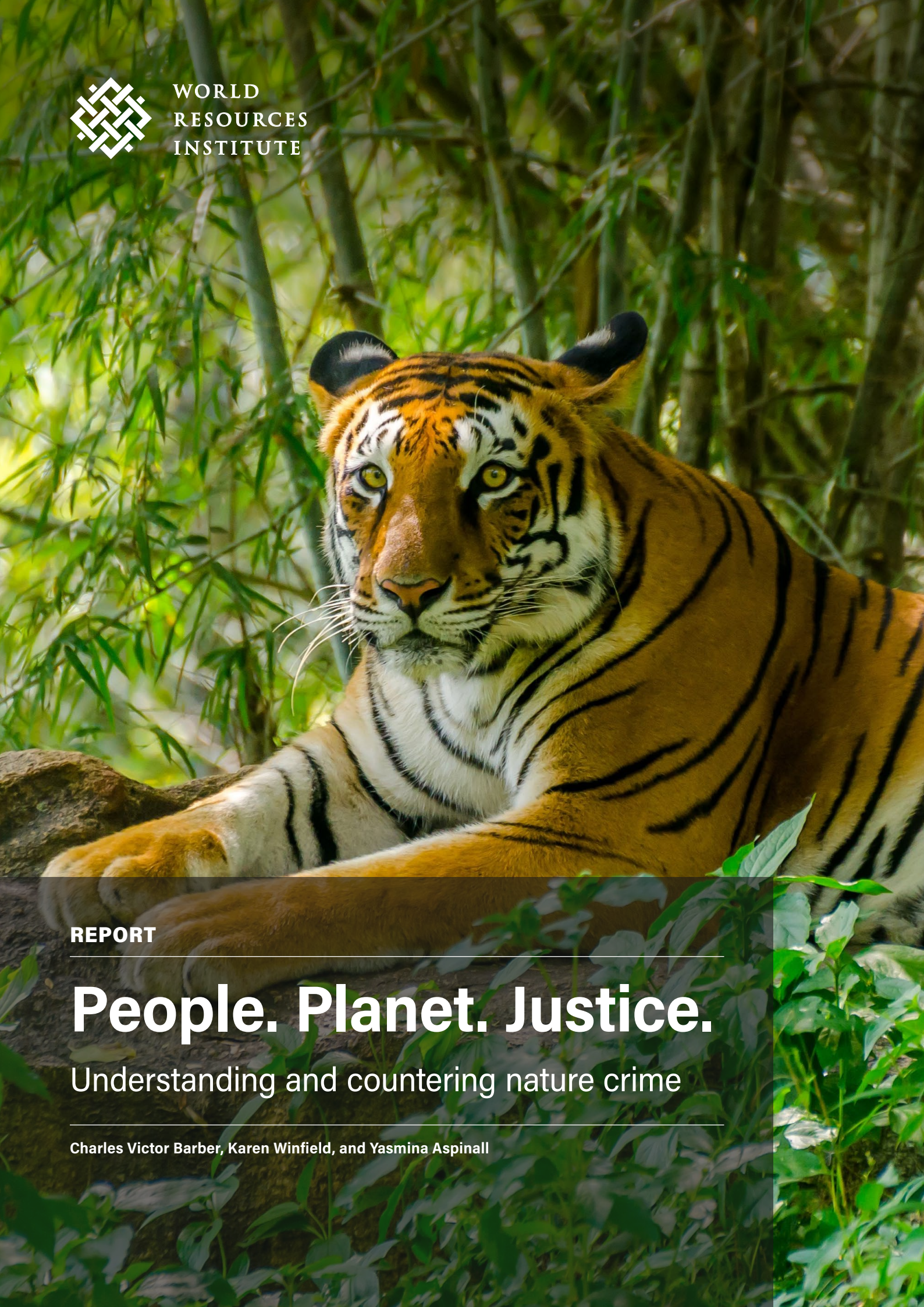

WORLD RESOURCES INSTITUTE

REPORT

People. Planet. Justice.

Understanding and countering nature crime

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Foreword

The world's most biodiverse and carbon-rich lands are under attack. Even if regulations are put in place to protect our natural ecosystems, they remain vulnerable to "nature crimes" — wildlife trafficking, land grabbing, and illegal logging, fishing, and mining.

