TROPICAL RESOURCES

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Conservation status of White-Bellied Heron
Farming achiote in Ecuador
Hydropower in Burma
Swidden agriculture and betel nut in Myanmar

Yale SCHOOL OF THE ENVIRONMENT

TROPICAL RESOURCES

The Bulletin of the Yale Tropical Resources Institute

Contents

The Bulletin

Please access the 2019 Bulletin at http://tri.yale.edu/tropical-resources-bulletin in order to view maps, graphs, photographs, and figures in color.
All figures used in these articles are the authors' own unless otherwise indicated.

About TRI

Mission

The Mission of the Tropical Resources Institute is to support interdisciplinary, problem oriented, and applied research on the most complex challenges confronting the management of tropical resources worldwide. Lasting solutions will be achieved through the integration of social and economic needs with ecological realities, the strengthening of local institutions in collaborative relationships with international networks, the transfer of knowledge and skills among local, national, and international actors, and the training and education of a cadre of future environmental leaders.

The problems surrounding the management of tropical resources are rapidly increasing in complexity, while demands on those resources are expanding exponentially. Emerging structures of global environmental governance and local conflicts over land use require new strategies and leaders who are able to function across a diversity of disciplines and sectors and at multiple scales. The Tropical Resources Institute seeks to train students to be leaders in this new era, leveraging resources, knowledge, and expertise among governments, scientists, NGOs, and communities to provide the information and tools this new generation will require to equitably address the challenges ahead.

TRI News

Publications

We are building a database of all publications resulting from TRI support. If you are a previous TRI Fellow, and published *anything* resulting from your fellowship research (journal article, book, popular press article, webpage, report, …), please let us know at tri@yale.edu.

The Burch Prize

The William R. Burch Prize is named in honor of the influential founding director of TRI. The $1,000 prize, generously funded by TRI alumni, is awarded annually to the paper written by a TRI Fellow published in *Tropical Resources* that best reflects Bill's visionary interdisciplinary leadership of TRI, as well as the mission of TRI: to support interdisciplinary, problem-oriented student research on the most complex challenges confronting the conservation and management of tropical environments and natural resources worldwide.

A Word from the Director

In this volume (Vol. 38) of *Tropical Resources*, we present the research of five TRI Fellows who conducted fieldwork in 2018. Their fieldwork was carried out in the tropics of the Americas and Asia, and included natural history information on endangered species, socio-economic impact surveys, as well as investigating the impacts of hydropower.

First, Indra Acharja (MFS) describes the natural history and population change of the critically endangered White-Bellied Heron in Bhutan. Indra examined long-term data from various sources, including GBIF and BirdLife International, as well as the Royal Society for the Protection of Nature. He found that habitat change due to hydropower and infrastructure development are isolating sub-populations and reducing resource availabilty. His field assessments of current known nests are published elsewhere.

Second, Akielly Hu (Yale College) delves into the perceptions, experiences, and values of people involved in an achiote-farming livelihood project implemented by TRI-partner organisation Nature and Culture International. She found that although growing achiote did provide an additional source of income, the low market price of achiote limits the conservation and livelihood benefits.

Third, Nick Lo (MESc) investigates the interplay between political boundaries, natural resources, ecology, and territorial claims along the Salween River, Myanmar, finding that top-down planning often fail to reckon with these socio-politoco-ecological realities.

Fourth, Jared Naimark (MESc) also worked in Myanmar, on a biodiversity conservation project documented the transition from swidden agriculture to the cultivation of a cash crop, betel nut. His ethnographic case study found conflicting narratives between returning refugees and the state that attempted to explain recent deforestation.

Finally, Paul Rink (MEM, JD) republishes his recent article examining the effects of forestry policy on deforestation in Brazil and Indonesia.

In all these studies, TRI Fellows are addressing critical local issues that have global repurcussions for human wellbeing and the environment.

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TRI Fellows research sites represented in this issue

Bhutan: Indra Acharja

Ecuador: Akielly Hu

Myanmar: Nicholas Lo

Myanmar: Jared Naimark

Brazil, Indonesia: Paul Rink

Indra. A.P. 2019. The current population, distribution, and conservation status of the critically endangered White-bellied Heron (*Ardea insignis*) in Bhutan. *Tropical Resources* **38**, 1–10.

The current population, distribution, and conservation status of the critically endangered White-bellied Heron (*Ardea insignis*) in Bhutan

Indra P. Acharja, MFS 2019[*]

Abstract

In this research, I reviewed the historical distribution and change over time of the current population, distribution and conservation status of the critically endangered White-bellied Heron. Based on the data available on GBIF database, BirdLife International Data Zone, eBird observation datasets, published and unpublished project reports, museum specimens and 17 years of conservation efforts of Royal Society for the Protection of Nature (RSPN), it is apparent that the current WBH population is extremely small, and its geographic range has shrunken to less than 10% of its historically apprehended range. Although the current estimated global population is 50–249 (IUCN 2017a), fewer than 60 birds are confirmed persisting today in three range countries. The bird is rapidly verging extinction, and there is not any preserved gene pool outside natural habitats. Currently, active nests and the successful breeding pairs are only known in Bhutan although it is expected with the population in northeast India and Myanmar. The population in Bhutan has remained at 22–30 birds for the last decade despite constant conservation efforts and supplemented with juveniles fledging annually. The riparian habitats are transforming at an alarming pace because of the increasing number of hydropower projects and the fast-growing infrastructure development. It is severely affecting resource availability and isolating each micro population from others due to interruption of flyways and spatial barriers. In the long run, it will potentially affect the breeding and genetic viability for the deficient surviving population. Substantial conservation efforts are being made to protect and revive the population across the range countries today.

Introduction

White-bellied Heron (*Ardea insignis*) is a large heron species of family Ardeidae, order Pelecaniformes, found in freshwater ecosystems of the Himalayas. It is categorized as critically endangered under the IUCN Red List of threatened species (IUCN 2018) and also the 94th species of the Top 100 EDGE Birds on EDGE of Existence list (EDGE of Existence, 2018). It was listed as threatened in 1988, uplisted to endangered in 1994, and to critically endangered since 2007 (IUCN 2017a, 2017b). Although the estimated population size is 50–249 adults (IUCN 2017a), fewer than 60 are confirmed to exist in the world today (Price & Goodman 2015).

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Looking at the historical records and museum collections, it is evident that the bird was distributed across northern India, Nepal, Sikkim, northeast India, Bangladesh, and Myanmar during later 1800 to early 1900 (Baker 1928, BirdLife International 2001). Its potential presence in river systems of Bhutan was also predicted during the 1890s, but only confirmed in 1976 (Royal Society for Protection of Nature 2011). It was first observed by His Majesty the King Jigme Singye Wangchuck in Phochhu (Royal Society for Protection of Nature 2011). Historically known throughout the Himalayan region, it is now one of the rarest birds in the world having disappeared from most of its historical range including Nepal, Bangladesh and Northern India (BirdLife International 2001, IUCN 2017b). Currently, the White-bellied Heron is fragmented into three subpopulations in Bhutan, northeast India and Myanmar (Tordoff 2007, Maheswaran 2007, 2008, 2014, Mondal and Maheswaran 2014, Royal Society for Protection of Nature 2011). The most recent surveys in the range countries have found 29 individuals in Bhutan, 6-8 birds expected in India and fewer than 25 in Northern Myanmar (Price and Goodman 2015, RSPN 2018). Due to the widespread loss of riverine habitats, restricted distribution, and small breeding population, the global population is believed to be further declining (Pradhan 2007, Pradhan et al. 2007, IUCN 2017a).

Nests of White-bellied Heron (WBH) have been observed infrequently. The first nest, presumed to be of WBH was reported in Darjeeling, India around the 1890s and another in Myanmar in 1929 (Hume 1878, Ali et al. 1968, Royal Society for Protection of Nature 2011). There are no subsequent records of WBH nests for more than seven decades until an active nest was found in Bhutan in 2003 (Royal Society for Protection of Nature 2011). However, WBH nests are still scarcely sighted; no active nest has been identified in Myanmar, and there are no successful nest sightings in India, although two unsuccessful nests have been located recently (Maheswaran 2014). Therefore, the active breeding pairs and successful nests are known only from Bhutan at present.

The initiation of WBH conservation project in Bhutan dates back to early 2000. In 2002, Dr. George Archibald, co-founder of International Crane Foundation and his team, while birding along Mochhu, sighted a lone WBH in Rimchhu. With them was the late Ms. Ellie Schiller, a professional fisheries biologist, then Head of Felburn Foundation, who was thrilled by the view of feeding majestic heron, once thought to be extinct. She was inspired to provide financial support to begin protection and study the bird in Bhutan (Personal communication with Dr. Archibald 2015). Subsequently, the RSPN a national conservation NGO, led by senior ecologist Rebecca Pradhan initiated its first conservation project at the beginning of 2003 by circulating the pictures of the WBH and posting requests to report any sightings. Then in May 2003, the first nest was found in Domthang, Zawa a few kilometers upstream Digchhu from Kamechhu (RSPN 2006) which gave new hope to WBH conservationists.

In 2015, an international workshop was held in Bhutan where more than 40 heron conservationists from range countries and international experts came together to streamline the conservation program. The international WBH conservation strategy was finalized, and researches and conservation work are being carried out all across the range today (Price and Goodman 2015).

In the last 17 years, the RSPN has expanded the conservation works across the country. The distribution, feeding, and nesting habitats have been mapped, education and advocacy programs have been conducted across the country, several types of researches have been carried out, dozens of nesting sites have been identified, and population trend is closely monitored for nearly two decades. In 2011 RSPN also conducted an experimental artificial incubation and captive rearing by collecting eggs from a wild nest at Phochhu. It was a success; a chick was hatched and raised in captivity for 134 days before releasing into the wild. This

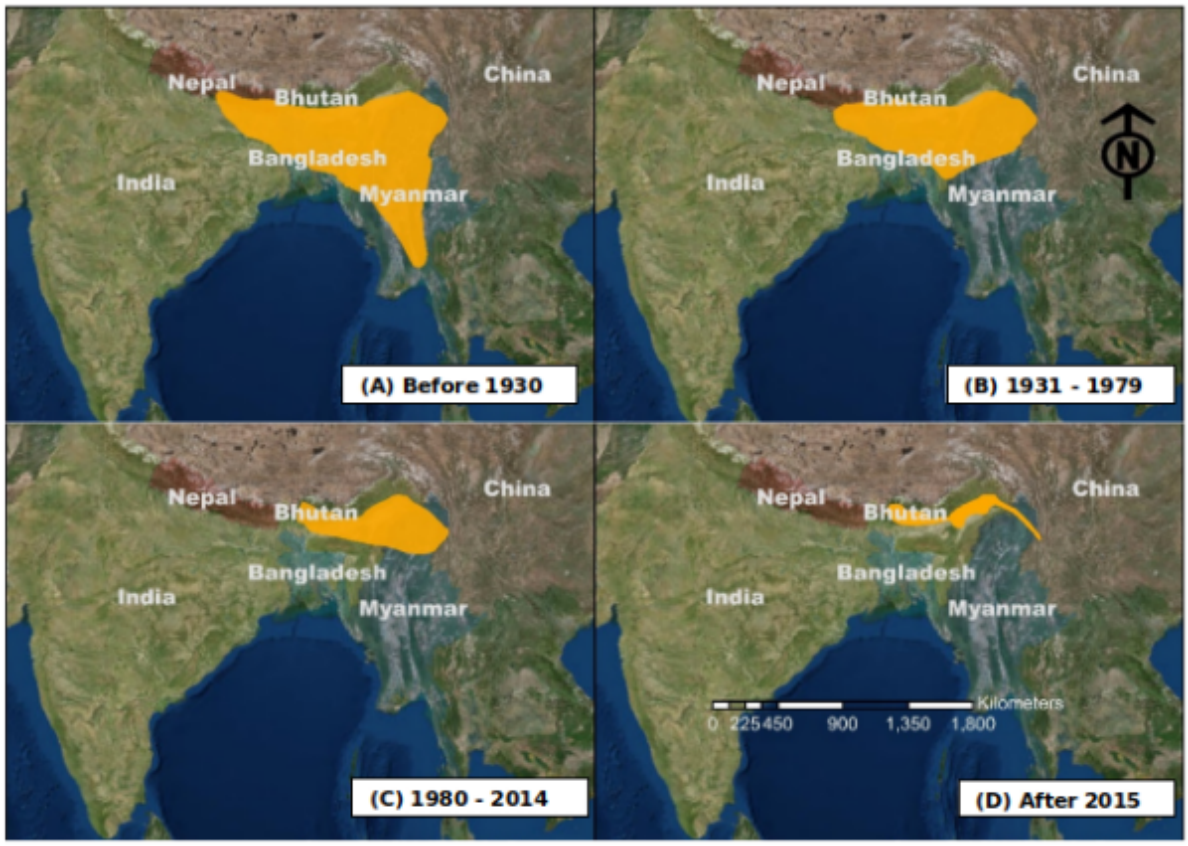

Fig. 1. Change in the distribution (orange) of White-bellied Heron over the century and current global distribution.

experiment provided an opportunity to understand the developmental biology and also the confidence in the captive breeding program as a potential approach to recover and maintain an ecologically effective wild population.

Despite concerted efforts by the RSPN and researchers from home range countries, very little is known about the breeding, fledging, post-fledging behavior, dispersal, philopatry, reproductive age, lifespan, and other life history of the bird. In this paper, I summarized the historical distribution and change over time, population trend and nesting records in Bhutan for the last 16 years and the current conservation status of this critically endangered bird.

Methodology

Data on historical distribution and occurrence were collected from GBIF database (GBIF.org 2019) which includes records from eBird observation datasets, iNaturalist, University of Michigan Museum of Zoology, naturgucker, Natural History Museum (London) Collection, Literature-based species occurrence data of birds of Northeast India, American Museum of Natural History, Yale Peabody Museum Collection and IUCN Species Red List database. Additional information was collected through a comprehensive literature review of historical field notes including Stray of Feathers; A Journal of Ornithology for India and its Dependencies 1878, which reflects the first discovery of White-bellied Heron.

Information on distribution, population, nest-

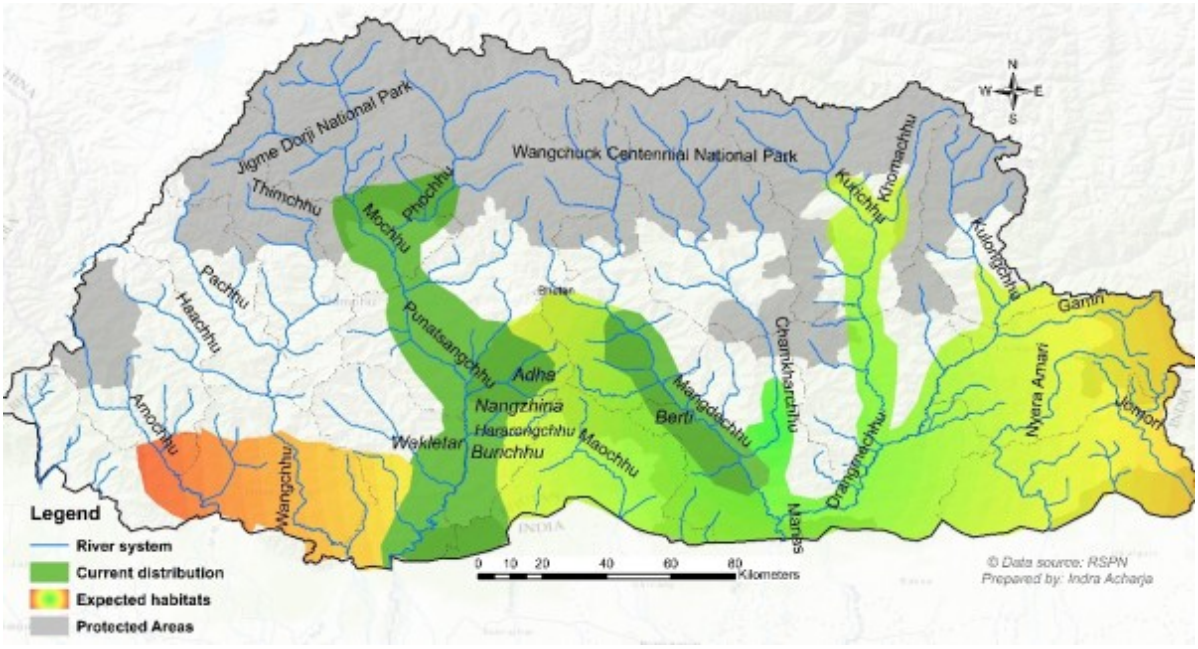

Fig. 2. The White-bellied Heron current distribution and expected habitat range in Bhutan.

ing and breeding history in Bhutan was collected from RSPN's database, annual reports, and project reports. Additional background information on feeding and breeding ecology and community engagement in the conservation of the WBH were obtained from Rangzhin, a quarterly newsletter of RSPN since 1994. The microhabitats and the population trend in each microhabitat were collected from the WBH annual population survey reports which the RSPN has systematically carried out since 2003.

From 1 June to 27 July 2018, we also revisited 14 of the 22 old and new nesting sites and we verified the location of each nest with GPS, and collected additional information on vegetation and biogeography of the area. We could not collect data from four nests at Nangzhina because of monsoon and lack of accessibility. The nest tree at Basachhu was burned, and the nest tree has fallen off, and a landslide eroded the tree at Harachhu. We also located two new active nests with two and three juveniles in Punatsangchhu and Mangdechhu basins respectively which are included in the review.

Data analysis

Data gathered from all sources were used to compile a database for the distribution and abundance of WBH across its range. The global occurrence observation database included GPS locations, count, date of observation and information source (fieldwork data, reports, published articles, museum collections, eBird datasets). Based on available occurrence observation data gathered, I produced global distribution maps for four periods, historical; before 1930, fairly recent; 1931–1979, recent; 1980–2014; and present; after 2015 (BirdLife International 2001). I produced graphs to visualize the population trend and variation with additional habitats discovered in the last 16 years in Bhutan. Data from Bhutan augmented prior information about the occupancy of microhabitat and micropopulations based on the annual population surveys. I analysed the trend and graphically represented the variations in each microhabitat to understand the population dynamics at each site. Using the nesting data which includes the location of nests, successful or unsuccessful, new nest or

reused and year of occupation, I produced a separate nest map which characterizes the spatial distribution of nesting habitats in Bhutan. All spatial data were processed and visualized using ArcMap 10.4 (ESRI 2019), statistical and graphical representations were done using MS Excel and the statistical software R version 3.5.1 (R Core Team 2019).

Results

Global distribution

The WBH distribution has shrunk by more than 90% in the last one and a half century. Historical ornithological literature shows that the bird occupied a large area of Himalayan foothills from plains of Nepal, across northeast India including, Sikkim, Darjeeling, West Bengal, Assam, Arunachal, Nagaland, Bhutan to southern Myanmar bordering with Thailand during first quarter of 20th century (Baker 1928, Ali 1993, Hancock and Kushlan 2005). During the second and third quarter of 20th century, it expatriated from most of the historical range, restricting itself to Bhutan, northern Assam, Arunachal and northern Myanmar. The bird has been declared extinct from Nepal, and also there are no recent records from West Bengal, southern Myanmar, and Bangladesh suggesting that the overall range has contracted substantially (Fig.1).

Distribution in Bhutan

Although the possibility of WBH occurrence in Bhutan was foreseen during the 1890s (Baker 1928) there were no recorded sightings before 1976 (Royal Society for the Protection of Nature 2011). Starting 1990, the sighting of WBH along the Phochhu, Mochhu, and Punakha increased substantially (RSPN 2006). A local observer at Phochhu remembers seeing a few birds feeding in the area almost every day since 1992 and he has recently expressed that it is becoming rarer to see one every day (Personal communication with Mr. Kinley Penjor, 2018). Beginning 2003, the RSPN initiated the WBH conservation project which resulted in the discovery of the birds in several other locations along the Punatsangchhu basin and also in Mangdechhu since 2006. Today, it has been observed at more than 14 microhabitats which are believed to be used regularly. As a result of the nationwide inventory conducted by RSPN and with the observation by birdwatchers, the distribution range in Bhutan expanded from previously expected 600m–1200 m.a.s.l to Chir Pine dominated temperate forest in the inner Himalayas up to 1500m to Moist-broadleaved forest below 150m in the south. In recent years, it was also sighted a few times from Kurichhu and Drangmechhu in eastern Bhutan, if confirmed it will potentially double the range in the country (Fig. 2).

