N. (2017). Animal autonomy and intermittent coexistences: North Asian modes of herding. *Current Anthropology*, 58(1), 57–81. <https://doi.org/10.1086/690120>
- Sukumar, R. (2011). *The story of Asia's elephants*. Marg Publications.
- Sullivan, S. (2011). Banking nature? The financialisation of environmental conservation. *Working Papers Series #8*, 5763, 1–41.
- Suter, I. C. (2014). *The conservation of captive Asian elephants in the Lao People's Democratic Republic*. The University of Queensland.
- Suter, I. C., Hockings, M., & Baxter, G. S. (2013). Changes in elephant ownership and employment in the Lao PDR: Implications for the elephant-based logging and tourism industries. *Human Dimensions of Wildlife*, 18(4), 279–291. <https://doi.org/10.1080/10871209.2013.788235>
- Tam, J., Chan, K. M. A., Satterfield, T., Singh, G. G., & Gelcich, S. (2018). Gone fishing? Intergenerational cultural shifts can undermine common property co-managed fisheries. *Marine Policy*, 90(February), 1–5. <https://doi.org/10.1016/j.marpol.2018.01.025>
- Trautmann, T. R. (2015). *Elephants and kings: An environmental history*. University of Chicago Press.
- Vanitha, V., Thiyagesan, K., & Baskaran, N. (2009). Socio-economic status of elephant keepers (mahouts) and human – Captive elephant conflict: A case study from the three management systems in Tamil. *Gajah*, 30, 8–12.
- White, C. S. (2015). Getting into fishing: Recruitment and social resilience in North Norfolk's 'cromer crab' fishery, UK. *Sociologia Ruralis*, 55(3), 291–308. <https://doi.org/10.1111/soru.12101>
- Zanotti, L., Ma, Z., Johnson, J. L., Johnson, D. R., Yu, D. J., Burnham, M., & Carothers, C. (2020). Sustainability, resilience, adaptation, and transformation: Tensions and plural approaches. *Ecology and Society*, 25(3). <https://doi.org/10.5751/ES-11642-250304>

SUPPORTING INFORMATION

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