Fueled by corruption, organized crime, and extreme inequality, nature crime damages far more than our natural ecosystems. It robs local communities and governments of resources and revenues. The perpetration of nature crime also undermines good governance and often converges with human rights abuses, particularly against Indigenous Peoples, journalists, and other frontline environmental defenders. Without effectively tackling nature crime, it will be difficult for the world to meet its commitments for people, nature, and climate.

Initially recognizing the challenge of illegal logging fifteen years ago, the World Resources Institute (WRI) launched and hosted the Forest Legality Alliance, a public-private partnership to strengthen efforts to ensure the legality of tropical timber exports and imports. More recently, we have expanded our scope to include work to combat illegal mining, fishing and wildlife trade, as well as illegal forest conversion for industrial-scale agriculture.

Nature crime is a growing global threat, intersecting with corruption, environmental degradation, and organized crime. To build a comprehensive response, WRI led the development of the multi-stakeholder Nature Crime Alliance—partnering with international organizations like Interpol, UN agencies, governments, and civil society. Launched in mid-2023, the Nature Crime Alliance has raised the political visibility of nature crime, mobilized funding to tackle the issue, and promoted partnerships to increase our collective capacity to prevent, detect, and suppress it.

Understanding the complexities of nature crime is a crucial step toward combating it effectively. This report provides a comprehensive overview of the current state of nature crime globally. It identifies how these crimes are committed and their connection to other organized criminal activities, like financial crime, corruption, and human rights violations.

The report also highlights successful solutions already underway, offering hope in tackling the criminal networks that profit from the destruction of nature. This includes an overview of potential strategies for combating nature crime, from strengthening international frameworks, to ramping up enforcement cooperation, to harnessing emerging technologies. On the ground, members of civil society, Indigenous Peoples, and local communities are critical stakeholders and partners in this fight.

Our task to protect people and nature becomes exponentially more challenging by the pervasive impacts of crime and corruption. But with more information, we can identify the solutions needed. We hope this analysis can underpin and support coordinated global efforts to tackle these crimes—crimes that, directly or indirectly, affect us all.

ANI DASGUPTA
President & CEO
World Resources Institute

Executive summary

This report analyzes five types of nature crime and their frequent convergence with other forms of criminal activity, including financial crimes, corruption, and human rights violations. It recommends strategies and solutions for policymakers, donors, and civil society organizations seeking to eradicate nature crime and its threat to people, planet, and justice.

HIGHLIGHTS

- Illegal logging, fishing, mining, wildlife trafficking, and land grabbing—"nature crime"—presents a critical barrier to conserving biodiversity, mitigating climate change, protecting human rights, and promoting sustainable development.
- Many places that are central to retaining and conserving biodiversity and ecological integrity, maintaining critical carbon stocks and ecological processes, and sustainably feeding 9 billion people are often lawless territories, beset with corruption and scarred by extremes of wealth and poverty and intimidation and violence against environmental and human rights defenders.
- Nature crime is frequently linked to financial crime, fraud, corruption, and labor and human rights violations. Although the natural resources targeted by nature crime lie largely in developing countries and in the ocean, criminal syndicates, rogue corporations, financiers, consumers, and other ultimate beneficiaries of nature crime are mainly tied to developed countries and markets as well as to elites within developing countries.
- Effectively preventing, reducing, and combating nature crime requires five broad strategies: strengthening national and international legal frameworks and enforcement mechanisms; reducing corruption; combating financial crime linked to nature crimes; protecting the rights of workers, rural communities, and Indigenous Peoples and empowering civil society; and deploying innovative tools and technologies to fight nature crime.

RESEARCH PROBLEM

A significant body of material and reporting concerns the nature, scope, and impacts of crimes affecting the environment, including what this report terms *nature crime*—illegal forms of logging, forest occupation and conversion, fishing, gold mining, and wildlife exploitation and trade. Much of that body of information and analysis, however, consists of either very detailed case studies on particular crime types and geographies or very broad journalistic and "gray literature" snapshots or surveys. This report seeks to strike a middle ground, systematically analyzing these five crime types as well as their frequent convergence with each other and with related financial crimes, corruption, and human rights violations. Based on that review and analysis, the report also recommends strategies and solutions for policymakers, donors, and civil society.