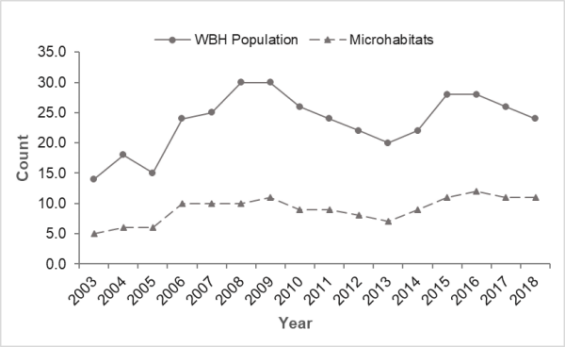

Fig. 3. The White-bellied Heron population count and the trend and the number of microhabitats the bird occupied each year for the past 16 years in Bhutan.

Population in Bhutan

The RSPN conducted the first comprehensive WBH population census in 2003. During the census, 14 birds were counted from five locations along the Punatsangchhu. For the next six consecutive years, the population and number of new sites increased to all-time highest in 2009 with 30 birds counted from 11 locations (Fig. 3). However, the apparent increase in population size was directly influenced by the discovery of additional birds in new habitats while the total number of birds in each habitat had always remained the same or had decreased. Despite the discovery of birds from several new habitats in recent years and 2–6 addi-

tional juveniles fledging annually, the population in Bhutan has remained at 22–30 individuals for the last decade. Fig. 3 summarizes the population, number of occupied habitats and overall population trend in Bhutan for the past 16 years.

There is a noticeable change in population in important microhabitats. According to RSPN's annual census, the population in all older habitats (Phochu, Mochhu, Punakha, Zawa, Kamechhu, Adha and Nangzhina) has drastically declined over the years (Fig. 4). The Phochhu and Mochhu area had eight birds during 2007 and 2008, but there is hardly one bird visiting the area presently.

Similarly, no birds were seen after 2013 in Zawa and the Kamechhu area; the oldest nesting site, where 6–8 birds were found before 2008. Overall the trend is also decreasing in Adha, Nangzhina and close by areas which were the most preferred feeding and nesting habitats until 2010. However, the population in Berti and, Goling sites was highest in 2009, no birds were seen during the 2010 census, but it is on increasing trend today.

In recent years more birds are being sighted in lower regions of Punatsangchhu and Mangdechhu basins, which are also newly discovered sites. The data indicate that the Burichhu and Wakletar are most promising sites with both population and nests in a sharp increase. The bird had been in these habitats since 2005, although it started nesting only after 2013. The census record indicates that the population is fluctuating with comparatively fewer number of birds further downstream Punatsagchhu; Sunkosh and Dagachhu area.

In 2014 two WBHs were sighted in Phibsoo Wildlife Sanctuary (PWS) which is located at southern Bhutan, bordering with the Indian state of Assam. The area is at the altitude of 100 m.a.s.l and the vegetation is mostly moist-evergreen broadleaved forest. In 2016, another lone bird was sighted in Lamoizhingkha range adjacent to PWS which is the southernmost region of Punatsangchhu. Although the vegetation composition and climatic conditions are different from previously known habitats, 3–5 birds had been recorded for the past five consecutive years and frequency of sighting had been increasing in the area, particularly during the winter. The recent observation records also indicate an increase in lower regions of Mangechhu basin. A few birds have been sighted feeding and nesting more than 20 km downstream from previously sighted areas which have vegetation and climate comparable to PWS.

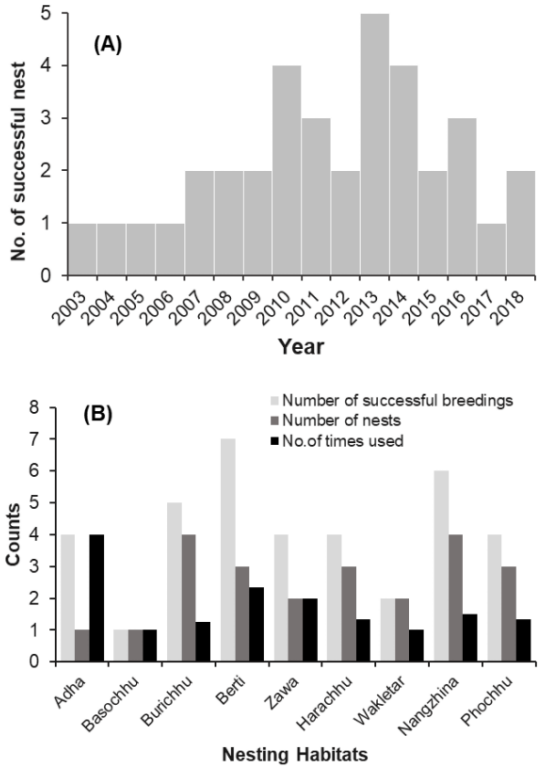

Fig. 5. (A) The number of successful White-bellied Heron nest and the trend for the last 16 years in Bhutan (B) Total number of successful breeding, number of nests and number of nests reuse in nine nesting habitats in Bhutan.

White-bellied Heron nests in Bhutan

Since the initial discovery of nests in 2003, RSPN has been able to locate 1 to up to 5 active nests for the last 16 years (Fig. 5A). The greatest number of active nests were discovered in 2013; one nest each in Phochhu, Adha, Burichhu, Hararongchhu, and Berti. Looking at the records, there are more varia-

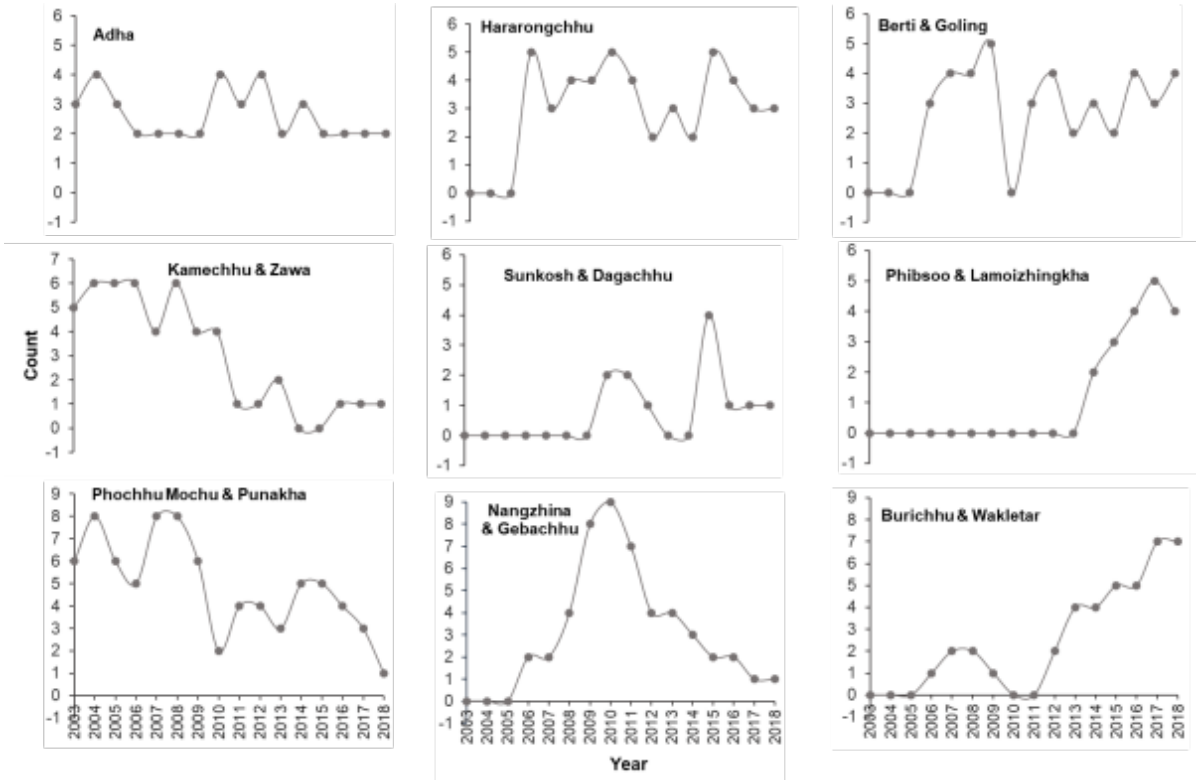

Fig. 4. The White-bellied Heron population count and the trend in key microhabitats in Bhutan for the past 16 years.

tions in the number of successful breeding in recent years unlike prior to 2009, where one or two nests were repeatedly reused. The data also indicates that the number of nest reuse has decreased in recent years and more new nests are being built every year (Fig. 5B). Nests at Adha and Berti were reused four successive years while nests at Burichhu, Wakletar, and Hararongchhu had been used only once.

According to RSPN's database, 22 WBH nests have been located in Bhutan starting in 2003 which are distributed in nine habitats (Fig. 5B & Fig. 6). Of the 22 nests, 19 are located in the Punatsangchhu basin and three in Mangdechhu Basin (Fig. 6).

Discussion

The current population of White-bellied Heron is critically low, and its geographical range has shrunk to less than 10% of its historically occupied range. Although the current estimated global population is 50-249 (IUCN 2018), fewer than 60 birds are confirmed surviving today in three range countries as per the White-bellied Heron International Workshop held in Bhutan in 2015. This population size was determined based on the most recent survey conducted in each range country prior to the workshop. As WBH is relatively conspicuous and confined to a predictable habitat, it would appear that overall numbers might not be as great as estimated by IUCN, which is a cause for serious concern for the viability of population in the wild.

In Bhutan, WBH census is conducted every year between last week of February to the first week of March. It is a modified point count and line transect method which is best suited for the detection of rare and spatially confined herons. It is conducted for five consecutive days, and it had been systematically carried out for the past 17 years. According to current statistics, almost 50% of the surviving pop-

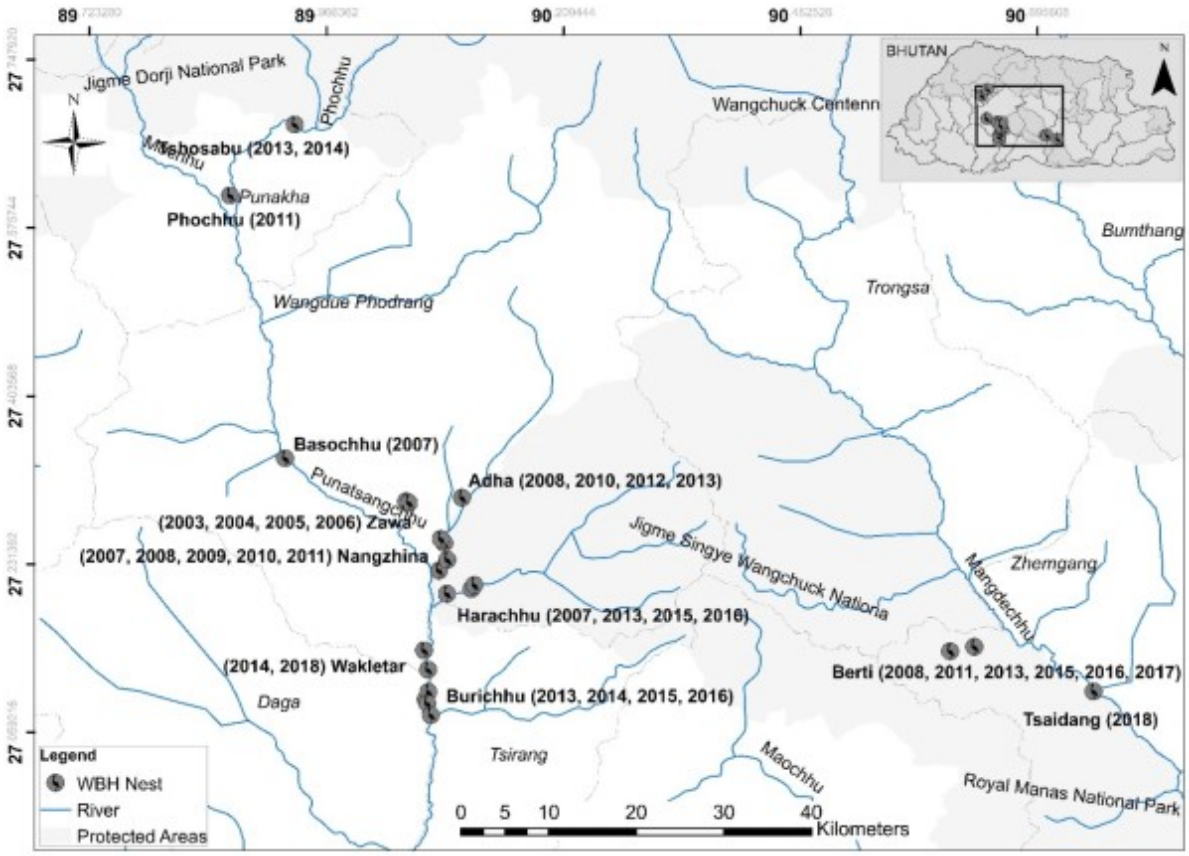

Fig. 6. The White-bellied Heron nests distribution and year of successful breeding in each nest from 2003–2018 in Bhutan. Each bird icon on the map represents a nest and the year in which the particular nest was used.

ulation and 100% of the successfully breeding population are in Bhutan. Although herons have been discovered in new sites in recent years, there is no net increase in total population. The data also indicate a constant decline in population from most of the former habitats which sustained a significant population for more than two decades.

It is difficult to know confidently why the birds are becoming scarcer, and this leads to speculation about the fate of these birds. Loss of feeding and nesting habitat due to land use change, disruption of flyways and increased disturbances are potentially the dominant factor driving the population decline. Most of the WBH habitats in Bhutan are under pressure today. The riparian habitats are transforming at an alarming pace with the increasing number of hydropower projects and the fast-growing infrastructure development. It is severely affecting resource availability and isolating one micro population from others due to interruption of flyways. In the long run, it will potentially affect the breeding and genetic viability for the small surviving population.

The local communities at Phochhu associate decline in the number of birds to the increasing frequency of rafting, picnicking and riverside recreational activities in the area. Similarly, a severe drop in the number of WBH sightings at Zawa was noticed after the beginning of the road and bridge construction at Digchhu, which is the only narrow

entry into the valley. Similarly, a decrease in population in Adha and Harachhu were associated with new road construction and mega construction work at the Harachhu-Punatsangchhu confluence. This strongly suggests that human caused disturbances are driving birds out of the range.

However, significant conservation efforts are being made to protect and revive the population in the region. White-bellied Heron conservation strategy developed in 2015 collaboratively by experts and researchers from range countries has streamlined the conservation priorities. It is being implemented in Bhutan, India, and Myanmar. Surveys are also being conducted in neighboring countries like China and Bangladesh. In Bhutan, RSPN has mapped distribution across the country and identified essential feeding and nesting habitats. Consecutive population surveys have been conducted for nearly two decades, and population, nests, and juveniles are being closely monitored. RSPN has also educated, inspired and engaged local communities, students, researchers, institutions and policymakers in the conservation of the species. Currently, several types of researches to understand genetic diversity, ecology, biology, and threats are being undertaken throughout the habitat range. RSPN also has plans to tagged juveniles with satellite transmitters to study the movement, migration and resource utilization. Finally, RSPN has initiated a research and breeding facility center in Bhutan which will secure an ex-situ gene-pool and a seed population to supplement the wild population through captive breeding and release program in the near future.

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Improving conservation and development outcomes: The achiote-farming livelihood project in Jamboé Valley, Ecuador

Akielly Hu, BA 2019[*]

Abstract

This study addresses the need to improve livelihood project implementation through a qualitative study of the achiote-farming livelihood project in Jamboé Valley, Ecuador, an unprotected area surrounded by the Podocarpus National Park. The objective of this study was to explore the perceptions, experiences, and values related to the achiote project in order to evaluate its socioeconomic and environmental impact and inform future project design to improve conservation and development outcomes. Semi-structured interviews were conducted with 21 families. Analysis of the data suggests that while achiote provides an additional source of income for families, its conservation and livelihood impact is limited due to the low market price of achiote, the growing importance of off-farm employment, and social embeddedness of cattle raising. While a livelihood project like achiote may not resolve all conservation and development issues, addressing market and profitability issues moving forward will enable the achiote project to address a clear need for improved livelihoods in Jamboé Valley.

Introduction

Since the 1980s, researchers and practitioners have focused on improving rural livelihoods as a way to address both development and conservation needs of a given region. A livelihood may be broadly defined as "the activities, the assets, and the access that jointly determine the living gained by an individual or household" (Ellis 2000). Because communities living in biodiverse areas often rely heavily on surrounding ecosystems for sources of livelihood like fishing, hunting, and agriculture, addressing livelihood needs has proved an unavoidable component of conservation (Adams et al. 2004, Wright et al. 2016, Harvey et al. 2018). Hundreds of livelihood-focused projects have been implemented globally to achieve this ideal "win-win" outcome of sustainable development and biodiversity conservation (Roe et al. 2015, Blomley et al. 2010).

Although livelihood-focused projects have been widely implemented, evaluations of their development and conservation outcomes have produced mixed results (Ferraro et al. 2012, Brooks et al. 2006, Nautiyal 2011, Weber et al. 2011, Bauch et al. 2014, Roe et al. 2015, Langholz 1999). As a systematic review by Roe et al. (2015), puts it: "It is clear that we do not understand why most alternative livelihood projects do not work, and why a small handful of them do". One challenge to proper evaluation is lack of quantitative monitoring of outcomes (Sutherland 2004). In a systematic review of integrated conservation and development projects by Brooks et al. (2006), less than a quarter of origi-

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nally reviewed articles could be analyzed due to lack of quantitative data. Another challenge is the high variation in the local and institutional contexts in which livelihood projects take place. As Lele et al. (2010) note, "trends in the larger political economy" and "location-specific histories and processes" may inhibit or enable conservation. Roe et al. (2015) also explain that variation in conservation and development outcomes are due to the fact that "interventions need to be designed specifically for the local context". Finally, conservation projects are often conceived and supported based on political preferences of stakeholders (i.e., nonprofits and governments) rather than evidence on causal impact (Bauch et al. 2014).

Clearly, there is a need for improved implementation of livelihood-focused projects. Brooks et al. (2012) found project design as significantly important for achieving success in livelihood projects. One method of improving project design is the use of monitoring and evaluation systems, which can inform future decision making for project funding and expansion (Stem et al. 2005). Because livelihood-focused projects inevitably have ecological, economic, and social effects, multiple measures of success must be included in evaluations (Brooks et al. 2006). Equally important is the need to evaluate the context of the targeted location and population, as it is often "macro-level processes, which are usually beyond the scope of livelihood focused interventions, that determine how livelihood pathways evolve" (Wright et al. 2016). In sum, three possible approaches may be taken to improve implementation: 1) evaluate the local context to inform decisions, 2) base project design on local contextual factors and existing livelihood project frameworks, and 3) develop a system for quantitative impact evaluation to measure progress over time.

This study addresses this need to improve livelihood project implementation through a qualitative evaluation of the achiote-farming livelihood project in Jamboé Valley, Ecuador, an unprotected area surrounded by the Podocarpus National Park. In June 2014, the conservation NGO Nature and Culture International (NCI) exchanged abandoned pastureland in the Jamboé Valley for forested land inside Podocarpus National Park owned by 21 local landowners. After obtaining a grant from UNESCO, NCI worked with the Ecuadorian Ministry of Environment and the Universidad Técnica de Loja to provide achiote seeds and technical assistance for families to farm achiote on these former pasturelands. NCI also arranged for Industria Lojana de Especerías, a local spice industry, to buy the product at a predetermined price from the families. The primary goals of the achiote project are to promote an alternative to deforestation for cattle ranching and diversify local livelihoods (NCI).

Achiote (*Bixa orellana* L. [Bixaceae]) is a shrub or small tree 6–10m tall native to South America (Gargiullo 2008). It produces seeds covered in a red aril, from which the commonly used spice and food colorant *achiote* (or *annatto*) is obtained (Rivera-Madrid et al. 2016). Because it is perennial and able to grow on poor soils, achiote has potential to generate income from degraded lands, such as the abandoned cattle pastures in Jamboé Valley (FAO). For the past four years, the achiote project has served as one of several NCI-sponsored sustainable livelihood and conservation projects.

The objective of this study was to explore the perceptions, experiences, and values related to the achiote project in order to evaluate its socioeconomic and environmental impact and inform future project design to improve conservation and development outcomes. Although NCI hopes to expand this program, the achiote project is still in its beginning stages. Currently, 19 (formerly 21) households farm achiote, with a total of 9.8 hectares of achiote planted to date. 9 of these families have not yet harvested any achiote. At the time of this study, no formal evaluation of the achiote project had taken place. Many methods for evaluating larger-scale livelihood projects involve quantitative analysis of survey data (Weber et al. 2011, Bauch et al. 2014). However, the relatively new nature and smaller size of the achiote project presents

an opportunity to address obstacles to potential expansion through an in-depth exploration of the participants' experiences and the local context of Jamboé Valley. For these purposes, qualitative research methods become useful for gaining insight into perceptions, values, and experiences (Stem et al. 2005). As NCI looks to expand the achiote project, understanding the local context, motivations, attitudes and experiences of participants will be key to addressing current and future challenges and improving the efficacy of the project.

Methods

Study area and population

Jamboé Valley, an unprotected area surrounded by the Podocarpus National Park, is situated in the Zamora-Chinchipe Province of the southeastern end of the Amazon basin (Figure 1). Podocarpus National Park is home to 99 known endemic plant species: the most endemic plants of any protected area in Ecuador (Lozano et al. 2010). The tropical Andes, which includes Jamboé Valley, houses 30,000 vascular plant species—one-sixth of the world's total—on less than 1% of all land on Earth (CEPF). Located within a biodiversity hotspot, Jamboé Valley can therefore be considered an ecologically important area for conservation.

The study population is comprised of 25 heads of households representing 21 families from five villages within Jamboé Valley. Of the 21 households, 19 were currently participating in the achiote farming livelihood project and two were not. This study surveyed all 19 households that were currently participating in the achiote project at the time of field research (June–July 2018). Nine of these families had not yet sold or harvested any achiote.

Recruitment

Study participants were recruited for semi-structured interviews with the assistance of NCI's achiote project promoter, a longtime resident of Jamboé Valley. All 19 households participating in the project agreed to interviews. Households not participating in the achiote project, or who had stopped participating, were also contacted with the assistance of the NCI employee. Two households not participating in the achiote project agreed to interviews.

During meetings with the participants, the nature, objectives, and methods of the study were explained. Informed consent to participate was then obtained from the participants. Participants were asked for their consent to record interview audio prior to beginning interviews. Participants were also informed that all information would remain confidential, and that no names would be shared.

Data collection and analysis

After verbal consent was obtained, in-person interviews were conducted. These interviews ranged from 18 to 64 minutes, and occurred in participants' homes or directly outside their homes according to the participants' preferences. Interviews were semi-structured, using an interview guide that included open-ended questions with follow-up questions as needed. The interview guides covered topics including, but not limited to, household economic activities, benefits and challenges of planting achiote, and perceptions of Jamboé Valley.

Interview audio was recorded on both a mobile device and a digital voice recorder. Interviews were then transcribed word-by-word. Analysis of transcript data was conducted using a grounded theory approach over the course of several weeks (Corbin & Strauss 2015). First, general themes and patterns were developed through an open-coding process. A codebook with variables was created to label and organize transcript segments. These codes divided the data into thematic categories. Codes were revised through an iterative process when needed. The author then applied these codes to transcripts using Dedoose, a qualitative data analysis software. Themes and findings were generated through a process of analyzing this coded data. For confidentiality reasons, participants' names will not be used in the discussion of the results.

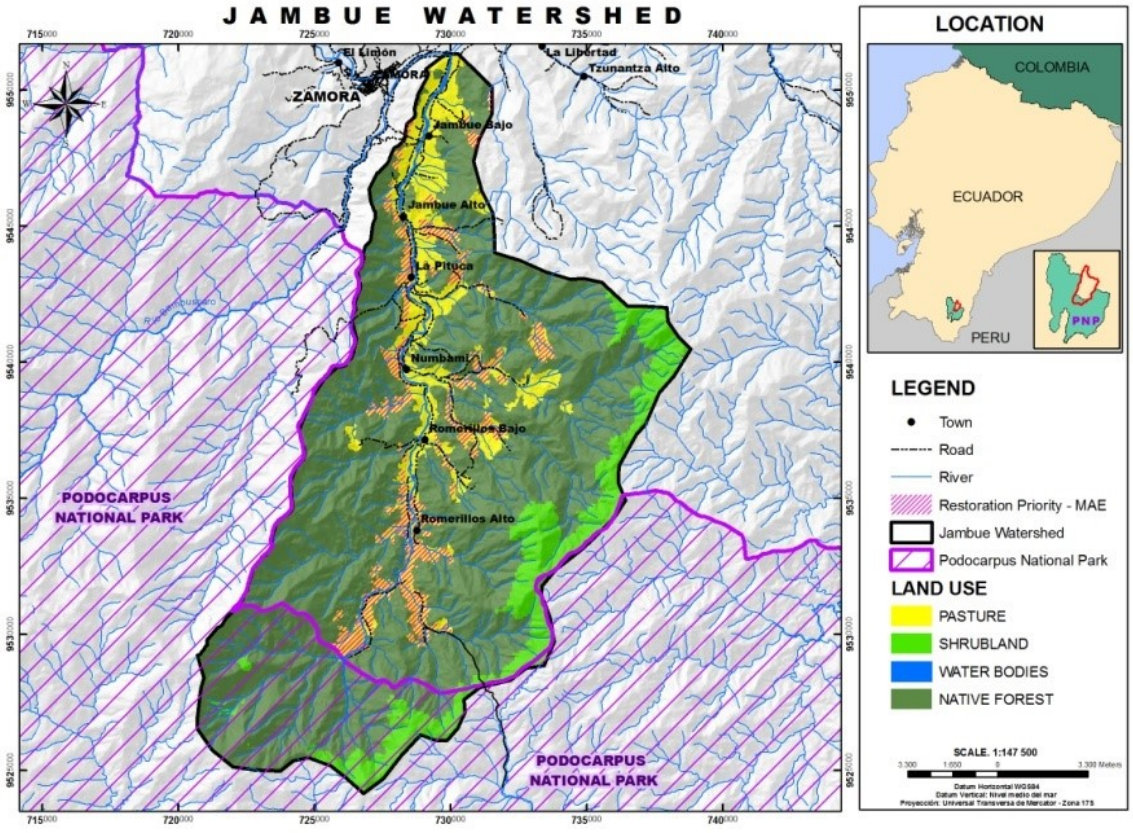

Fig. 1. Location of Jambue Valley and land use in Ecuador.

Results

Findings from interviews are organized into three broad categories: i) the local context of Jamboé Valley, ii) experiences with the Achiote Project, and iii) the Achiote Project moving forward.

i) Local context of Jamboé Valley

> "You have to fight to live"

Economic challenges and the need for sustainable livelihoods

Unemployment

The majority of interviewed families named unemployment as the number one problem faced by residents of Jamboé Valley. Because Jamboé Valley is a rural area, employment opportunities are mostly limited to agriculture. However, since deforestation and cattle-raising has depleted the soil over time, the land is no longer productive enough for agriculture beyond small subsistence plots.

> "There are no jobs, one can't live. What do you eat? As a result, the majority has left to do other things. They've left to the city to find work in construction or something else. And they've left the countryside."

The lack of productive land leads most families to rely on other economic activities. All the families interviewed plant subsistence crops and raise small animals such as chickens and cuy (guinea pig). Most also own two to twenty cows, with most owning around ten. Many male heads of house-

holds work in cattle pastures, tending to either their own cattle or the cattle of other families. Families regularly sell cows for about $300 each. Many male heads of households also find temporary contract work in mining or construction, sometimes commuting far away for months at a time.

Lack of long-term, stable jobs

Out of 21 families interviewed, only 7 had one or more family members with a long-term, stable job.

> "We are unemployed because sometimes we don't have enough schooling, or because we don't have the ability to move to the city and live there. No one hires us."

Jamboé Valley is located an hour and a half bus ride away from the nearest city of Zamora. As a small town, Zamora offers few employment opportunities for the families interviewed, especially because most residents of Jamboé Valley don't have a degree and have difficulty getting hired by institutions. The 7 families with a reliable income expressed the importance of prioritizing and maintaining their long-term jobs. The 14 families interviewed without a reliable source of income tend to depend much more on contract work and cattle-raising.

Challenges with current livelihoods

Logging: No longer viable for most

Many of the families interviewed used to rely on logging as a main source of livelihood. However, at the time of this study, only one family continued to log wood. One reason families stopped logging was the stricter enforcement of environmental laws under the Rafael Correa presidency (2007–2017), which regulated logging areas and required loggers to buy permits. Another factor was the depletion of trees, as the area of forested land decreased and access to viable wood became increasingly difficult.

Logging is also dangerous and difficult work. For one participant, a lifetime of logging led to a hernia.

> "Imagine that you're logging down trees, you have to use a lot of force. So much force you have to use for those trees so that you can profit, and now I have a hernia. This affects my health. It hurts."

Many other families also expressed that given the choice, they would not log wood because logging is very dangerous. A few participants also cited how logging has a negative impact on the environment. The one family that continues to log wood perceives almost no issues with logging.

Contract work: Separated families and unstable income

Several families that rely on temporary contract work expressed frustration with the need to separate families when the male head of household travels to find jobs. Contract work in mines, construction, or other venues often requires travel for days, weeks, or months at a time.

> "It's difficult because we're no longer together with our children. As a result, they aren't happy about having only one parent because they ask me: 'where is he?' or 'when is he returning?' "

Several families also described contract work as challenging due to the instability of income and unpredictability of finding a job.

Cattle pastures

Almost all of the families interviewed maintain cattle pastures and raise cows. Although a few families commented on the challenges of cattle-raising, including the need to vaccinate cows and regularly cut down trees to create more pasture space, most didn't express strong feelings. While almost all families own cattle, for most families, contract work

or long-term employment provides a larger source of income than cattle.

> "We are abandoned"

Desire for institutional support to address unemployment and livelihood needs

The majority of participants expressed a desire for the government, non-profit organizations, or other institutions to address the issues of unemployment and lack of sustainable livelihoods in Jamboé Valley. Several residents specifically noted a need for technical support to improve the productivity and quality of the crops grown and cattle raised.

> "The authorities don't help us. There are other countries, other provinces where many authorities help them…[with] agriculture, cattle ranches… They give them resources so that they can improve the quality of the cows, and improve the quality of crops."

Other residents expressed a desire for more development projects or "más proyectos para todos trabajar" (more projects so everyone can work). Some pointed to the achiote project as an example of an initiative that allowed everyone to gain a livelihood using the resources of their own land. One participant pointed to the example of the bread oven initiative, in which the government and an international Catholic humanitarian organization called Caritas helped a women's association in Numbami (a village in Jamboé Valley) create a business baking and selling bread.

Perceived value of the environment

When asked about living in Jamboé Valley, six participants explicitly mentioned the beauty of the natural environment. They spoke of the trees, the clean air, and how the trees provide oxygen. By and large, they prefer living in Jamboé Valley to living in the city.

> "[Jamboé Valley is] very beautiful due to the mountain, the landscape…very good land."

> "[Jamboé Valley is] all free of contamination. We would say pure air due to the nature."

ii) Experiences with the Achiote Project

Motivations for participating

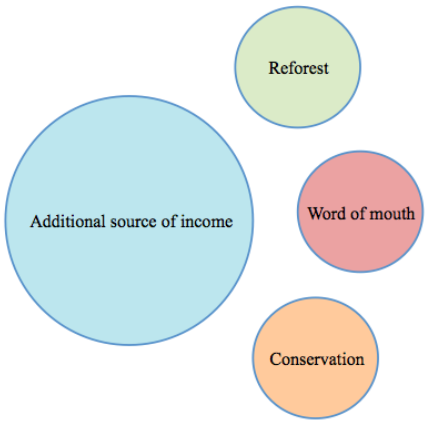

Fig. 2. Motivations for participating in the Achiote Project.

Additional source of income

Most families joined the achiote project to gain an additional source of income (Figure 2). For families that lack a stable source of income, the achiote project appeared to address an important need for more sustainable sources of livelihoods.

> "Because you know that we are unemployed, and with this we have a resource."

For families with a stable source of income, achiote presented an opportunity to gain more income and begin saving extra money.

> "I thought that if I wanted I could save a bit of money."

Reforest and fertilize lands

A few families were motivated by the potential to reforest and fertilize the degraded cattle pastures in Jamboé Valley.

> "The motive was to reforest. To address the air contamination, all this. So it's good that the trees produce clean air."

Word of mouth and peer influences

For a few participants, seeing the benefits nearby families had obtained from achiote convinced them to also participate.

> "Some neighbors were planting over there…they talked to us about their achiote and for this reason we began to plant."

Conservation

For one participant, the achiote project was appealing because of its potential to conserve nature and reforest Jamboé Valley, rather than continuing deforestation.

> "I liked [the achiote project] a lot because the ongoing destruction of nature wasn't good. I realized that I couldn't cut down trees anymore. It's better to care for the trees and nature."

Perceptions of the Achiote Project compared to previous development projects

Projects similar to the achiote project had previously been implemented in Jamboé Valley. One example is a government-sponsored initiative in 2010 to grow coffee in Santa Cecilia, one of the villages in Jamboé Valley. Unlike NCI, the government did not find a market to sell the coffee in, nor did they follow up with residents when the coffee plants failed to grow well.

> "They just gave us everything but never followed up with us nor supported us like they did with the farming of achiote."

Compared to previous development projects such as the coffee initiative, families perceived the way NCI went about implementing the achiote project very positively. They expressed appreciation that NCI not only provided seeds and technical assistance, but also found a market to sell the achiote in by creating partnership with ILE and helped with selling achiote. A few families also noted positively that achiote, unlike coffee, is native to Jamboé Valley.

> "Something is something"

Effects on livelihoods

As shown, 9 out of 19 currently participating households have not yet harvested any achiote. This is either because they recently planted achiote and the plants have yet to mature fully, or due to labor and/or time constraints (see: Challenges with Achiote).

For almost all participants, the income earned from achiote harvests does not significantly affect their livelihoods. This is mostly due to the low price Industría Lojana de Especerías, or ILE, pays the farmers for their achiote. Most families have an attitude of "something is something, and nothing is worse", regarding the effect achiote has on livelihoods.

> "Achiote on one hand gives us a little bit of economic help, even though they [ILE] are paying us very little."

For the participant who earns the most income from achiote ($300), achiote earns just enough for a month of food for his family.

> "The achiote is very little…I imagine that it's very little because right now I'm harvesting around 1000 kilos and

Table 1. Household achiote holdings and income. *Notes*: [1]This family is the only household that does not sell their achiote harvests directly to ILE. Instead, they process and sell their own achiote products in the nearby town of Zamora themselves, for a profit of approximately $30.25 per week for the weeks that they sell achiote. Exact numbers on total profit for the whole year were not provided; [2]This household described their income from achiote as "some dollars", exact numbers for income earned was not provided; *Indicates that the household had not yet harvested any achiote; 'n/a' indicates that this information was not provided in the interview.

Year Planted	# of Achiote Plants	Income from Achiote Last Year
2012	100	$165.00
2012	300	$100.00
2014	800	$180.00
2014	900	*
2014	300	*
2014	110	$36.00
2014	300	$20.00
2016	800	*
2016	100	*
2016	300	*
2016	150	*
2016	400	*
2017	300	*
2017	350	*
n/a	350	$200.00
n/a	200	Sell processed achiote for $30.25/week[1]
n/a	500	$300.00
n/a	400	$125.00
n/a	800	"Algunos dolaritos"[2]

> 1000 kilos brings me barely $300. And in one year, $300 per year, it's gone with one month of food."

Support for children's education

Several female heads of households commented on the benefit achiote provides for their children's education. Because there is no secondary school in Jamboé Valley, families must pay for their older children to take the bus to Zamora every day to attend class. With the income from achiote, families can support this transportation cost and other miscellaneous expense for school.

> "With these resources…working there, picking the seeds, I have a benefit for the help of my children…books, notebooks, and apart from those, transportation."

Effects on the environment

Reforestation

Many participants had a difficult time identifying how the achiote project had affected the environment. However, several participants noted that achiote reforested the degraded cattle pastures.

> "All of this land that is achiote, before it was bare, empty land. And now, it's forest."

A few also commented on the benefits of fertilizing the land with the phosphorus-rich achiote husks.

Challenges with Achiote

Low market price set by Industría Lojana de Especerías (ILE)

All participants cited the low market price set by ILE as the number one challenge of farming achiote (Figure 3). ILE currently pays families $0.30/kilo for achiote buds, and $0.70/kilo for achiote seeds. Many families commented that the current price makes farming achiote unprofitable, especially given the labor demands and labor/time/land constraints detailed below.

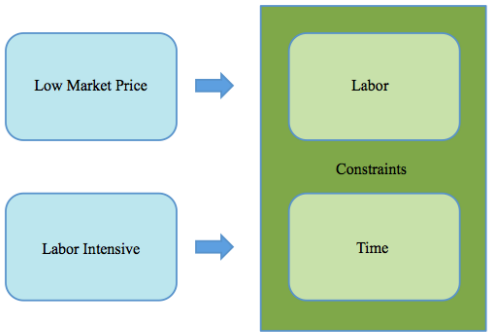

Fig. 3. Challenges with Achiote.

> "We don't have a market other than ILE. It's difficult to find another market that we can compete with. Because they pay us very little. Maybe there's another option. If the price were just 10 cents or so higher, it would benefit all of us."

Most families expressed frustration with the fact that they currently have no other option other than selling to ILE for this low price. A few families said that their preferred price would be $1.00/kilo, for both achiote buds and seeds. However, even a slight increase in price would make achiote more profitable for families.

Labor intensive

Exacerbating the issue of the low price are the high labor demands of achiote. Manual labor is required to plant, trim and maintain, and harvest the achiote trees. Additional labor is required to pick out the seeds to sell achiote in seed-form. Families also noted that because ILE will only purchase organic achiote, farmers must exert more labor to compensate for a lack of pesticides or other chemicals.

> "Achiote is quite a lot of work because you have to care for it, you have to maintain the plants. If you don't tend to the plants, they don't produce."

Labor constraints due to the low market price

Many families lack the human resources required to meet the high labor demands of achiote farming. Most male heads of households are occupied with cattle-raising, contract work, long-term employment, or a combination of the above. Most female heads of households are responsible for child-raising, cooking, cleaning, and the raising of crops and small animals for subsistence. To harvest more achiote, many families would have to hire people to help. Several families already hire workers (usually extended family members or neighbors) to help with their current achiote holdings.

However, the low price of achiote means that families often cannot afford to hire the additional help needed to harvest achiote or pick achiote seeds, among other tasks.

> "The price of achiote doesn't cover the cost for a worker to help us."

Last year, one family had to pay their neighbor to harvest all their achiote because the mother was sick and had to take care of a young child, and the father had to work in the cattle pastures. A harvest of 100 kilos of achiote buds, sold at the ILE price of $0.30/kilo, should have earned them $30. However, because they had to pay their neighbor $20 (about $10 a day for two days) in order to harvest

this amount, they were left with only a net profit of $10. In the mother's words, "no queda casi nada" "there is almost nothing left".

Time constraints

Families have limited time to farm achiote because they prioritize more lucrative sources of livelihood. This is especially true for the seven families interviewed that rely on long-term stable employment. In one family, four members work in a gas cooperative in Zamora and earn a total of $4,000/month – a relatively high income in Jamboé Valley. Only the female head of household and one of her children tend to the achiote. Because the husband and three of the children work in Zamora during the week, they only farm achiote on Sundays. Last year, they barely harvested any achiote.

> "We dedicate our time to achiote on the weekends. The weekends, when I don't have work."

Families lacking long-term employment also prioritize more lucrative work like cattle-raising or contract work in construction or mining. Most participants described farming achiote on days off from work.

Land constraints

When asked whether or not they would plant more achiote in the future, a few families said they lack land to expand their crops.

iii) The Achiote Project moving forward

We are exploited: Most wish to expand Achiote only if the low market price rises

Most families participating in the achiote project expressed that they wish to continue farming achiote with their current holdings, due to the benefits they receive with the additional income. However, most said that they would only plant additional achiote if the price were to increase.

A few participants recognized that the issue of the low price is an issue of being exploited as a farmer who has no choice but to accept whatever price is offered for their product.

> "The bad fortune of the agricultural worker, of the farmer, is that one can't name the price of their own products…All of us who produce here, we're exploited. Exploited by the businessmen, by the middlemen, like that."

Desire for autonomy in selling Achiote and/or more similar projects

A few participants expressed interest in obtaining resources to create their own achiote business – to sell directly to consumers rather than selling at the low price to ILE. One family already processes their own achiote and sells it in Zamora, obtaining higher profit than they would selling to ILE. Given resources to obtain a building, company registration, and materials for processing achiote, this family said they would stop all other economic activities, including cattle-raising and contract work, to run their own achiote business.

A few other participants expressed a desire for more projects similar to achiote, but with different crops. One participant suggested selling cloud ear fungus – native to Jamboé Valley and commonly used in Chinese cuisine – to Chinese markets. Another participant suggested producing sugar cane or plantains.