METHODOLOGY

This report was researched and written between 2021 and 2024 in the course of developing and launching the Nature Crime Alliance hosted by World Resources Institute. The lead author and colleagues interviewed some 150 people and conducted small convenings on various nature crime subtopics. The list of Nature Crime Alliance members provides a good representative sample of the organizations consulted (Nature Crime Alliance 2024a). The authors also reviewed hundreds of peer-reviewed journals, gray literature reports, and journalistic pieces pertaining to the topic. The report also builds on previous published works on nature crime by the authors.

FINDINGS

Types and impacts of nature crime

Illegal gold mining is estimated to generate illicit profits up to US$48 billion per year (INTERPOL 2022). In parts of Latin America, the value of illegal gold exports has surpassed cocaine. The practice causes massive deforestation, toxic mercury contamination of soil and water, and brutal exploitation of miners, many of whom are trafficking victims. Illegal mining is controlled by organized criminal groups who also engage in drug trafficking, prostitution, money laundering, and corruption of government officials.

Illegal, unreported, and unregulated (IUU) fishing is estimated at 20 percent of global marine fisheries catch, worth $10–$23 billion annually (Widjaja et al. 2023). Experts calculate that 8–14 million metric tons of fishery products go unreported each year, associated with gross revenues of $9–$17 billion (Sumaila et al. 2020). China's vast distant-water fishing fleet is the world's largest—although by no means the only one. IUU fishing severely threatens the sustainability of fisheries, marine biodiversity, and the livelihoods and food security of coastal communities worldwide, particularly in developing countries.

Wildlife trafficking is a major contributor to global biodiversity loss, affecting some 4,000 species, according to recent seizure data, which likely capture only a fraction of the true trade (UNODC 2024). Trafficking of iconic species such as elephants, rhinos, and tigers continues, although there is progress in some countries. Many species, from cheetahs to parrots to amphibians, are imperiled by the engagement of organized criminal networks in the live animal trade for the pet and hobbyist/collector market. Others exploit captive breeding and other loopholes in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the global treaty on international wildlife trade. Trafficking is increasingly conducted via online platforms. Criminal revenues likely reach into the billions, much of which goes to fund organized crime, which can be used to fuel insurgencies and civil conflict—making nature crime a national security issue in some places. Legal and illegal trade and markets for live wildlife are also key risk factors in the emergence of zoonotic diseases such as SARS, Ebola, and COVID-19 (Plowright et al. 2024).

In 2016, the United Nations Environment Programme estimated that illegal logging accounted for 15–30 percent of the timber trade globally, with estimates even higher for some tropical countries (Nellemann et al. 2016). Primary forests, critical for biodiversity and climate mitigation, are prime targets even in protected and conserved areas. Illegal logging causes severe forest degradation and biodiversity loss, serves as a catalyst for more widespread deforestation and land invasions, and increases the risk of pathogen spillover and zoonotic infection from novel viruses. "Conversion timber" from illegal clearing for commercial agriculture is estimated to account for 30–50 percent of tropical timber exports (Dummett and Blundell 2021). Overall ecosystem damages due to illegal logging total $30–$100 billion per year (Nellemann et al. 2016).

Illegal agro-conversion and associated land grabbing drive over 60 percent of tropical deforestation, with conservative estimates of nearly 75 percent of recent agro-conversion deemed illegal. Although land grabbing is often conducted by foreign entities, powerful domestic interests are frequently the main actors, sometimes colluding with organized criminal networks and corrupt officials and politicians. The result is widespread displacement of local communities and violation of Indigenous Peoples' rights as well as biodiversity loss.

CONVERGENCE

Corruption, financial, and human rights crimes

Nature crime is integrally linked with other crimes:

- Corruption enables criminals to obtain permits in violation of national legislation, bypass enforcement, enjoy political protection, and even affect elections. Bribery of officials is routine in many countries; state agencies may be infiltrated or co-opted by criminal interests.
- Complex money laundering and tax evasion schemes disguise and integrate illicit proceeds into the legal economy. Fraudulent trade invoicing, anonymous shell companies, and complicit financial institutions facilitate the process.
- Human trafficking for forced labor in mining, fishing, logging, and agriculture is rampant. Workers endure slavery-like conditions and violence. Women and children are sexually exploited.
- Environmental and land defenders face rampant death threats, violence, and murder for speaking out against land invasions and resource theft. According to Global Witness (2024), more than 2,000 such defenders were killed between 2012 and 2023, likely an undercount. Indigenous activists are disproportionately targeted.