> "In the event that there was a project like this, everyone would plant. For this to happen, they [NCI] would have to support us, from planting to obtaining a market."

Discussion

Exploring the local context of Jamboé Valley helps us better understand the social, economic, and environmental impact of the achiote project, as well as its future potential and limitations. Communities like Jamboé Valley face unique obstacles to economic and social stability due to their reliance on a

natural resource for income and employment (Bailey & Pomeroy 1996). Resource depletion is one such obstacle. When there are no more trees, logging becomes less and less a viable livelihood in Jamboé Valley. Resource-dependent communities are also often vulnerable to decisions made by external actors, such as government environmental policies like the increased logging regulation in Jamboé Valley (Mejia et al. 2015, Hoelle 2011, Bailey & Pomeroy 1996). Because most families no longer log wood for a living, and previously forested lands are now bare and degraded, large-scale deforestation is no longer a major concern. Therefore, in considering the environmental effects of the achiote project, it's important to note these important economic and ecological behavioral shifts of Jamboé Valley residents.

What the achiote project aims to achieve instead is reducing the need to deforest land for maintaining cattle pastures. Relevant to this conservation goal are the limitations of livelihood-focused interventions to reduce pressure on a natural resource. While it's possible that with a high enough income, achiote might reduce the need to raise cattle, we also see that even Jamboé Valley residents with a relatively high, steady source of income own and raise cattle. In explaining the persistence of low income and environmentally degrading land uses in the Brazilian Amazon, Garrett et al. (2018) suggests that cultural values and social embeddedness, rather than economic reasons, might explain the persistence of cattle-raising of rural families. Cattle-raising also offers a cheap and effective way of establishing control over a large territory (Bowman et al. 2012, Hecht 1993). Cows can also extend the economic life of land: when lands go out of production after years of planting crops, grass can be planted for cows to graze on until the lands become fully degraded (Hecht 1993).

Cattle is also an important method of income diversification in regions like Jamboé Valley where income diversification opportunities are limited (Garrett et al. 2017). Ellis (2000) defines livelihood diversification as "the process by which households construct a diverse portfolio of activities and social support capabilities for survival and in order to improve their standard of living". The Sustainable Livelihoods Approach framework suggests that sustainable livelihoods are achieved and maintained through livelihood diversification, or engaging in a range of economic activities (Scoones 1998, Ellis 1998, Appendini & Zoomers 2001). Achiote achieves its objective of diversifying local incomes by providing low-income families with another option for income generation (Hanazaki et al. 2013). Achiote can also contribute to household economic resilience by providing a seasonal source of income, as its main harvest is in April/May with another small harvesting season in November/December. Resource dependent communities can be thought of as not dependent on a single resource, such as trees, but dependent on an entire ecosystem. Relying on multiple resource bases in an ecosystem with different seasonalities, such as achiote, can therefore serve as another way to diversify incomes and promote household resilience (Marsche and Berkes 2006).

To promote livelihood diversification and household resilience, we must also examine macro-level economic trends that affect the livelihoods of Jamboé Valley residents, such as the increasing importance of off-farm employment. As of 2018, 36.33% of Ecuador's population lives in rural areas (World Bank). For rural populations in the Ecuadorian Amazon, Perez et al. (2015) found that off-farm employment was the principal income source for 68% of the population and accounted for 53% of total household income on average. These findings are consistent with rural areas around the world. Several studies note the growing importance of non-farm economic activities for rural populations in Ecuador, South America, and Asian and African developing regions (Andersen et al. 2009, Reardon et al. 2007, Ros-Tonen and Wiersum 2005, Elbers and Lanjouw 2001, Lanjouw 1999). Trends in Jamboé Valley reflect these worldwide trends, as most families rely primarily on off-farm income from employment in cattle pasture clearing, con-

tract work in construction or mines, or long-term employment in the city. Factors contributing to the rising participation in off-farm employment in Ecuador include population growth, declining soil fertility (such as the degraded cattle pastures in Jamboé Valley), improved roads, and growth of urban labor markets (Perez et al. 2015).

The growing importance of off-farm employment has led many scholars to propose that governments address livelihood needs of rural populations by increasing access to off-farm job opportunities. One way to do this is improving access to education, so that rural communities can gain the skills and qualifications necessary for jobs in nearby towns (Perez et al. 2015, Vasco 2011). Other methods include expanding employment through public works projects or in the transportation sector (Lanjouw 1999, Ros-Tonen and Wiersum 2005). Finding off-farm employment has implications for conservation as well. A study of brazil nut harvesters in Peru found that only the poor who find work unrelated to the forest can succeed in breaking the link between poverty and forest resource degradation (Escobal 2003). Findings from interviews with achiote project participants confirm that in current circumstances, no farming activity can replace the economic importance of non-farm wage-labor or long-term institutional employment.

However, as part of a diverse portfolio of household economic activities, achiote presents great potential to contribute to the development of sustainable livelihoods in Jamboé Valley. Although many assessments of livelihood-focused projects have produced mixed results, some organizations have achieved successful conservation and development outcomes. In Bangladesh, for example, training for alternative income generating activities resulted in a 43% reduction in fishing in protected areas or during closed seasons (Rahman and Begum 2011). Several studies show that successful livelihood projects depend heavily on reliable pricing and markets (Nautiyal 2011, Sievenan et al. 2005). Ros-Tonen and Wiersum (2005) suggest that non-timber forest products can improve livelihoods if products can be harvested efficiently, infrastructure (including transportation and roads) are available for products to reach markets, products have established markets or niche markets (such as fair trade certified products), producers have the capacity to add value to products (such as through processing of food products), and producers have alliances with outsiders including development agencies or environmental organizations who may identify new markets and new donors. The achiote project already has many of these important elements, including infrastructure, an established market, and an alliance with an environmental organization. To achieve greater conservation and development outcomes, NCI may consider identifying new markets to resolve the issue of the low price of achiote sold to ILE, and providing resources for producers to process achiote food products. Results from this study indicate that participants are interested in both potential approaches to expansion. New markets for achiote may also become more viable over time, as studies continue to identify potential medicinal uses of achiote due to its anti-oxidative, anti-cancer, hypoglucemic, antibiotic and anti-inflammatory properties (Rivera-Madrid et al. 2016).

Although it's important to design livelihood projects to address locally defined needs and achieve positive social and/or economic outcomes, it's unlikely that these interventions alone will achieve desired conservation goals (Wright et al. 2016). However, building positive relationships with resource dependent communities and improving attitudes towards conservation is, in contrast, an achievable and realistic goal that can also be considered an indirect change in behavior (Wright et al. 2016). Additionally, achiote addresses many social needs of Jamboé Valley residents. For rural communities, studies have found that people often perceive a higher quality of life in the countryside, and that income is not necessarily an adequate measure of wellbeing (Macdonald & Winklerprins 2014, Garrett et al. 2017). Results from this study similarly find that achiote project participants desire to live

and work off their own land in Jamboé Valley. The achiote project therefore addresses these unquantifiable needs by providing a source of livelihood for residents to continue living and working in the countryside.

Conclusion

This study used semi-structured interviews to capture the beliefs and motivations that underlie the behaviors of achiote project participants (Berkwits & Inui 1998). These perceptions and attitudes shape participants' support for a livelihood project, and ultimately determine the project's success as a result (Harvey et al. 2018). Exploring local contextual factors and experiences of participants might also facilitate the design of a comprehensive quantitative survey to evaluate the project in the future. Quantitative data will become especially useful for measuring impact as the number of participants rise over time and statistically significant data analysis becomes possible (Hammarberg et al. 2016). The more the people affected by these programs play a role in evaluating these projects, the more policies and practices will support their priorities, allowing them to achieve the sustainable livelihoods they need (Chambers & Conway 1992). As NCI looks to expand the achiote project or possibly initiate other livelihood projects, collecting feedback from participants will be key to furthering their mission of conservation and economic improvement.

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Lo. N. 2019. Rebellious river: Chinese hydropower development in an illegible landscape. *Tropical Resources* **38**, 26–37.

Rebellious river: Chinese hydropower development in an illegible landscape

Nick Lo, MESc 2019[*]

Abstract

Some of the most prominent forms of Chinese investment overseas are the large-scale hydropower dams that radically transform river systems. This essay explores how the topography of the Salween River basin in Burma creates a geographic space that is less conducive for state-making projects, while also making the basin a target of state-centric development masterplans. Building large dams on the Salween would not only have major ecological impacts, but also would reshape territorial relations between the Burmese military and ethnic armed resistance groups, as well as affecting indigenous people's lifeways in the basin. The Chinese state's imposition of national boundary lines on the Salween in environmental policy, disassembling the river into discrete units and disassociating transboundary impacts, showcases how the top-down gaze of state planners often fails to reckon with the socio-ecological realities of a given landscape. The illegible terrain of the Salween River basin's highlands, in terms of its history of territorial conflict and political volatility, creates obstacles for the Chinese hydropower development apparatus—such state actors fail to take into account the contemporary legacies of the Salween River basin's geographically and politically sedimented history of state and corporate violence against people and the environment.

Introduction: Remoteness, lost

> While all was dark and gloomy in the depth of the valley, the setting sun caught the tops of the mountains across the river, and one forgot their bare brown slopes under the waves of crimson light which they reflected. Gradually a deep blue shadow crept up out of the valley and wrapped the hills in slumber, while a soft clinging mist seemed to precipitate itself from the atmosphere and spread over the rice-fields far below. In the gloaming the crimson died down to purple, the purple became violet, and still the glorious colours of sunset played up and down the valley.
>
> Francis Kingdon Ward 1913: 236

Over a hundred years ago, Francis Kingdon Ward trekked up and down the great watersheds of the Salween, the Mekong, the Yangtze, and the Irrawaddy. Starting from colonial Rangoon, he would make his way up the Irrawaddy to Bhamo, then head eastwards along the Shweli to reach the Shan hills of Yunnan to find the Salween (Figure 1). Yet long before white men ever set foot there, the Salween highlands were the site of trade and

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friction, caught between the orbits of Burma, Tibet, and China, where cultural boundaries were porous and the state had a weaker grip—as the traditional Chinese saying goes, *tian gao, huangdi yuan*—the heavens are high and the emperor is far away. Things have changed in the 21st century, as states have begun the enclosure of one of the last free-flowing rivers of Asia.

This essay explores how the geography of the Salween River has on one hand endowed the river with socio-ecological qualities not conducive to state-making (cf. Scott 2009), but has on the other hand in recent decades made the Salween a target of modern state-building projects—on both sides of the Sino-Burmese border—that seek to harness the river's power. The imposition of national boundary lines on a river, disassembling it into discrete units and disassociating transboundary impacts, showcases how the top-down gaze of state planners often fails to reckon with the socio-ecological realities of terrain and landscape.

My in-depth interviews with environmental activists and indigenous and minority rights advocates in Burma often turned to the impacts of Chinese infrastructure, particularly hydropower dams on the Irrawaddy and Salween Rivers. This essay builds off of work done before beginning my research at Yale, combining desk research, field interviews, and cartographic visualizations of patterns of infrastructure development, conflict, and environmental degradation. Due to the fact that access to dam sites on the Salween River basin is restricted by the Burmese military, my primary data is largely derived from interviews with activists and NGO staff in cities in Burma and elsewhere in the region, including Thailand and China.

The Salween, resistant to state-making

Historically, as a result of the remoteness of the Yunnan highlands on the eastern edge of the Himalayan massif, other major rivers of the great Himalayan watershed like the Salween attracted much less attention from the Chinese state. Beginning in the 2000s, the government sought to develop the hydropower resources of the Salween River. After 15 years of anti-dam campaigning by Chinese environmentalists, the government is now planning on creating a national park for the "Nu River Grand Canyon." Yet south of the border in Myanmar, Chinese developers' plans to build the large dams on the Salween are still live, though they have been stalled by the continuous outbreak of armed conflict in Shan State and Karen State (Figure 2).

The geography and history of the Salween are integral factors in determining the politics of the present day. The Salween River originates in the Tanggula Mountains on the Tibetan Plateau, where the Salween's tributaries meander down and winds its way through Kham in eastern Tibet. From Tibet, the Salween heads southwards to find its way into the Three Parallel Rivers area of Yunnan Province (Yu et al. 2018). By the time the Salween reaches Yunnan, it is known as the *Nujiang* in Chinese, or "angry river." Further south, as the mountains and gorges give way to hills, the Salween River valley enters the realm of the former Shan statelets, extending across southwest Yunnan and northern Burma; there, the *saophas*, Shan nobles, ruled multi-ethnic polities based on wet-rice cultivation (Scott 2009, Giersch 2006, Leach 1960).

The Salween then meanders through the subtropical jungle maze of the Karenni and Karen hills, snaking along the border with Thailand, where Karen-affiliated nationality groups have traditionally practiced swidden cultivation. After the British invaded and occupied Burma in the 1850s, these forests were heavily logged for valuable teak, (Bryant 1996, 1994). Out of the hills, the Salween heads southwards, meandering across its floodplain, past Hpa-an, capital of Karen State. Further south in the floodplain, agrarian communities in Karen State are dependent on the Salween itself for its rich fisheries as the river winds past the city of Mawlamyine, formerly known as Moulmein, emptying out at the Gulf of Martaban in the Andaman Sea (Aung 2017).

Gorge-like or hilly throughout most of its

Fig. 1. Salween River at dusk, Thai-Burma border. *Credit:* N. Lo.

length and bereft of a major floodplain until the last few hundred kilometers, the Salween is perhaps not as well-known as its neighboring rivers due to its low population and relative remoteness from expansionist states. This kind of natural "illegibility" has proven fortuitous for the Salween's ecology, for the time being (Scott 2009, 1998). In the past, steep gorges prevented the watershed from being extensively logged (Moore 2007), and clearing of tree and vegetation cover was largely carried out as part of swidden rotation cycles, leaving a largely undisturbed montane landscape between Tibet and the Shan hills, home to all manner of diverse fauna like the recently 'discovered' snub-nosed monkeys.

The combination of complex cultural histories and variegated mountainous terrain, both carved out by the Salween and its tributaries, and competing claims over natural resources, have created a volatile, fluid sociopolitical terrain that is resistant to rigid state claims over territory. Presently, the Salween River basin is populated largely by peoples that are typically referred to by the relevant state (Chinese, Thai or Burmese) as ethnic minorities, hill tribes, or ethnic nationalities. All of these terms are loaded with meanings that are specific to each state yet carry the same general connotation of being "backwards" and "savage"—living off the land through hunting and foraging and swidden cultivation is interpreted by state actors as signs of primitiveness. For the Chinese state, its ethnic minority populations' lack of "civilization" and material "impoverishment" needed to be rectified through "development" (Harwood 2013, Harrell 1995).

Crucially, the Salween has not been significantly altered by large-scale engineering along the entirety of its length, with the exception of two small dams on its tributaries in Tibet, making it one of the last free-flowing great rivers of Asia (McDonald 2007). However, this has not prevented the Chinese and Burmese states from exerting their control over the Salween River valley. Communities along the Salween in Shan, Karenni and Karen States have been subject to extreme violence, intensive resource extraction and militarization since the colonial era, with teak and ironwood being the most desirable commodities. This rampant extraction of natural resources continues under the oversight of the Burmese military, known as the Tatmadaw (Woods 2011, Smith 1991). Today, the value that states hope to extract from the Salween landscape is hydropower. The developmentalist mindset that the Chinese state actors have brought to the Salween is emblematic of "state simplification"—as James Scott notes, these schemes often bring about disastrous results (1998: 4).

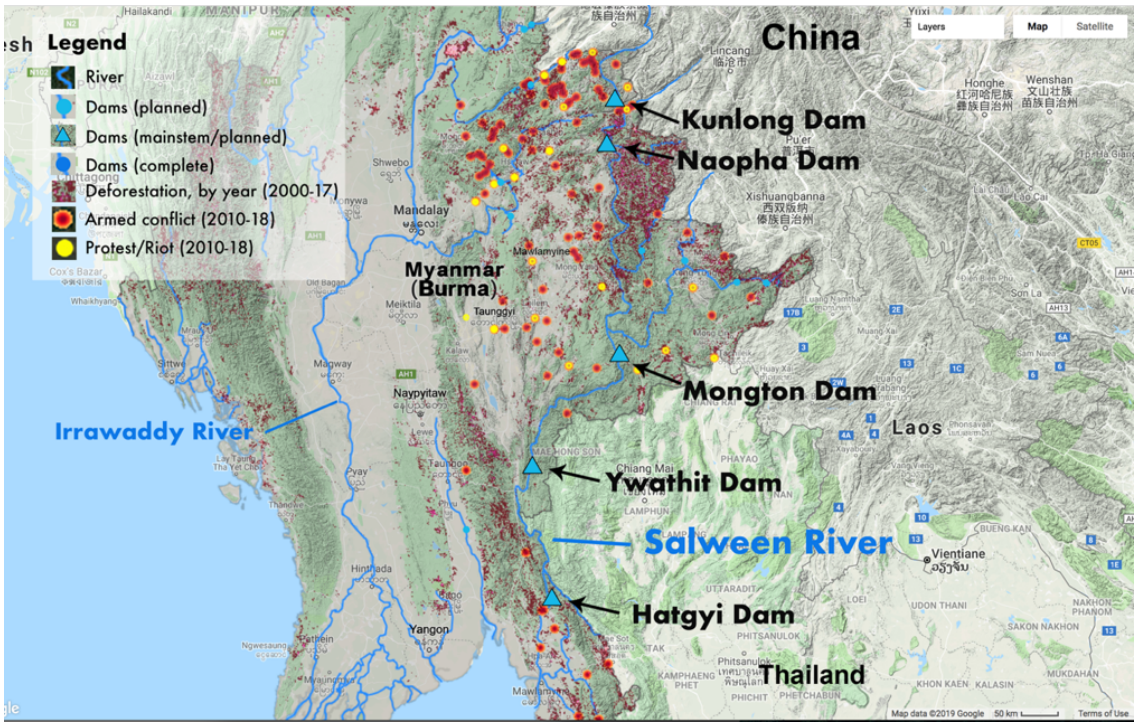

Fig. 2. Map of Salween Basin, Myanmar/Burma. Map of Salween River across Myanmar/Burma, with information obtained from the following sources: conflicts (ACLED), dams (IFC), deforestation (Hansen), rivers (MIMU). *Credit:* N. Lo & T. Huang, Yale University, 2019.

River enclosure movement

Since the Communist Party's consolidation of China's peripheries during the 20th century, remote rivers like the Salween have become much more valuable to the state. In their infrastructural masterplans, Chinese state developers have imposed a series of artificial boundaries on the ecological impacts of their activities, a perhaps intentional form of ignorance that devalues the Salween River's existence as a functioning, contiguous system that flows without interruption, shaping the landscape and the humans and nonhumans who live in it.

Over the course of its run from its source through Tibet and China, the Salween experiences a drop in elevation of approximately 5,000 meters—according to Chinese government estimates, harnessing all of this water with a thirteen-dam cascade would produce more 21,000 MW, over 3,000 MW more than the Three Gorges Dam (Magee & McDonald 2006). If this initial plan had progressed any further, up to 80,000 people would have been relocated out of the Salween River valley in Yunnan (ERI 2004). Unlike the fate of many other rivers in China, there has been substantial public debate over the future of the Salween's continued flow. Since the Salween River campaign in China has been documented extensively by various scholars [1], I will briefly note that the Salween campaign became one of the most well-known environmental disputes in China's public sphere. The Chinese state has now removed the Salween River hydropower dams from its list of major infrastructure projects in its 13th Five Year Plan (Bosshard 2016;

[1] See Magee, D. & McDonald, K., 2006.; Ho, P. & Edmonds, R., 2007; Mertha, A.C., 2008; Harwood, R., 2013; and Yu, X.G. et al., 2018, for overviews of Salween River anti-dams campaign.

Leavenworth 2016). Instead, the Chinese government is planning on creating a national park—the Nu River Grand Canyon National Park—as part of the nationwide effort to construct an "ecological civilization." (Li 2017a, Jing 2016).

Yet this aspiring ecological civilization is also financing the construction of large-scale dams downstream, south of the border, on the very same river. In the name of helping to electrify the Burmese hinterland and develop Burma's national economy as "South–South cooperation" (Yeh 2016), the Chinese government and its state-owned hydropower enterprises inked deals with the then-military regime to construct six dams on the main stem of the Salween: the Kunlong and Naopha dams in northeast Shan State, Mongton dam in southern Shan State, Ywathit dam in Karenni State and Hatgyi dam in Karen State (Figure 2, SWC 2016).

By attributing downstream dam plans to the Burmese government's prerogative, placing artificial national boundaries on the Salween River allows Chinese state actors to disassociate the government's protection of the Salween upstream in China from Chinese hydropower corporations' impacts on ecology and communities downstream in Burma—as if the Salween in Burma was an entirely distinct entity from the Salween in China. This artificial disaggregation serves the interests of the Chinese state, which is looking for a spatial fix for its excess construction capacity, and those of the Burmese state, which is looking to consolidate its grip on peripheral territories. There are a couple strands to follow here: 1) the constructed boundaries of ecological impacts, and 2) the ignorance of socio-political contexts abroad.

Constructed boundaries of socio-ecological impacts

The fate of the Salween remains unclear, though anti-dam advocates are holding out hope that the Burmese civilian government led by the National League for Democracy will be able to live up to its manifesto, and reconsider the infrastructure development deals signed under the former military junta (Naing 2016). Even in China, environmental activists are waiting to see what the state's next moves are with regards to the Salween. However incongruous it seems, local provincial officials do not see the establishment of a national park and the construction of dams in the same river valley as being mutually exclusive (Yu et al. 2018, Liu 2017a). The imposition of an arbitrary boundary on where protected areas "end" may lead to distorted decision-making processes that neglect the contiguous systems between the river and its surrounding riparian forests and mountains (International Rivers 2016).

The developmental gaze that Chinese state actors apply to the Salween River is distorted by these politically constructed boundaries. As with the Chinese dams on the Mekong, which millions and millions of people rely on for their livelihoods in Southeast Asia, the Chinese state maintains a massive imbalance in power in relation to downstream nations like Burma (Middleton & Allouche 2016). Chinese state-owned power generation companies are attempting to move forward with their hydropower development plans downstream in Burma in the name of "clean energy," but the economic rationale behind such massive hydropower dams is unclear.

The Salween dam deals were signed either before or in 2010, and the Burmese government's initial plan was to export the majority of electricity generated to China. Currently, with China's macroeconomic slowdown, electricity demand has not grown apace with electricity production (Magee & Hennig 2017). The likelihood of Myanmar dams selling electricity to Yunnan is low, as the latter is already at overcapacity with its own hydropower production and is looking to export excess generation to other countries (Lin 2017, Liu 2017b). Most recently, Burma's new energy minister U Win Khaing even expressed doubts about moving forwards with the large hydropower schemes (Lewis & Naing 2017).

Chinese hydropower developers' decisions to push ahead with dam plans on the Salween in

Burma appear to be driven by either hubris or ignorance. Much blood has been shed in the Salween basin in Burma, as the Tatmadaw clashed alternately with the Karen National Liberation Army, the Communist Party of Burma, the Shan State Army-North, the Shan State Restoration Council, as well as dozens of other ethnic armed resistance groups, over the course of seven decades (Raleigh 2018; Smith 2007, 1991; see Figure 3 and 4 for visualization of conflict since 2010-2018). The Salween River basin has also proven to be sanctuary for peripheral peoples fleeing military oppression. Hundreds of thousands of Karen, Shan and Karenni people have lived in refugee camps on the Thai side of the Salween for decades, waiting for the last embers of war to be snuffed out before they ever set foot in Burma again (Thwe 2003).

It is in this context that I first took a trip up the Salween to cross over to Mutraw (Papun) District, the northernmost corner of Karen State, largely still under the control of the 5th Brigade of the Karen National Union. On the way upstream, we pass by a wooden sign nestled in the vegetation on the western shore. "NO DAM." My activist colleagues told me it was from several years prior, when they mobilized Karen communities to protest against the Hatgyi dam, which would have flooded the refugee camps along the river. Chinese dam developers had walked blindly into the politically volatile and historically charged landscape of the Salween.

Hydropower and war along the Salween River

Up and down the Salween, conflict has derailed developers' plans. Grassroots and community-based groups have drawn links between the militarization of ethnic nationality-populated uplands of Burma with the various hydropower dam projects on the Salween[2]. Violence broke out near the Hatgyi dam site between one of the Karen armed groups and the Tatmadaw in October 2014 and September 2016, leading to the displacement of thousands of Karen villagers (Interview, Yangon, 2018, see Figure 4). At the Ywathit dam in Karenni State, Chinese engineers were killed in 2010 by a Karenni resistance group (Mang & Yan 2013), while the outbreak of fighting between Kokang and Ta'ang armed groups and the Tatmadaw in 2015 halted the Kunlong dam's preparatory work (Shin 2015, see Figure 3). Progress on all of the Salween dams has stalled around the dam sites due to security concerns, including the kidnapping of Chinese engineers near the Mongton dam (Interview, Chiang Mai, 2018).

It would be too simplistic to say that the Chinese state does not care at all about the downstream impacts of its activities, or that the Chinese investors can simply overcome a "weak state" (Lu 2017). As many observers have pointed out, the problem is not only Chinese corporations—governments like Burma are willing receivers of Chinese capital, but do not have the regulatory capacity to manage the socio-environmental impacts of such large-scale development projects (Interview, Yangon, 2018, Lamb & Dao 2017). According to one informant, the Burmese government staff at the Environmental Conservation Department, in charge of reviewing environmental impact assessments, could not understand the detailed, dense English reports submitted by corporations and the IFC (Interview, Taunggyi, 2018).

Yet what is more pertinent to my inquiry here is how the Chinese state actors have embroiled themselves in a variety of controversies without understanding how they arrived there in the first place. In his adaptation of Ferguson's "anti-politics machine" (1990) to the Myitsone dam 'incident,' as it referred to in Chinese, anthropologist Laur Kiik describes how the hydropower developers did not foresee how China's poor reputation in Burma—a result of the Chinese government's ongoing sup-

[2]For more detailed, on the ground information collected from war-displaced communities and refugees, see: Karen Rivers Watch 2016, 2014 & 2004; Shan Sapawa Environmental Organization 2009, 2006, EarthRights International & Karen Environmental and Social Action Network, 2003.

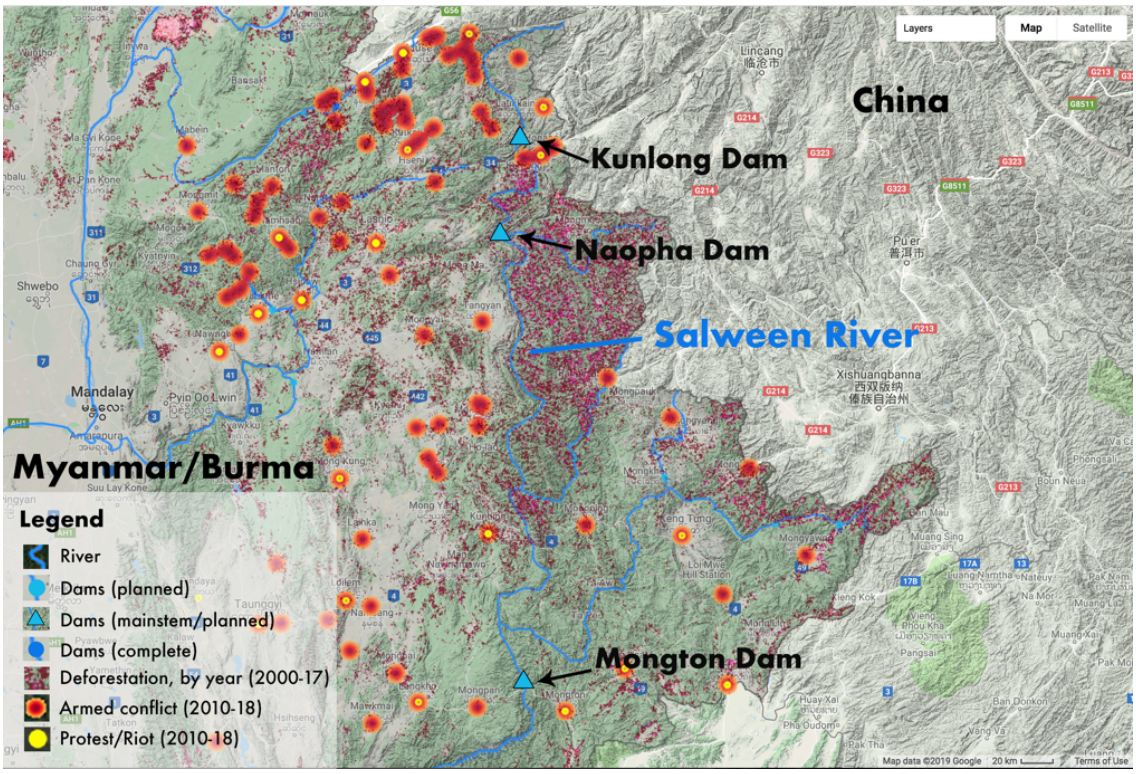

Fig. 3. Map of Salween Basin (Upper), Myanmar/Burma. Map of Salween River in Shan State. *Credit:* N. Lo & T. Huang, Yale University, 2019.

port for both non-state armed groups *and* the Burmese military—could possibly weigh down the dam project with political baggage. Public protest, among other factors, led to the Burmese government's suspension of the 3.6 billion USD Myitsone dam project in 2011, shocking China (Kiik 2016).

Nevertheless, in spite of fierce opposition from civil society and local communities, Chinese state actors have quietly continued their operations on these Burmese Salween projects. Activistsin Shan State pointed out how Chinese developers failed to take into account any of affected people's perspectives for years, resulting in highly visible and media-savvy protests at the few public consultations that took place in 2015 (Interview, Taunggyi, 2018). According to these informants, teams of Chinese engineers have returned to the Mongton dam site to conduct unknown surveys—there is little clarity on the ground because access has been restricted by the Burmese military (Interview, Taunggyi, 2018). Just as recently as May 2018, a Shan villager had been fatally shot by the Burmese military while traveling down the river near the Mongton dam—a grim testimony to the lingering insecurity and lawlessness in the borderlands where Chinese hydropower dams are planned (Interview, Chiang Mai, 2018, Yee 2018). Though realities on the ground are hard to extricate from rumors, it is clear that the Chinese state-led development model has not been very successful in the Salween.

When it arrives in the Salween River basin, the Chinese hydro-development apparatus is unequipped to deal with fragile political situations, and exacerbates the ongoing violence by facilitating the expansion of Burmese state power. My informants said that the Chinese hydropower devel-

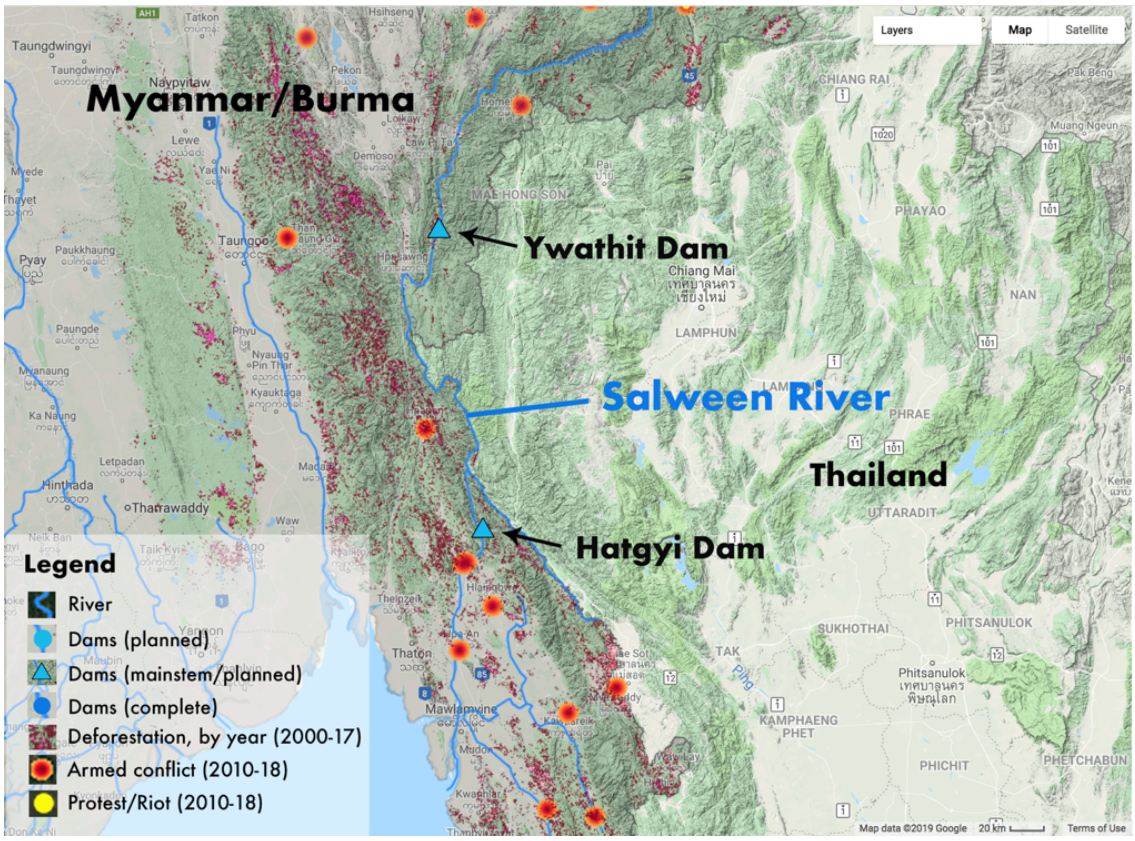

Fig. 4. Map of Salween Basin (Lower), Myanmar/Burma. Map of Salween River in Karenni/Kayah State and Karen/Kayin State. *Credit:* N. Lo & T. Huang, Yale University, 2019.

opers primarily worked with the Ministry of Electricity and Energy, sidelining other stakeholders whose views did not align with their own (Interview, Taunggyi, 2018). Though the Chinese state is responding to the Myitsone dam suspension and other Chinese-led development projects' poor reputation by issuing a number of regulatory guidelines to improve social and environmental standards for overseas investments (International Rivers 2013), this effort seems disingenuous. The Chinese state-owned conglomerates responsible for developing the Mongton dam have not changed their secretive practices—instead of engaging with the local communities around the Wan Hsa La area, the engineers are escorted around by the very same military units that have terrorized local populations for decades (Interview, Taunggyi, 2018). Though the Chinese corporation perceives its collaboration with the military junta of Burma as a neutral and apolitical form of infrastructure service-delivery, in reality, the Burmese regime is in the proactive process of subjugating ethnic armed resistance across the nation with Chinese-supplied arms, reaching into remote territories with Chinese-paved roads.

Conclusion: Subversive spaces along a rebellious river

In the "Ecological and Environmental Cooperation Plan" for China's Belt and Road Initiative (MEP 2017), the Chinese state's conception of an ecological civilization is not one that perceives socio-ecological systems through a holistic lens—rather, it is an eco-modernist framework that defines de-

velopment according to the agendas and perspectives of top-down authoritarian planners and myopic bureaucrats – never the people whose lives and homes are transformed (Chen et al. 2017; Chen 2013). This kind of depoliticized, distorted sustainable development ideology allows the Chinese state to export destructive, large-scale infrastructure development projects and then follow through with performative corporate social responsibility programs throughout Burma, obscuring and eliding the grievances of ethnic communities against the Burmese military's atrocities.

These contradictions and disjunctures are the result of an apolitical development apparatus coming into contact with the variegated sociopolitical terrain of the Salween basin and running into trouble. From the Sinocentric perspective, as an 'advanced' civilization, Chinese state developers see themselves sharing China's developmental path with its poorer neighbors, including Burma. Their myopia leads developers to assume that if people are resisting hydropower development, it is because they are uneducated and do not understand the benefits of hydropower, not that the people simply do not want to leave their land – the Chinese state-making project is something that is perceived as inherently benevolent, bringing order, harmony and development to the unruly peripheries. These narratives are not borne out in the real world, and especially not in the Salween River basin, where people are refugees and survivors who have managed to avoid successive empires and states.

The Chinese state's willful ignorance of and perhaps its incapability to address the socio-ecological realities of the Salween, and other locales, will set itself up for failure. Caught between empires of violence and hegemonies of knowledge, subversive spaces like the Salween that give rise to resistance and counter-narratives will persist. Out of these territories of struggle, people continue to fight against the seemingly hegemonic forces of development and modernization, complicating the state's linear narratives by telling their truths from the ground, and their stories from the river.

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"Holes emerging in all the forests": Swidden, betel nut, and the repurposing of environmental myths in Myanmar

Jared Naimark, MESc 2019[*]

Abstract

Political ecology has long critiqued hegemonic narratives blaming marginal peoples for environmental degradation. Yet, historically constructed myths that blame indigenous swidden agriculture for deforestation persist in tropical forest conservation. This article seeks to understand how such myths evolve amidst a transition from swidden to cash crop agroforestry. Based on an ethnographic case study of a biodiversity conservation project in Tanintharyi Region, Myanmar, it explores the origins and consequences of an emerging environmental narrative that blames cultivation of betel nut (*Areca catechu*) by returning Karen refugees for causing deforestation. I show how contemporary conservation discourse reifies and repurposes persistent narratives from two key historical moments: 19th century colonial representations of Karen swidden as destructive, and 1990s counterinsurgency campaigns against supposedly dangerous Karen swiddeners. I find that the repurposed narrative blaming betel nut cultivation produces a disingenuously pristine forest to be managed by excluding *any* Karen agricultural activities, obscuring the political-economic drivers of deforestation and facilitating the Myanmar state's territorialization of the contested Karen borderlands during the current ceasefire period. These findings suggest further study of the everyday practices of conservationists, and how counter-narratives from below can challenge dominant environmental narratives.

Introduction

Production of betel nut, a stimulant harvested from the *Areca catechu* palm, is booming among indigenous Karen communities in the proposed Lenya National Park (LNP) in Tanintharyi Region, Myanmar. Historically, Karen people in Lenya practiced swidden cultivation, known as *ku* in S'gaw Karen language. They produced upland rice alongside diverse vegetable crops through a rotational "slash and burn" technique, leaving fields fallow for at least seven years until they would regenerate with forest growth, before returning to cultivate. Today however, Karen people in Lenya are converting swidden fallows to perennial cash crop orchards of betel nut, which is then sold through distributors for consumption in cities throughout Myanmar and exported to India. This betel-taungya system adapts traditional *ku* by planting betel nut seedlings alongside upland rice. After the rice harvest, instead of fallowing the swidden these fields mature into betel nut agroforests, representing the primary income source and livelihood strategy for Karen villagers who have long suffered under the military regime. However, foreign conservationists working in Myanmar blame the Karen betel-taungya system for causing deforestation:

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> You know they're clearing the forest to plant betel nut. So, I think overall the impact is nothing compared to oil palm but if you add it all up over a few years it's still not insignificant. And at some point, they're gonna have to stop expanding into the forest. Otherwise there won't be any forest. And that's just, I mean that's just fucking simple maths.

Taking this conservationist view of betel nut as a starting point, my research examines how the hegemonic narrative blaming indigenous swiddeners for deforestation evolves amidst a transition to cash crop agroforestry. Political ecology has long critiqued environmental narratives that blame marginal people for causing degradation (Robbins 2012). The myth that indigenous swiddeners are misusing or destroying the environment has been historically constructed and deployed by elites in order to justify taking control of swiddener's territories (Dove 1983, 2015). Myths denigrating swidden have facilitated state territorialization through the creation of forest reserves (Vandergeest and Peluso 1995) and policies outlawing swidden throughout Southeast Asia (Fox et al. 2009). Despite decades of work by environmental anthropologists showing otherwise, the myth that indigenous swiddeners are to blame for deforestation persists (Doolittle 2010:70) and continues to inform ubiquitous policy narratives (Colfer et al. 2015). Thus, my research seeks to understand the emerging narrative blaming Karen betel-taungya within the historical and political context of blaming Karen swidden. What political aims does this narrative serve? What acts of dispossession does it enable? And what are the material consequences for local livelihoods and biodiversity conservation?

I analyze these questions using Gregory Simon's (2018:72) framework of "disingenuous natures" defined as: "the management interventions and coinciding social-ecological conditions that emerge from faulty science, partial data and erroneous environmental narratives." Disingenuous natures hinge on the continuous upcycling of environmental myths through a process of narrative repurposing, in which: "knowledge residues of the colonial past are carried forward and reproduced in contemporary—yet geographically disparate, and politically convenient—global resource management contexts" (Simon and Peterson 2018:5) These upcycled narratives of environmental change are made durable through the management regimes they inform, reifying the narrative and producing "disingenuous natures" (Simon and Peterson 2018). Such environments are disingenuous, because "despite being constructed by surreptitious knowledge, incomplete science and fictitious histories—they are understood and managed as if they were a legitimate, authentic and thus genuine depiction of past and contemporary socioecological interactions" (Simon and Peterson 2018:5).