RECOMMENDATIONS

Strategies to combat nature crime

Strengthen legal frameworks at both national and international levels, including by enacting stronger penalties (against specific nature crimes as well as corruption and money laundering legislation); closing legal loopholes; enabling use of technology-based evidence in court; allowing more effective asset seizure; protecting whistleblowers; and more effectively protecting Indigenous land and natural resource rights.

Ramp up international intelligence-based enforcement cooperation. Bolster implementation of CITES; expand joint initiatives such as the International Consortium to Combat Wildlife Crime and the Law Enforcement Assistance Program of the International Criminal Police Organization and the United Nations Office on Drugs and Crime; and increase the focus of finance and trade platforms, including the Financial Action Task Force and the World Customs Organization.

Prioritize financial crimes linked to nature crime. Develop nature crime typologies and red flag analyses; enact beneficial ownership registries; increase the use of suspicious transaction reporting; train countries' financial intelligence units and financial sector actors in identifying nature crime–linked financial flows and transactions; promote asset seizure and recovery; and strengthen anti–money laundering laws and their enforcement.

Mobilize civil society as partners in fighting nature crime. Government enforcement agencies need to more actively partner with nongovernmental organizations (NGOs) ranging from those with an international reach or field presence to grassroots local and Indigenous environmental defenders on the front lines. For their part, NGOs can collect and pass along information and intelligence, mobilize advocacy campaigns against nature criminals and advocate for stronger, cleaner, and more equitable law enforcement; work with investigative journalists to expose and explain nature crime; and provide financial, legal, and political support to Indigenous and local environmental defenders who are often under threat.

Use technologies to detect and prevent nature crime. Rapidly developing geospatial monitoring tools from satellite arrays to on-the-ground monitoring devices can be used to detect instances of nature crime; chemical, DNA, and other materials identification methodologies can help identify the species and origin of samples of wood, agricultural commodities, and seafood. Artificial intelligence/machine learning systems can vastly speed up analysis of suspicious trade/customs data, online sales, and shipping patterns.

A major global effort integrating these strategies is desperately needed to disrupt the immensely profitable destruction enabled by nature crime. The humanitarian and ecological stakes could not be higher. Deeper understanding of the scope, modes of operation, and devastating impacts of nature crime can catalyze the political will and innovative strategic interventions required to protect the global environmental commons and the human rights of those who defend it. This report provides the evidentiary foundation for rapidly scaling up a coordinated global response to the scourge of nature crime. The time to act is now.

Introduction

Our world is facing a triple crisis of climate change, biodiversity loss, and widespread social injustice. Nature crime is driving all three. It won't be possible to safeguard people, nature, and climate without understanding and eradicating these crimes.

It is increasingly apparent that the global environment and humanity are caught in convergent crises. Fires, floods, droughts, and extreme heat have moved from the predictions of scientists into the daily lives of billions of people. Although the manifestations of climate change and biodiversity and habitat loss are seen and felt almost everywhere, they are particularly evident, and worrisome, in the two ecosystems most critical for maintaining both a stable climate and the planet's biodiversity: the tropical forests and the ocean (from coral reefs and other coastal and nearshore marine ecosystems to pelagic systems).

Tropical rainforests, critical for preventing both biodiversity loss and climate change, have been converted and destroyed across the globe, and they continue to be destroyed despite decades of political commitments and media concern. Despite substantial slowing of tropical deforestation in Brazil and Colombia between 2022 and 2023, the overall rate of tropical primary forest loss globally in 2023 remained consistent with recent years, according to data reported by Global Forest Watch (Weisse et al. 2024). Many of Southeast Asia's once vast rainforests have vanished or are severely degraded across the region (Estoque et al. 2019), and deforestation of the Amazon appears to be approaching a "tipping point" (Praeli 2022) with respect to the forest's capacity to sustain biological diversity, maintain rainfall, and act as a carbon sink. The Congo Basin is currently on track to lose more than a quarter of its rainforests by 2050 if present trends continue (Eba'a Atyi et al. 2022). Additionally, and particularly as new forest areas are opened through forest conversion and logging, wildlife exploitation (legal and illegal) has endangered thousands of species.