In this article, which synthesizes key findings of my master's thesis research into the controversy over Lenya National Park, I show how conservationists are actively repurposing a persistent environmental myth by blaming Karen betel-taungya for deforestation. First, I review my qualitative research methods which draw on anthropology and political ecology. Next, I provide a brief historical and political context to conservation in Tanintharyi Region. I then go on to examine how the betel-taungya narrative marks the beginnings of a repurposed environmental myth, building upon two key historical moments: 19th century colonial representations of Karen swidden and 1990s counterinsurgency campaigns against the Karen. Based on interviews with conservationists, I illuminate how these old narratives are being upcycled to fit the current conservation agenda for establishing protected areas. Finally, I conclude with some insights for further study of persistent environmental myths, including how counter-narratives from below can contest dominant narratives. Overall, I find that the repurposed narrative produces Lenya National Park as a disingenuous forest to be managed by excluding *any* Karen agricultural activities, obscuring the political-economic drivers of deforestation and

facilitating the Myanmar state's territorialization of the contested Karen borderlands during the current ceasefire period.

Methods

This article is based on 10 weeks of qualitative social science field-based research in Myanmar in May–August 2018. I draw primarily on 39 semi-structured interviews with conservationists and Karen villagers about their perspectives on Lenya National Park and betel nut cultivation. Interviews with Karen villagers in LNP were carried out with assistance from Karen staff of the Conservation Alliance Tanawthari (CAT), who I am collaborating with to apply this research towards indigenous rights advocacy. CAT staff provided consecutive translation of interviews from Burmese and S'gaw Karen language to English, which I audio recorded and transcribed. These were coded based on perspectives on betel nut, and analyzed using a grounded theory and political ecology approach. Interview data is complemented by ethnographic participant observation in conservation workshops and village agricultural activities, analysis of conservation project documents, and historical research using both primary and secondary sources. In order to protect the identities of those who participated in this research project, I omit the names of all informants, villages and conservation organizations.

Historical and political context of Lenya National Park

After Burma gained independence in 1948 the Karen National Union (KNU) took up arms fighting for Karen independence, and now political autonomy under a federal system. Since then, Southeast Myanmar has seen seven decades of civil war (Jolliffe 2016). In the 1990s, Myanmar's military carried out brutal counterinsurgency campaigns targeting civilians. As a result, an estimated 80,000 Karen people remain displaced from Tanintharyi, either as refugees in Thailand or internally displaced persons (IDPs). The KNU entered into a preliminary, bilateral ceasefire agreement with the military in 2012, which has opened up formerly off limits areas in Tanintharyi Region to "ceasefire capitalism" (Woods 2011) in the form of large-scale natural gas, coal, tin, and oil palm projects. It is in this context of a war-torn, militarized resource frontier of shifting territorial control during a tenuous ceasefire period that conservationists have arrived to implement their projects.

Containing the largest remaining intact, lowland, wet evergreen forest in a unique biogeographic transition zone, Tanintharyi is constructed as holding global importance for the conservation of endangered and endemic species (Donald et al. 2015). Conservationists are working in partnership with the Myanmar government to vastly expand and improve management and connectivity of the protected area network in the region, including establishing the 780,000-acre Lenya National Park (LNP). However, Karen indigenous rights activists have lodged an official complaint against LNP, over concerns it would prevent displaced Karen people from returning to their customary lands—a process which has already begun on a small scale. Because of this complaint, the park's future remains in flux. This paper thus serves as a close examination of one of the flashpoints in the ongoing controversy over LNP: conservation discourse that blames Karen betel-taungya for causing deforestation.

The colonial narrative blaming Karen swidden emerges

Karen in the uplands of Myanmar and Thailand are the descendants of a long process of evading lowland states, likely practicing swidden cultivation because it is less "legible" to the state for appropriation (Scott 2009), making it one of the defining features of Karen identity (Rajah 2008). When the British annexed Tanintharyi Region in 1826 with interests in teak, they encountered Karen swidden. For instance, in 1887, colonial officer Donald Mackenzie Smeaton (1887) wrote: "Those in the

hills still follow the primitive and destructive methods of their forefathers." Similar depictions were presented by American Baptist missionaries in the early 20th century. In these descriptions, we see the emergence of a colonial narrative blaming Karen swiddeners for destroying the forest—but what political purpose does this narrative serve?

In *The Political Ecology of Forestry in Burma*, Raymond Bryant (1997) employs a close reading of colonial archives to show how it was politically easier to blame shifting cultivators rather than the unregulated and powerful logging companies actually responsible for deforestation in Tenasserim. We can thus understand the myth that Karen swidden is "primitive" and "destructive" as being constructed by British colonial foresters in order to order to obscure the root cause of deforestation and instead justify policies restricting Karen swidden and territorializing the Karen borderlands through the creation of reserved forests. Following the "disingenuous natures" framework (Simon and Peterson 2018), this narrative serves as a "residue of the colonial past," which has been made durable through the creation of forest reserves and restrictions on swidden—producing "disingenuous forests" in Tanintharyi Region.

Counterinsurgency and swidden in the Karen borderlands The second key historical moment for understanding the production and persistence of a narrative blaming Karen swiddeners is the Myanmar military counterinsurgency tactics against the Karen National Union (KNU) that displaced Karen civilians from Lenya in the 1990s. In their landmark analysis of Cold War Southeast Asia, Peluso and Vandergeest (2011) show how counterinsurgencies against jungle-based guerilla rebels aimed to resettle civilian swidden agriculturalists suspected of supporting insurgents, and created state forest reserves conveniently emptied of people. My interviews with Karen people in Lenya reveal a similar pattern of counterinsurgency and resettlement. Many Karen living within the park boundary are originally from other villages further upstream, where the military launched a major offensive against KNU positions in 1996. Houses, rice stores, and crops were burnt to the ground as some villagers fled to hide in the forest, surviving on meager rations. Most Karen villagers were forcibly resettled in government-controlled "strategic hamlets" (Peluso and Vandergeest 2011) downstream. One villager recalls: "If we didn't move, the Burmese army would see us in the forest and kill us." These strategic hamlets were located far away from upstream KNU positions to cut off support for the rebels, while also in close proximity with military bases so that Karen residents could be monitored closely. Racializing any Karen civilian as a KNU collaborator, the military upheld a shoot-on-sight policy for those attempting to tend to their abandoned swiddens. It is these earlier acts of military violence, emptying the jungle of supposedly "dangerous" Karen people, that allow conservationists to construct a disingenuously pristine forest landscape for protection today. The military's narrative depicting Karen swiddeners as dangerous, along with its material legacy in depopulating the forests, thus provides another crucial residue for reformulation.

Contemporary conservation discourse repurposes the narrative Throughout my research, foreign conservationists were consistent in their claims that betel-taungya by Karen people returning after the ceasefire was causing deforestation. While one American conservationist recognized the right of displaced Karen people to resettle in LNP, she also worried that some might come back with "more of a business mindset to clear land in the forest." This claim was echoed by a remote sensing expert who has worked on LNP. He sees Karen betel nut expansion as "anarchy," encroaching on "uninhabited forest areas" and therefore fragmenting critical tiger habitat. These views are reflected in official project documents, which claim returning refugees and IDPs will bring "additional pressures" on "environmentally sensitive areas" and that betel nut expansion by returnees is a "principal threat" to LNP. Karen rights organizations have contested this depiction of returning refugees as threats, lodg-

ing an official complaint on behalf of affected communities, advocating that LNP "must not go ahead until substantial guarantees are put in place for the safe, voluntary and dignified return of all those who have been displaced by civil war." Yet, when I asked one conservationist how his organization would approach the question of return and resettlement, he replied curtly: "That's obviously a concern for us cause then you've got holes emerging in all the forests, and it would be impossible to manage." In this way, conservation discourse depicts betel-taungya by returning Karen IDPs and refugees as a dire threat to the integrity of LNP and the globally important forest landscape.

How can we understand the origins of this narrative? First, it neatly repurposes the long-running, historically constructed myth that Karen rotational swiddeners are "primitive" and "destructive." Rather than being interpreted as more modern or sustainable than swidden, betel production is made equivalent to swidden. Conservationists react strongly to images of "slashing and burning" common to both systems, fitting Karen smallholders into their preexisting slot and reifying the narrative of blame. Second, the conservationist discourse repurposes the knowledge residues and spatial legacies from counterinsurgency, constructing returning refugees as deforesting park encroachers rather than as indigenous peoples with a right to their historic lands. While this rhetoric is shaped by the materiality of the betel nut boom, in a sense this narrative is not about betel nut at all. Rather, it is about the continued criminalization of *any* Karen forest livelihoods, no matter whether they are swidden or cash crop agroforestry, in order to complete the territorialization of Tanintharyi's borderland forests by creating LNP.

Conclusion

Through this case study I have traced not only the genealogy of a persistent environmental myth, but also the dynamics and contestations of a narrative repurposing in progress. I suggest that this encourages further study of the everyday practices of conservationists themselves. Two observations highlight this: First, conservationists in Myanmar are preoccupied with the image of slashing and burning, providing continuity between old and new narratives. Further study of conservation discourse should thus look closely at the role of spectacle—and the way conservationist rhetoric is shaped by an emotional reaction to globally circulating images of environmental destruction. Second, conservationist depictions of betel nut deforestation in Myanmar are largely based on remote sensing data of forest cover change. This suggests the need to study the way that these aerial view, remote technologies are mediating knowledge produced about deforestation, and shaping contemporary environmental narratives.

Finally, examining the Karen counter-narrative about betel-taungya sheds light on how conservation is entangled with the long struggle for territory and sovereignty in the Karen borderlands. Karen worry that their betel-taungya land will be enclosed by the park—asking "how will we survive?" It is through this lens that Karen see foreign conservationists as "working for the government" to help the Burmese finally take control of Karen territory. These restrictions are not understood as a new intervention, but rather as a continuation of the military's earlier forced removal of Karen and restrictions on swidden. They reject the persistent, continuously reformulated myth that blames Karen people for the destruction of their own forests, instead drawing our attention to the political-economic factors that have historically caused deforestation in Myanmar—politically connected logging and palm oil companies. In this way Karen contest the disingenuous forest, countering with a landscape of cultural survival and self-determination.

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Regulating the trees for the forest: How Indonesia and Brazil attempt to reduce deforestation through forestry policy

Paul Rink, MEM, JD[*]

Introduction

Brazil and Indonesia are respectively the first and third most rainforest-covered countries in the world.[1] Perhaps as a result of such status, they have each included substantial forest conservation aspirations in their nationally determined contributions (NDCs) under the Paris Agreement. Brazil has pledged to "achieve, in the Brazilian Amazonia, zero illegal deforestation by 2030 and . . . restor[e] and reforest 12 million hectares of forests by 2030."[2] Indonesia has pledged to "reduce unconditionally 26% of its greenhouse gases against the baseline scenario by the year 2020" by several means, including "through sustainable forest management" and a "social forestry programme."[3]

This paper presents a descriptive analysis of the legal and regulatory frameworks that these two countries have put in place to obtain such targets. The paper further compares the two systems so as to better understand the challenges and opportunities Brazil and Indonesia face in obtaining their lofty deforestation reduction aspirations. Although Brazil's management system is comparatively more robust, analysis ultimately reveals that both Brazil and Indonesia experience similar challenges in enforcing their forest management laws and regulations.

Section II of this paper provides an overview of the legal and political framework for forestry in Brazil, and section III provides the same for Indonesia. Similarly, section IV expounds on challenges that Brazil faces in relation to its forest governance system, whereas section V does the same for Indonesia's governance system. Section VI compares the two systems and analyzes the similarities and differences of the challenges that they face. Finally, section VII provides concluding thoughts.

Overview of the Legal and Political Framework for Forestry in Brazil

Brazil expresses the value it places on its forest resources and on the greater environment in several different constitutional provisions. For one, the Brazilian Constitution explicitly incorporates protection for the various biomes of the country:

> "[t]he Brazilian Amazonian Forest, the Atlantic Forest, the Serra do Mar, the Pantanal Mato-Grossense and the coastal zone are part of the national

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[1] Joseph Kiprop, *5 Countries with The Largest Rainforest Coverage*, WORLD ATLAS (July 14, 2017), https://www.worldatlas.com/articles/5-countries-with-the-largest-rainforest-area.html.

[2] Federative Republic of Brazil, *Intended Nationally Determined Contribution*, 3 (Sept. 21, 2016), http://www4.unfccc.int/ndcregistry/PublishedDocuments/Brazil%20First/BRAZIL%20iNDC%20 english%20FINAL.pdf.

[3] Republic of Indonesia, *First Nationally Determined Contribution*, 7 (Nov. 6, 2016), http://www4.unfccc.int/ndcregistry/PublishedDocuments/Indonesia%20First/First%20NDC%20In donesia_submitted%20to%20UNFCCC%20Set_November%20%202016.pdf.

> patrimony, and they shall be used, as provided by law, under conditions which ensure the preservation of the environment."[4]

For another, the Brazilian Constitution recognizes rights to environmental protection more generally – even to the point of restricting exclusive private property rights. According to the Brazilian Constitution, "property shall observe its social function" in accordance with the individual and collective rights of all Brazilian citizens.[5] The Constitution then reads environmental preservation into this social function of property[6] and gives the government the power to expropriate certain landed property "which is not performing its social function".[7] Furthermore, the Brazilian Constitution recognizes a right to environment that places an obligation both on the Brazilian government and on the wider Brazilian community "to defend and preserve [the environment] for present and future generations."[8]

The strong environmental protection language contained within Brazil's Constitution carries over to its national forest management laws. In 1934, the Brazilian legislature passed the country's first Forest Code in response to increases in deforestation for the development of coffee plantations. The Code set forth the principle that forests are essential to "the common interests to all inhabitants of the country."[9] Thirty-one years later, in 1965, the Code was updated by Law 4771[10] to recognize natural vegetation as a "good[] of common interest" for its own sake and not just for its potential economic utility.[11]

This "New Brazilian Forest Code" underwent further modifications when Law 12,651/2012 (also known as the "New Forest Code") entered into force in 2015;[12] however, the resulting changes to the Forest Code were largely seen as a step backward for forest protection in Brazil due to the following because the New Forest Code

1. Gave more freedom to Brazilian states to determine (and potentially reduce) the delineation standards for Permanent Preservation Areas (APPs) "according to their interests and needs;"[13]

2. Reduced by 58% the amount of degraded land that certain landowners are obliged to restore, thus providing blanket amnesty for large quantities of unlawful deforestation;[14]

[4] CONSTITUTION OF THE FEDERATIVE REPUBLIC OF BRAZIL, THIRD EDITION 2010, Ch. VI art. 225 ¶4.

[5] CONSTITUTION OF THE FEDERATIVE REPUBLIC OF BRAZIL, THIRD EDITION 2010, Title II art. 5.XXIII

[6] Marcia Fajardo Cavalcanti de Albuquerque, *Biodiversity and Agriculture – Friends or Foes? The Legal Implementation of Agroforestry Practices in Brazil*, in IUCN ACAD. ENVTL. L. SERIES, PROTECTING FOREST & MARINE BIODIVERSITY: THE ROLE OF LAW 141 (Ed Cozens, et al., ed., 2017); CONSTITUTION OF THE FEDERATIVE REPUBLIC OF BRAZIL, THIRD EDITION 2010, art. 186.

[7] CONSTITUTION OF THE FEDERATIVE REPUBLIC OF BRAZIL, THIRD EDITION 2010, art. 184.

[8] CONSTITUTION OF THE FEDERATIVE REPUBLIC OF BRAZIL, THIRD EDITION 2010, Ch. VI art. 225.

[9] Decreto No. 23.793, de 1934 (Braz.).

[10] Simone Bauch et al., *Forest Policy Reform in Brazil*, SOC. AMER. FORESTERS 132, 134 (Apr./May 2009).

[11] Thiago Bandeira Castelo, *Brazilian Forestry Legislation and to Combat Deforestation Government Policies in the Amazon (Brazilian Amazon)*, XVII(4) AMBIENTE & SOCIEDADE 215, 217 (Oct.-Dec. 2015).

[12] *Id.* at 229.

[13] *Id.* at 219-20 (noting "that the new text provides for the reduction of the minimum extent of [APPs] from the current 30 meters to 15 meters of marginal range, [sic] and marks the riparian forests protected from minor riverbed and not the highest level of travel water").

[14] Britaldo Soares-Filho et al., *Cracking Brazil's Forest Code*, 344 SCI. MAG. 363 (Apr. 25, 2014); See also, Federico Machado & Kate Anderson, *Brazil's New Forest Code: A Guide for Decision-Makers in Supply Chains and Governments*, WWF-BRAZIL 47 (2016) https://c402277.ssl.cf1.rackcdn.com/publications/859/files/original/wwf_brazils_new_forest_code _guide.pdf?1455912714 (indicating that this 58% reduction occurred because the New Forest Code eliminated the requirement for owners of rural land holdings of a small enough size to compensate for illegal deforestation that occurred prior to July 22, 2008).

3. Allowed state officials to significantly reduce Legal Reserve areas of the Amazon if they meet certain requirements.[15]

At the same time, the New Forest Code also produced some environmentally progressive initiatives. Most notably, it established a satellite-imagery based Rural Environmental Registry (CAR). This registry program has significant potential to facilitate vastly more effective compliance monitoring within legal forest reserve areas.[16]

Even before the New Forest Code, many programs to combat deforestation had arisen in Brazil. In 2000, Brazil created the National Forest Commission (CONAFLOR) to implement the National Forestry Program and to more broadly further the forest conservation agenda through the development and improvement of forestry laws.[17] Brazil also implemented specific programs to help with deforestation efforts, including the 2001 Preventing and Combating Deforestation, Burning, and Forest Fires program, the 2004 Action Plan for the prevention and control of deforestation in the Amazon program (PPCAD), and the 2008 Sustainable Amazon Plan.[18]

Under the auspices of CONAFLOR, the focus of the National Forestry Program changed from promoting forest protection to promoting forest development in the mid 2000's.[19] This switch of emphasis represented an effort to facilitate alliances with interest groups intent on developing and utilizing forest resources.[20] The premise behind the new policy was to promote opportunities to profit from sustainable forest resource extraction rather than to encumber profit potential through command and control regulation.

Further changes in Brazilian forestry management occurred in 2006 with the passage of Law 11,284 which created the Brazilian Forest Service (SFB).[21] The SFB was tasked with creating an information system for national forests and providing technical assistance regarding sustainable land use.[22] Law 11,284 also decentralized forest management by transferring significant autonomy to create and enforce laws related to environmental crimes from the federal government to the various state governments. Take, for example, the approval and enforcement of individual forest landowners' forest management plans being moved to the states.[23] This transfer of authority theoretically allowed for more stringent laws better tailored to individual state circumstances than federal laws would otherwise be. At the same time, the national forestry regulator – the Brazilian Institute of Environment and Renewable Natural Resources – continued to assist state governments with enforcement activities.[24]

In addition to these national programs and initiatives, Brazil has historically taken a leadership role in international efforts to combat cli-

[15]Andrea Azevedo & Tiago Reis, *Brazil's Forest Code - Assessment 2012 – 2016*, AMAZON ENVTL RES. INST. 39 (Feb. 2017), https://www.researchgate.net/publication/313226969_Brazil's_Forest_Code_-*Assessment_2012*-_2016 (noting that Article 12 Paragraph 5 of the New Forest Code allows state authorities to "reduce to 50% (fifty percent) the Legal Reserve areas, if and only [if[the state has its [Ecological-Economic Zones] approved and more than 65% of its territory occupied by conservation units of public domain and/or indigenous territories").

[16]Castelo, *supra* note 12, at 229.

[17]Bauch et al., *supra* note 11.

[18]Castelo, *supra* note 12, at 222-26.

[19]Bauch et al., *supra* note 11.

[20]*Id.*

[21]*Id.* at 135.

[22]*Id.* at 136.

[23]*Id.* at 135.

[24]Castelo *supra*, note 12, at 227.

[25]Ana Carolina Bastida, Mariano Colini Cenamo, & Gustavo Silva Chávez, *Mapping REDD+ and Land Use Financial Flows in Brazil: National and Subnational Analysis for the Period 2009 through 2016*, FOREST TRENDS REDDX 28 (Jul. 2017), https://www.forest-trends.org/wp-content/uploads/2017/09/doc_5621.pdf.

mate change through reduced deforestation.[25] For instance, within international climate change negotiations, Brazil has adopted an ambitious national target to reduce deforestation-related greenhouse gas emissions by 80% of the baseline scenario by 2020.[26] Relatedly, Brazil's national Reduction of Emissions from Deforestation and Degradation (REDD+) strategy aims to contribute to climate change mitigation by eliminating illegal deforestation and otherwise facilitating rainforest recovery.[27] The roots of this national program extend back to 2009 when all of Brazil's state governors presented their respective REDD+ strategies during COP 15 at Copenhagen in December 2009.[28] Brazil also signed a Memorandum of Understanding on deforestation with the United States in March 2010 that was intended to facilitate the exchange of practical methods to reduce emissions including carbon markets, research initiatives, and technology transfer.[29]

In 2017, Brazil officially implemented the Rural Environmental Registry (CAR), the new national land registry established under the 2012 Forest Code reforms, leading to significant reductions in the cost of forest management monitoring and enforcement.[30] To register under CAR, landowners must use high-resolution satellite imagery provided by the Ministry of the Environment to identify and register their land holdings. Once registered, the georeferenced survey maps make it much easier for the federal government to catch perpetrators of illegal deforestation.[31]

CAR was adopted relatively rapidly, indicating that the program offered net benefits for many forest landowners. Several incentives facilitated rapid initial registration rates:

1. Relatively strictly enforced fines for non-membership in certain states (notably Mato Grosso and Pará);

2. Resolution No. 3545 (2008) which required documented certification of environmental law compliance in order to qualify for low interest rate public loans;

3. Public prosecutor and Greenpeace pressure on state slaughterhouses to stop accepting cattle from producers who could not demonstrate adequate environmental law compliance; and

4. Subsidies from governmental and non-governmental organizations for the GIS surveys necessary to participate in CAR.[32]

Through these incentives, CAR has made it prohibitively costly for landowners to remain *outside* the registry in many circumstances, At the same time, the incentive structure in place to facilitate full or even substantial compliance within the system is not nearly as robust.[33] As a result, although registered land holdings initially demonstrated lower deforestation rates than unregistered ones, this trend diminished over time and varied according to property size.[34]

[26] Peter May, Brent Millikan, & Maria Fernanda Gebara, *The Context of REDD+ in Brazil: Drivers, Agents, and Institutions*, 2 CIFOR 17 (2011) http://www.cifor.org/publications/pdf_files/OccPapers/OP-160.pdf.

[27] Carlos A. Klink, The Implementation of the Warsaw Framework for REDD+ by Brazil, FED. REP. BRAZIL 17 (Nov. 2015), http://redd.mma.gov.br/images/publicacoes/wfr-brazil-2015.pdf.

[28] May et al., *supra* note 28, at 18.

[29] *Id.* at 19.

[30] Andrea Azevedo, et al., *Limits of Brazil's Forest Code as a Means to End Illegal Deforestation*, National Academy of Sciences 7653, 7654 (Jul. 18, 2017).

[31] *Id.* at 7653.

[32] *Id.* at 7654-55.

[33] See infra text accompanying notes 133-147.

[34] Azevedo et al., *supra* note 32, at 7653.

Overview of the Legal and Political Framework for Forestry in Indonesia

Like the Constitution of Brazil, the amended Indonesian Constitution explicitly mentions environmental protection and forest management. First, it states that "[e]very person shall have the right . . . to enjoy a good and healthy environment".[35] Additionally, the Constitution dictates that public resources such as forests are to be considered state property in many circumstances36 – specifically, that public land and any forest resources within it "shall be under the powers of the State and shall be used to the greatest benefit of the people."[36]

Also similar to Brazil, Indonesia has historically established strong environmental policies,[37] although the implementation of such policies and the enforcement of corresponding laws has often been weak, particularly in relation to forest management. During Dutch colonization, logging was rampant and locally controlled on all islands except for Java where it was tightly regulated.[38] In 1967, President Suharto introduced the Basic Forestry Law which placed control of most forested land throughout the country in the hands of the national government.[39] In 1970, Regulation No. 21 further established the power of the national government to assign concession rights for lumber harvesting to private individuals. Under President Suharto's leadership, these rights became more and more concentrated in the hands of a few until five large timber companies controlled approximately 30% of the country's timber concessions by the mid 1990s.[40]

With the end of Suharto's regime in May 1998, President B. J. Habibie, his successor, was eager to reform the forestry sector through a process of decentralization. He started by allowing increased local participation in lumbering activities and by empowering local government officials to grant their own small forest concessions for logging.[41] In his rush to decentralize, however, he neglected to establish strong regulatory oversight of these newly decentralized logging practices. The resulting boom in poorly regulated local timber operations led to severe corruption as moneyed concession owners agreed to support local politicians in exchange for regulatory favors.[42] As a result, many local politicians considered harvested timber "legal" as long as district taxes were paid regardless of whether that timber was extracted in compliance with national laws.[43]

Around this same time, cash crop production of other forestry products (i.e. wood pulp and palm oil) escalated substantially. Despite legal prohibitions on clearing land through burning,[44] tropical peat forests were rapidly drained and burned to make way for the creation of palm oil plantations.[45] During the 1990s, Indonesia participated in multiple international conferences, strategizing sessions, and action plans related to this issue, but the resulting "system of international cooperation" led

[35]CONSTITUTION OF THE REPUBLIC OF INDONESIA 1945, art. 28H ¶1

[36]CONSTITUTION OF THE REPUBLIC OF INDONESIA 1945, ¶33(3)

[37]Nicholas A. Robinson, *For Pete's Sake: Environmental Law Amidst the Bogs*, in IUCN ACAD. ENVTL. L. SERIES, PROTECTING FOREST & MARINE BIODIVERSITY: THE ROLE OF LAW 53, 78 (Ed Cozens, et al., ed., 2017).

[38]Krystof Obidzinski & Koen Kusters, *Formalizing the Logging Sector in Indonesia: Historical Dynamics and Lessons for Current Policy Initiatives*, 28(5) SOC. & NAT. RES. 530, 532-33 (2015).

[39]*Id.* at 533-34.

[40]*Id.* at 534.

[41]*Id.* at 535.

[42]*Id.* at 535-36.

[43]*Id.* at 536.

[44]Indonesian Law No. 32/2009 on the Protection and Management of Environment; Indonesian Government Regulation No. 4/2001 on Management of Environmental Degradation and/or Pollution linked to Forest or Land Fires.

[45]Robinson, *supra* note 40, at 78.

[46]Nicholas A. Robinson, *Forest Fires as a Common International Concern: Precedents for the Progressive Development of International Environmental Law*, 18 PACE ENVTL. L. REV. 459, 478 (2001).

to limited on-the-ground policies or laws. [46] To date, the few truly effective forest protection policies in Indonesia have been those establishing strict legal protection for High Conservation Value areas.[47] Other, weaker protective designations have mostly failed to offer significant protection from forest degradation.

In keeping with its international cooperation efforts, Indonesia signed a Voluntary Partnership Agreement (VPA) with the EU in 2013, to combat rampant illegal logging by reinforcing Indonesia's 2009 timber legality assurance system. However, this VPA is only able to reduce the damaging impacts of logging insofar as Indonesia's logging concessions laws provide sufficient protection for the rainforest and the people dependent on its resources.[48] Given Indonesia's politically influential private industry[49] and the fact that much deforestation occurs not as a result of logging but as a result of slash and burn land-clearing activities,[50] such legal protections can hardly be considered sufficient.

The President in particular and the executive branch more broadly represent the driving force of forestry, land use, and natural resource policy in Indonesia,[51] but legal regime reforms around the turn of the twenty-first century have significantly curtailed the President's ability to act unilaterally in these areas. In particular, Law No. 22 of 1999 on Regional Governance instituted significant decentralization policies within the Indonesian government, channeling significant autonomy in many sectors – including the natural resource management sector – to local jurisdictions and, to a lesser extent, state governments.[52]

As a result of this decentralization process, provincial and local government regulations can sometimes take precedence over the President's decrees and regulations. In fact, provincial and local governments can issue and enforce permits that directly contradict those of the President.[53] In such situations, the President is likely to be most effective by expressing broad policy goals through presidential decrees and then coaxing subordinate public-sector entities to set agendas and coordinate actions in pursuance of these objectives.

The balance of power tipped yet again with the passage of both Law No. 32 of 2004 and Law No. 23 of 2014, drawing some of the decentralized authority over natural resource management back up to the provincial and national government levels.[54] This shift reinstalled some of the President's original authority over forest regulation but also muddied the jurisdictional waters. The seesawing effect between national and local authority has led to contested control and resulting enforcement confusion which continues to undermine the effectiveness of applicable forestry laws and regulations.

Further limits on the President's power to enact resource policy compound the confusion. For example, the President's management power is also strictly checked by the legislative branch of government – particularly the Peoples' Representative Council (DPR). Constitutional reforms during the turn of the twenty-first century led to amendments that severely curtailed the President's historic legislative abilities.[55] Following these reforms, the

[47] Robinson, *supra*, note 40, at 79.

[48] Obidzinski & Kusters, *supra*, note 41, at 531.

[49] See infra text accompanying notes 108-112.

[50] See *supra* text accompanying notes 47-48.

[51] Ardiansyah et al., *supra* note 38, at 13; see, e.g., infra text accompanying notes 62-63.

[52] *Id.* at 6.

[53] *Id.* at 13. But see, *Id.* at 42 (noting that the national Ministry of Housing Authority (MoHA) has the power to revoke local regulations and policies that conflict with national priorities. A high proportion of rescinded local policies came from heavily reforested areas thus suggesting the local forest management policy may be especially likely to poorly align with regulations in higher levels of government.).

[54] *Id.* at 1.

[55] Cecilia Luttrell, *The Political Context of REDD+ in Indonesia: Constituencies for Change*, 35 ENVTL. SCI. & POL. 67, 69 (2014).

President can propose bills to DPR, but does not have the power to institute laws outright.[56] In addition, although the president can still enact unilateral regulations and decrees related to intended policies, they are subject to DPR scrutiny and modification.[57]

This reliance on legislative approval can prove debilitating for intended presidential reform given the coalition-based nature of Indonesia's political system. Because Indonesian parliament has never been controlled by one specific party, the president must rely on alliances with multiple parties to obtain approval for policies requiring majority vote.[58] Previous presidents have attempted to encourage as much participation as possible in a coalition style of governance, but this can lead to instability due to implicit difficulties in coordinating many parties with differing agendas and interests.[59]

Perhaps even more destabilizing, presidential regulations and decrees are subject to alteration or elimination by subsequent presidents. In order to avoid significant risk of presidential successors overriding these presidential decrees, a sitting president must convince the DPR to convert presidential decrees and regulations into more permanent governmental regulations.[60]

At the same time, having the support of a large funding institution can make it politically infeasible for parliament to oppose policies even if it does not support them. For example, President Yudhoyono announced that Indonesia would be implementing carbon emission reduction targets in 2010 and then signed a Letter of Intent for financial support with the Norwegian government.[61] This agreement required the President to impose a moratorium on issuing new licenses to companies intent on degrading peatland and other forested lands. He enacted this moratorium without input from the legislature, but it has nevertheless remained in place.[62] As such, it seems probable that Parliament either implicitly endorses this moratorium or that the economic incentives involved in Norway's financial pledge have made legislative alterations to this moratorium difficult to enact politically.

Beyond the presidency, the wider executive branch also experiences significant checks on its forest management policy-making abilities. Although the Ministry on Forestry and the Environment has ultimate authority to administer public lands and forests, conflicts with local jurisdictions following the decentralization of Indonesian governance have hindered its effectiveness.[63] Additionally, it has a conflicting dual mandate to both increase Indonesia's exports and to simultaneously put regulations and policies into place that preserve forest resources.[64] Trying to balance both of these interests through an effective regulatory scheme can be difficult. Partly due to the difficulty in creating regulations that appease this dual mandate, Indonesia has created an overly complex regulatory system that

[56] Ardiansyah et al., *supra* note 38.

[57] Luttrell, *supra* note 58, quoting Koichi Kawamura, *Is the Indonesian President Strong or Weak?*, INST. DEV. ECON. 23 (2010) ("[A]ny president wishing to implement his own policies has needed to obtain approval in the form of parliamentary legislation.").

[58] Luttrell, *supra* note 58.

[59] *Id.*

[60] Ardiansyah et al., *supra* note 38, at 13.

[61] Luttrell, *supra* note 58.

[62] *Id.*; see also Robinson, *supra* note 40, at 59-60, 83 (noting a lack of resources devoted to implementation of this moratorium led to insufficient enforcement. Some new concessions were thus created despite the moratorium although the overall rate of new concessions went down.).

[63] Ardiansyah et al., *supra*, note 38, at 72.

[64] *Id.* at 18.

[65] Vice Minister of National Development Planning, I*ndonesia Revised Draft REDD+ Strategy 8* (Sept. 24, 2010), https://www.unredd.net/documents/un-redd-partner-countries-181/asia-the-pacific-333/a-p-partner-countries/indonesia-187/national-programme-implementation-technical-including-tors-1547/national-redd-strategy-1700/3419-indonesia-s-national-redd-strategy-draft-1-revised-3419.html (noting that forestry regulations must be clarified and condensed in order to address the

its governmental ministries are ill-equipped to enforce.[65]

Compounding these difficulties, President Joko Widodo, who replaced President Yudhoyono in 2014, combined the original Ministry of Forestry with other ministries in 2015, thereby creating the new Ministry on Forestry and the Environment (MoEF).[66] The new expansive mandate for MoEF left the mandate and priorities for forest management somewhat opaque. In 2015, President Joko Widodo gave an indication of the low importance he places on forest management by discontinuing the Reduction of Emissions from Deforestation and Degradation (REDD+) agency.[67] He promised to reestablish REDD+ under MoEF, but exactly how it will fit into this new institutional structure remains unclear.[68]

Challenges for Brazil's Forestry Policy

The major challenge for the future of Brazil's forest management regime is in matching up its strong forestry legislation with strong enforcement capacity. For example, low permanent personnel numbers as well as inadequate operating budgets have created a general impression that enforcement agencies lack capacity to punish those who fail to abide by forest management policy provisions.[69] Exacerbating the problem further, the Brazilian Forest Service (SFB) does not even have the authority to hire permanent workers, just temporary ones.[70] Furthermore, the states with the least enforcement capacity tend to be the vast Amazon states which experience the most logging issues.[71] The resulting lack of institutional presence has contributed significantly to continued illegal deforestation.[72]

In addition, the lack of consistent punishment diminishes the effectiveness of Brazil's forest management policies. Most illegal deforestation fines go unpaid and illegal logging equipment goes unconfiscated due to overburdened courts, an overly complicated review process, and loopholes in enforcement laws.[73] These issues are often compounded by elements of regulatory capture that allow political patronage groups aligned with the timber industry to obtain favorable policies and decisions at the local level.[74]

Delays in regulatory rollout are also hindering the efficacy of Brazil's forest management policies. For example, only states with completed forest management plans and rainforest inventories can receive bids for federally approved private concession project sites.[75] Although SFB has contracted several inventories and is developing corresponding sustainable forest management plans, the time necessary to conduct these activities is substantial.[76] As a result, program implementation has encountered significant delays.[77]

Rollout of financial support for deforestation policies has also been slower than optimal. The main program for REDD+ finance in Brazil is called the Amazon Fund. The governments of Norway and Germany, as well as the state-owned Brazilian corporation, Petrobras, contribute compensa-

"sheer number and complexity of overlapping, inconsistent, and contradictory regulations in the forest sector which provide ample opportunity for administrative corruption").

[66] Indonesian Presidential Regulation No. 16 of 2015.

[67] Ardiansyah et al., *supra* note 38, at 23.

[68] *Id.*

[69] Bauch et al., *supra* note 11, at 136.

[70] *Id.*

[71] *Id.*

[72] May et al., *supra* note 28, at 20.

[73] *Id.*

[74] *Id.*

[75] Bauch et al., *supra* note 11, at 137.

[76] *Id.*

[77] *Id.*

tion donations to the Amazon Fund. In theory, the donated money is then disseminated to specific reforestation activities[78] including support for small-scale farming, satellite monitoring, research, traditional communities, stakeholder engagement, institutional strengthening, etc.[79] However, onerous bureaucracy and processing inefficiencies have been the cause of delays in distributing funds to these projects.[80] As of 2016, only a little over 50% of the 1 billion USD disbursed into the Amazon Fund had been distributed to institutions.[81]

This poor dispersal of funds has led to a wide gap between the amount of payment for emissions reduction and the actual reductions achieved within the country. Payments from the Amazon Fund to Brazil for reductions amount to less than 10% of what Brazil has actually been able to achieve.[82] This underpayment is likely a contributing factor to the increase in deforestation that occurred in 2015 and 2016 after years of declining rates.[83] To make matters worse, Brazil's economic recession has cut the internal government budget for reforestation strategies substantially.[84] The policies that were so helpful in bringing down Brazil's deforestation rate by 75% during the early twenty-first century[85] are unlikely to continue being so successful in the wake of these financial problems.

Fundamental issues related to enforcement capacity are not the only problems Brazil faces in relation to its forest management practices. Several other factors embedded in Brazil's policy and regulatory frameworks represent obstacles to successfully implementing its forestry policies.

First, numerous, demanding regulations are impractical or impossible for forest operators to reasonably satisfy.[86] This problem is only exacerbated by the confusing jurisdictional changes that Brazil has undergone in the twenty-first century both in relation to decentralization and to legislative reform.[87] In addition, Brazil's Rural Environmental Registry (CAR) program has unrealistic expectations for compliance given the incentive structures it has put in place.[88]

Second, land tenure may not always be easy to identify or may be disputed particularly in indigenous peoples' territories.[89] REDD+ is difficult to implement when it is not clear to whom accountability should be assigned for a particular piece of land. This challenge exists both in terms of potential punishment for deforestation activity and in terms of potential payments for abiding by forest restoration requirements.[90]

Third, weak environmental safeguards in other sectors may counteract reforestation efforts.[91] For instance, every kilometer of road built through the Brazilian Amazon leads to approximately 400 – 2,000 hectares of destroyed rainforest.[92] Additionally, large-scale infrastructure projects, persistent credit programs that promote rural cattle farms, and the globalized trade in Brazilian com-

[78] Bastida et al., *supra* note 27, at 8.
[79] *Id.* at 11.
[80] *Id.* at 3.
[81] *Id.* at 8.
[82] *Id.* at 28.
[83] *Id.*
[84] *Id.* at 13.
[85] *Id.* at 12.
[86] Arnoldo Contreras-Hermosilla, *People, Governance and Forests – The Stumbling Blocks in Forest Governance Reform in Latin America*, 2 FORESTS 168, 171 (Nov. 2. 2010).
[87] See *supra* text accompanying notes 10-17, 23-26.
[88] 89 See infra text accompanying notes 132-146.
[89] Contreras-Hermosilla, *supra*, note 89, at 173.
[90] May et al., *supra*, note 28, at 31.
[91] Contreras-Hermosilla, *supra*, note 89, at 174.
[92] *Id.*

modities such as minerals and soybeans all link to Brazil's rate of deforestation.[93] Different ministries within the government often have diverging priorities and objectives, further exacerbating this issue. As an example, the Ministry of Agriculture has forecasted significant increases in livestock production and beef exports of 52% and 93% respectively over the coming decade.[94] Meanwhile, the Ministry of Environment has set a goal of obtaining 40% of Brazil's target carbon emissions baseline reductions from decreased deforestation.[95] Reconciling this predicted increase in livestock production with deforestation reduction goals will undoubtedly prove difficult,[96] particularly given the National Forestry Program's recent switch of emphasis from forest protection to forest development.[97]

Fourth, recent jurisdictional reforms may threaten existing environmental protections.[98] For example, Law 11,284's decentralization of natural resource policies creates particular challenges for REDD+ in Brazil. These challenges vary depending on context but often involve inadequacy of institutional capacities for enforcement, a lack of transparency in implementation, and elite capture of benefits.[99] In addition, Brazilian states' newly established authority to adjust standards for Permanent Preservation Areas under the New Forest Code threatens the protected status of many forested locations.[100]

Challenges for Indonesia's Forestry Policy

Unlike Brazil, Indonesia's major challenge lies not in refining the enforcement of its regulations but in fully establishing a robust regulatory framework for forest governance. In particular, the rapid decentralization of Indonesia's government since 2001 has led to many challenges for instituting robust forestry policies. For one, governance structures were not clearly laid out during decentralization, leaving division of power largely ambiguous between various levels of government.[101] The legislative shift of certain oversight and management authority back to the federal government through Law 32 in 2004 and through Law 23 in 2014 was intended to remedy this issue,[102] but it ultimately created further jurisdictional confusion.[103] Another challenge is that decentralization (along with thorough legislative oversight) hinders the policy-making ability of the President to fulfill his mandate of creating effective natural resource management policy.

The jumbled nature of Indonesia's forestry policy significantly undermines market-based efforts to protect its rainforests. Indonesia's efforts to reduce deforestation (including those under the REDD+ program) are focused primarily on the commodification of forest ecosystems in attempts to conserve the resources that they provide. Such neoliberal policies rely on strong legal structures and governance capabilities as preconditions to

[93] May et al., *supra*, note 28, at 33-34.

[94] *Id.* at 34.

[95] *Id.*

[96] *Id.* at 34-35.

[97] See *supra* text accompanying note 20.

[98] May et al., *supra* note 28, at 26. See also, Contreras-Hermosilla, *supra*, note 89, at 187. (noting that overlapping jurisdictions among Brazil's federal, state, and municipal governance structures can lead to disputes and confusion).

[99] 100 *Id.* ("The recent rush to decentralize forest policy from the federal to state governments in the Brazilian Amazon, without due attention to problems of weak governance in the region has important implications that may undermining the success of REDD+").

[100] 101 See *supra* note 14 and accompanying text.

[101] Luttrell, *supra*, note 58, at 71.

[102] See *supra* text accompanying note 57.

[103] Luttrell, *supra*, note 58; *Id.*

[104] Bernice Maxton-Lee, *Material Realities: Why Indonesian Deforestation Persists and Conservation Fails*, 48:3 J. CONTEMP. ASIA, 419, 420 (2017) https://scholars.cityu.edu.hk/en/publications/material-realities-why-indonesian-deforestation-persists-and-conservation-fails(6b5fcaf3-a2b9-4df7-a70d-0e3d69728170).html *citing*, e.g., Boucher, D., P.et al., *Deforestation Success Sto-*

achieve reductions in tropical rainforest deforestation.[104] Because Indonesia struggles with regulatory coherence and capacity to effectively institute its governance frameworks, however, such economic policies may lead to ecologically destructive effects.[105]

These destructive effects may come about in many ways. One way is through profit-seeking entities taking advantage of regulatory incoherence and poor enforcement. For example, programs like REDD+ and the Roundtable on Sustainable Palm Oil (RSPO) attempt to financially reward companies that take steps toward forest conservation either directly (typically through payments) or indirectly (typically through certifications).[106] However, these programs are plagued with difficulties particularly related to oversight and verification. Industry actors have strong incentives to cover up potential transgressions of program standards, and auditors often face similar pressures to look the other way due to some combination of insufficient capacity, a willingness to assume industry's good faith behavior by providing benefit of the doubt assessments, or outright collusion.[107] These pressures may be coming not only from industry actors but also from local government officials keen to see economic boosts from industry activity.[108] In addition, despite structures created within these programs to ensure multi-stakeholder engagement, companies seeking a particular certification or reward tend to dominate the conversation.[109]

Relatedly, corruption in the natural resources sector threatens to undermine REDD+ and other deforestation reduction efforts. Political appointments for industry executives as well as "complex and informal webs of influence and exchange"[110] between government and industry tycoons are emblematic of this corruption.[111] Evidence exists that parliamentary decisions are driven largely by industry rather than by voters. Furthermore, of Indonesia's twenty-one billionaires, sixteen earned their fortunes through oil palm plantation investments,[112] and certain companies maintain historic close ties with decision makers in government agencies related to the forestry sector.[113] To circumvent powerful and corrupt vested interests in governmental ministries, ad hoc programs such as the REDD+ Task Force often arise to conduct the boots-on-the-ground implementation work with which higher level agencies have been tasked.[114] Such programs may work to an extent as a second best solution, but they typically involve a high level of institutional inefficiency.

ries: Tropical Nations Where Forest Protection and Reforestation Policies Have Worked. UNION CONCERNED SCIENTISTS (2014) http://www.ucsusa.org/sites/default/files/legacy/assets/documents/global_warming/ deforestation-success-stories-2014.pdf. (noting the success of such policies in the context of Brazil).

[105] But see, *Id.* at 419-20 (arguing that even with strong legal structures and governance capabilities, neoliberal market mechanisms will fail to avoid "significant destructive ecological outcome[s]").

[106] *Id.* at 433.

[107] *Id.*

[108] *Id.* at 434, 437 ("Underpinning any discussion about forest use and conservation is a conviction among many ministers and industry actors that restrictions on forest use go against the national interest or damage sovereignty.").

[109] *Id.* at 434; John F McCarthy, *Certifying in Contested Spaces: Private Regulation in Indonesian Forestry and Palm Oil*, 33(10) THIRD WORLD QUARTERLY 1871, 1878-79 (2012).

[110] Luttrell, *supra*, note 58, at 71 (quoting E. Aspinall & G. van Klinken (Eds.) THE STATE AND ILLEGALITY IN INDONESIA, (2010)).

[111] *Id.*

[112] *Id.*

[113] *Id.*

[114] *Id.* at 70; see also, Schutte, S.A., *Government Policies and Civil Society Initiatives Against Corruption*, in Bunte, M., Ufen, A. (Eds.) DEMOCRATIZATION IN POST-SUHARTO INDONESIA, CONTEMP. SE ASIA SERIES, 81, 97 (2009) ("There is a tendency in Indonesia to create new task forces and commissions, instead of holding leading officials accountable for the lack of progress.").

Comparison of Forestry Policy in Brazil and Indonesia

Brazil and Indonesia are both part of the Global Forest Legislation Initiative, a collaboration intended to facilitate strong forest governance across participating countries.[115] Both countries have environmental preservation and, more specifically, forest management provisions in their respective constitutions and legislative frameworks.[116] Furthermore, both have also signed agreements with Norway to protect their respective rainforests in exchange for money through the REDD+ program.[117] Yet, Brazil and Indonesia continue to encounter difficulties in achieving consistent, effective rainforest protection.

In some ways, their difficulties are very similar:

1. They both have recently decentralized, leading to weakened or unclear environmental protection regimes.

2. They both lack clarity on crucial issues such as land tenure rights or overarching governance structures, thus hindering the optimal implementation of their respective forestry policies.

3. Competing incentives from various government agencies and industry in both countries threaten to reduce forest protections.

4. They both lack capacity or motivation to adequately enforce the laws and regulations they have put in place.

There are many things that both countries could do to chip away at these shared problems. Regarding the first and the second, one approach that both countries could take would be to enhance their existing national-level policies to better accommodate unique local situations and regulatory regimes. For decentralized forestry policy to work, states need to feel empowered and capable of regulating themselves. The national government should facilitate these sentiments through an appeal to community buy in, supporting capacity building in regions where it is necessary while focusing on more facilitative policies where it is not.[118] Not only would such a "bottom-up" approach potentially help reduce regulatory confusion, but a corresponding increase in local ownership and involvement would also potentially increase the likelihood of compliance. Even better, these interventions are not outside the realm of feasibility. The decentralized governance systems in Brazil and Indonesia could actually help facilitate such a strategy.[119] At the same time, in order to better harmonize rules across jurisdictions and to avoid a regulatory race to the bottom, the two national governments could install federal regulatory floor requirements for all regional or local forest management policies.[120] These minimum requirements would serve as a response to the third difficulty by helping ensure a base level of risk-alleviating, regulatory uniformity (leading to predictability for the benefit of industry players) while also allowing more ambitious regions, states, or municipalities to increase environmental protection standards if desired.

Of course, these proposed solutions would come with many difficulties of their own and would not offer complete solutions. In Indonesia in particular, the many checks on the executive branch's power to enact forestry policy would make such national-level changes challenging. Both Indonesia

[115] Ludovino Lopes, *A Review of Forest Legislation in Four Countries*, GLOVE FOREST LEGISLATION STUDY 1 (2013), http://www.climatefocus.com/sites/default/files/GFLI-Study-1st-edition-Executive_Summary.pdf.

[116] See *supra* notes 5-17, 37-43, and accompanying text.

[117] Richard Milne, *Norway: Environmental Hero or Hypocrite?* FINANCIAL TIMES (May 6, 2016), https://www.ft.com/content/6c984298-12bc-11e6-bb40-c30e3bfcf63b.

[118] Lopes, *supra*, note 118, at 32.

[119] Id; see also, *supra* note 26 and accompanying text (noting that Brazil's decentralization process has established a framework for this strategy).

[120] *Id.*

and Brazil would face resource limitations, industry pushback, and other obstacles.

In the same way, efforts to address the fourth difficulty by attempting to increase enforcement would be unlikely to provide a complete solution due to the remoteness and inhospitable terrain of the rainforest in both Indonesia and Brazil.[121] Diminishing rates of return from continuously increasing monitoring efforts suggest that economic cost-benefit considerations will preclude the complete elimination of possible deforestation detection loopholes and blind spots. In addition, criminal penalties for deforestation tend to more heavily punish the least powerful drivers of the harm (i.e., local timberman or small-scale landowners). As such, penalty shifting toward larger scale drivers of illegal deforestation would be crucial for effective and equitable enforcement of forestry law.[122] Alternatively, local empowerment activities that counteract deforestation incentives (e.g., community forestry programs, benefit sharing arrangements, and equitable forest ownership initiatives) would likely prove more effective than strict criminal enforcement paradigms in the long run.[123] Such programs, however, require significant capacity, including large financial and human capital investments that Brazil and Indonesia are unlikely to procure easily.

Despite the significant similarities in many of their forest management issues, on a more fundamental level, Brazil and Indonesia differ in their struggles with forest governance. Brazil is currently working through difficulties related to establishing the right incentive structure to ensure widespread compliance with its already developed laws and regulations.[124] Indonesia, on the other hand, is still struggling to create a clear and effective legislative and regulatory framework for forest governance despite already having strong environmental legislation on the books.

One of the main reasons the various forest management reforms and initiatives that Brazil has developed over the last few decades have lasted so long is because of widespread citizen approval. For example, the 2004 Action Plan for the Prevention and Control of Deforestation in the Amazon (PPCAD) garnered broad support both from the public and from high-levels of government. Strong collaborative linkages across thirteen governmental ministries – as well as two federal policing agencies and the nation's armed forces – buoyed forest governance initiatives in the face of grumblings from vested interest groups.[125] In line with broad public support for forest protection, over 19 million hectares of Brazilian rainforest were designated as federally protected land between 2003 and 2008.127 Estimates indicate that 36% of the reduction in deforestation rates between 2004 and 2008 can be directly attributed to these designations of protected lands.[126]

Indonesia, on the other hand, has not been able to similarly develop a citizen-supported, integrated forest management legal framework for many reasons. First, the President, as the main driver of forest management policy, is checked by legislative oversight and decentralization processes.[127] The influence that private industry has over the policy-making process[128] means that presidential policy development for forest management is only possible if it is both incremental and supported by some level of industry buy in. The resulting watered-down legislation leads to a weak and confusing le-

[121] *Id.* at 33.
[122] *Id.*
[123] *Id.*
[124] *Id.* at 30.
[125] Contreras-Hermosilla, *supra*, note 89, at 192.
[126] *Id.* at 44.
[127] See *supra* text accompanying notes 55-62.
[128] See *supra* text accompanying notes 109-112.
[129] Robinson, *supra*, note 40, at 80 (stating that "training and equipping environmental law enforcement authorities in a nation as

gal framework quite different from Brazil's more robust forest management governance structure.[129] As a result, there is a lack of regulatory and legislative strength to bridge the gap between aspirational national forest policy and local incentives for citizens to illegally exploit the natural resources available to them.[130]

In lieu of substantial forestry legislation, Indonesia primarily relies on a makeshift "private regulation" system in which international consumers' increasing demands for sustainable supply chains and for rainforest preservation have encouraged industry actors to self-regulate through participation in certification schemes.[131] Unfortunately, the monitoring and evaluation processes that grow out of such private regulation struggle to accommodate interests at all scales and within various sectors.[132] Brazil also uses similar private regulation approaches, most notably in the certification processes embedded in programs like REDD+, but combines such approaches with a robust regulatory framework to effectively scale and distribute incentives and benefits. Without similar fortifying regulations, Indonesia is not able to use its private regulation approaches as successfully.

Another important difference between the forest management struggles of the two countries relates to recent governance shifts that have exacerbated already existing difficulties for each country. In the case of Indonesia, President Joko Widodo's discontinuation of the REDD+ agency and general restructuring of governmental ministries related to environmental protection a few years ago have made the national government's regulatory authority unclear in many circumstances. This lack of clarity only compounds the jurisdictional confusion brought about through the decentralization process during the turn of the twenty-first century. Unfortunately, Indonesia is in desperate need of the opposite: more transparent allocations of enforcement authority for environmental regulations. As a result, these contemporary reforms to Indonesia's environmental regulatory framework represent a step away from effective forestry management.

Recent reforms in Brazil – namely the 2012 Forest Code reforms – similarly highlight and compound the struggles with forestry governance that Brazil is already facing, although these difficulties are distinct from those of Indonesia. At first glance, it may seem that the "New Forest Code" is something of a mixed bag, providing some improvements and some setbacks. After all, the New Forest Code did establish the CAR system for satellite-imagery based monitoring to enforce REDD+ compliance. Yet, the obstacles to effective environmental governance that this legislative reform created undercut any improvements in monitoring.

Forestation policies in Brazil have led to success historically, reducing deforestation rates by as much as 75%.[133] This past success implies that the low hanging fruit for deforestation reduction has already been achieved. Thus, in order to obtain further deforestation reductions, programs like REDD+ need to look in harder to reach places. The New Forest Code attempts to do so but ultimately shoots itself in the foot by creating incentives that discourage compliance with its own provisions.

To remain in full compliance with the CAR program, landholders must also remain in full compliance with the 2012 New Forest Code which requires them to maintain a certain percentage of owned land with its natural vegetation.[134] Many farmers with smaller land holdings felt heightened government scrutiny when they first registered un-

large as Indonesia proceeds too slowly to cope with the pace of illegal peat area conversion").

[130] McCarthy, *supra*, note 112, at 1885 (noting that local institutional incentives will "usually be incompatible" with the post-materialist concerns commonly embedded in the president's forestry mandates which have been primarily reflective of regulatory certification processes developed overseas).

[131] *Id.* at 1871.

[132] *Id.* at 1886.

[133] See *supra* text accompanying note 88.

[134] Azevedo, et al., *supra*, note 32, at 7653.

der CAR but that feeling seems to have dissipated over time, often to the point where the benefits of minimal clearing activities outweigh the risk of disciplinary fines.[135] The emerging strategy for illegal lumbering in CAR zones is to cut high-value trees sparsely so that harvest is not easily apparent using remote sensing monitoring techniques.138 Federal and state officials have confirmed that logistical difficulties in inspecting on-site deforestation events forestall close monitoring and punishment of such behavior. The resulting lack of prosecution for illegal timber harvesting quickly leads to diminished compliance. Thus, many landholders – even those within the CAR system – are engaging in small-scale, unlawful deforestation practices with the realistic expectation of impunity.[136]

Furthermore, full compliance with CAR requires more than just conservation and deforestation prevention. Law 12,651 of 2012 which established the New Forest Code imposes an obligation on land-owners to *remediate* previously forested land that they own even if they did not actually cause the degradation themselves.[137] When deciding whether or not to comply with this aspect of the CAR program, farmers take into account compliance incentives, restoration costs, opportunity costs of foregone agricultural activities on the deforested land, the likelihood of legal regime change, and the likelihood of being caught and fined for noncompliance.[138]

This cost-benefit analysis typically leans even further toward non-compliance than decisions related to whether to comply with deforestation prohibitions. Economic rewards for compliance are relatively minor (a 15% increase in available subsidized loans), risks of punishment are low, and costs (both in terms of reforestation costs and opportunity costs related to foregone timber and agricultural products) are often prohibitively high.[139] Absent a strong incentive like the soy and beef moratoria on non-CAR registered products,[140] farmers are unlikely to comply with restoration requirements because of these strong countervailing incentives.[141]

Motivations to comply with land remediation requirements are weak not only because the corresponding economic benefit is too low but also because it can only be achieved through full rather than incremental compliance. Currently, there is no financial incentive to remediate denigrated land unless the landholder can remediate enough of it to obtain the Legal Reserve percentage threshold. In fact, this policy creates perverse incentives in at least two respects. (1) It encourages land holders to sell denigrated land on the market place rather than attempting to obtain relatively miniscule benefits under the CAR forest restoration program. (2) It encourages good faith land holders to avoid buying new tracts of denigrated land in case those tracts may push them under the Legal Reserve percentage threshold across all of their land holdings.

In addition, the 2012 revisions to the Forest Code have further weakened incentives for full compliance with CAR in the following ways:

1. They forgave fines for illegal deforestation that occurred prior to 2008, and

2. They decreased the area required for restora-

[135] *Id.* at 7655-56.

[136] Azevedo, et al., *supra*, note 32, at 7656.

[137] Fajardo Cavalcanti de Albuquerque, *supra*, note 7.

[138] Azevedo, et al., *supra*, note 32 at 7656.

[139] *Id.*

[140] May et al., *supra*, note 28 at 17 (noting that these moratoria were extended in 2010 despite countervailing pressure from rising soy prices and producer interest in planting new soy plantations).

[141] Azevedo, et al., *supra*, note 32, at 7656 ("Only 6% of landowners with forest debts in Pará and Mato Grosso reported that they were taking the necessary measures to compensate or restore their Legal Reserves, whereas 76% affirmed that they would only compensate or restore if coerced to do so through government fines or market incentives.").

[142] See *supra* notes 14-16 and accompanying text.

tion and preservation by varying amounts dependent on the region.[142]

This lowering of standards and amnesty for prior illegal behavior discouraged compliance with CAR requirements because it basically forgave noncompliance. In addition to providing an economic payoff to illegal deforesters before 2008 and implicitly punishing those who complied with the deforestation laws, these reforms also decreased incentives to comply with the Forest Code writ large because of the potential expectation that it will continue to weaken over time.[143] Stricter monitoring and enforcement through personnel increases and improvement in satellite monitoring technology could potentially counteract this perception in the future, but these developments have not yet occurred.[144]

Thus, the New Forest Code exacerbates Brazil's biggest current problem in forest management: the failure to fine-tune regulations to ensure optimal compliance with its robust management framework. It represents a step away from a maximally effective forest management program in Brazil.

At the same time, it is worth considering what such a "maximally" effective forest program would look like. In relation to the rainforest restoration requirement under the CAR program in Brazil, 18% of surveyed landholders "said they would never compensate or restore their forest debts" even if faced with severe restrictions on their forest products imposed by both private and public actors.[145] Thus, it seems that even incredibly strong enforcement could never ensure full compliance with the requirements of the CAR program, presumably because those requirements are too lofty given current incentive structures.

In the context of Indonesia, similarly ambitious goals have been co-opted by bad faith actors who feign environmental stewardship. The Indonesia Palm Oil Pledge (IPOP) was established in 2014 as a partnership of major private sector industries in the palm oil sector. The stated goal of the initiative was "to work towards sustainable palm oil that is deforestation free, respects human and community rights and delivers shareholder value through collaborative multi-stakeholder efforts."[146] Yet, due to a misunderstanding of the complexities involved in their own supply chains, many of the participants committed to achieve untenable goals, such as blanket prohibitions on deforestation regardless of forest type.[147] Although one might praise these organizations for making such high-minded commitments despite the difficulties in obtaining them, a more cynical observer may accuse them of setting targets they never intended to achieve in order to placate their increasingly sustainability conscious consumer base.

Given these considerations, it seems as though incentive structures based on unrealistic targets may be counterproductive in many circumstances. By assuaging environmentally concerned actors without any significant increase in actual environmental protection, they threaten to act as a placebo when real medication is required. Perhaps providing rewards (or requirements) for incremental improvements in environmental stewardship may be a more effective way to achieve real environmental results despite the resulting loss of aspirational idealism.

Conclusion

Brazil and Indonesia share many similarities both in the structure of their respective forest governance systems and in the corresponding issues these systems face. At a macro scale, the primary difference between the two rests in the fact that Brazil has a more firmly situated system of forestry governance than Indonesia. Yet, both countries struggle with

[143] Azevedo, et al., *supra*, note 32 at 7656.
[144] *Id.* at 7657.
[145] *Id.* at 7656.
[146] Maxton-Lee, *supra*, note 107.
[147] *Id.* at 15-16.

similar lack of enforcement capacity, lack of clarity on crucial aspects of forestry policy, complications resulting from recent jurisdictional reform, and difficulty in creating appropriate incentives for regulatory compliance.

One of the more interesting similarities between the two countries is the ambitious targets found in their respective governance systems.[148] Despite this ambition, Indonesia and Brazil create poor incentives for changing behavior – Brazil by setting difficult-to-reach objectives for individual landowners that risk alienating even initial attempts to achieve them[149] and Indonesia by neglecting to establish a clear and well-enforced regulatory framework that requires citizens and industry to take its deforestation goals seriously. In order to live up to their impressive forest management aspirations, Brazil and Indonesia will first have to find ways to address these respective issues.

[148] See *supra* text accompanying notes 3, 4, 98, 153.
[149] See *supra* text accompanying notes 138-151.

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