The ocean is warming faster than it has in the entire course of human history (Johnson and Lyman 2020). In its 2023 special progress report on the Sustainable Development Goals (SDGs), the United Nations stated, "The ocean is in a state of emergency as increasing eutrophication, acidification, ocean warming, and plastic pollution worsen its health. Additionally, the alarming trend of overfishing persists, leading to the depletion of over one third of global fish stocks" (United Nations 2023).

These converging crises are not experienced equally by everyone. Pervasive inequality and injustice between different parts of humanity means that some (a minority) are far more complicit in the breakdown while others (the majority) suffer the most from the consequences of that breakdown.

There have been numerous high-level "calls to action" and "summits" on climate, biodiversity, food security, and other elements of planetary and human well-being. But, as the United Nations Secretary-General's report to the September 2023 UN summit on the SDGs warned, the nations of the world are largely failing to meet those goals (United Nations 2023). Insufficient financing is, of course, one critical impediment, but it is not the only one.

This report focuses on what we term *nature crime*—a critical but underappreciated barrier to effectively addressing the triple crisis of climate change, biodiversity loss, and global social injustice. As will be shown in this report, some places that are central for conserving biodiversity, retaining critical carbon stocks and ecological processes, and sustainably feeding 9 billion people—mainly places in tropical developing countries and across the vast expanse of the ocean—are thinly governed and sometimes even lawless territories that are often prone to corruption, marked by extremes of wealth and poverty, and scarred by frequent intimidation and violence against environmental and human rights defenders.

Nature crime encompasses illegal forms of logging, conversion of natural ecosystems, wildlife exploitation and trade (domestic and international), fishing, and mining; it is frequently linked to financial crime, fraud, corruption, and labor and human rights violations. Although the resources targeted by nature crime lie largely in the developing countries, the criminal syndicates, rogue corporations, financiers, consumers, and other ultimate beneficiaries of nature crime are largely linked to developed countries and markets as well as elites within developing countries.

This report reveals that nature crime converges not only with financial crime, corruption, fraud, and human rights abuses but also increasingly with other major sectors of criminal behavior, such as the trafficking of illegal drugs, small arms, and humans. Nature crime also converges with ostensibly legal industries and actors, "hiding in plain sight" in the supply chains that provide consumers with food from land and sea, wood products, minerals, clothing, exotic pets, curios, and other products. And although many nature criminals are indeed violent members of organized crime cartels, many others are engaged in white-collar nature crime and hide behind legitimate businesses.

Our focus here is on serious crimes (versus petty crimes and technical illegalities) and on the actors and interests that drive and control nature crime and reap the lion's share of its profits—the bosses and beneficiaries at the top of the pyramid. This is a matter of practicality as well as

ethics: in violent, lawless environments with extremes of wealth and poverty, there will always be another courier or another poacher if the reward is worth the risk. Initially targeting the foot soldiers of nature crime is, of course, a practical necessity in both intelligence and law enforcement tradecraft. However, crime science must be employed to ensure resources are used effectively; putting a few people in jail without getting to the underlying causes of criminal activity often just trains future criminals but does not prevent future crime.

The authors take the view that *illegal* and *criminal* are not always synonymous. For example, when a government passes a law that makes the traditional livelihood activities of Indigenous Peoples or local communities illegal or sets quotas, we do not view these livelihood activities as necessarily "criminal," even if laws or regulations are violated. In some cases, it may be that—from the perspective of international laws, agreements, and norms concerning human rights—it is the state that has committed a "crime."

This report begins by explaining the workings of five types of nature crime that most directly harm biodiversity and natural ecosystems and prevent nature from playing its critical role in ecosystem services and mitigating climate change. We then go on to delve into the convergence between nature crime and various associated crimes, such as financial crime, corruption, and the violation of human rights via intimidation, forced labor, and violence. Finally, we offer recommendations on strategies that we believe will be effective in containing and combating nature crime in the 21st century and will thereby help to solve the great global environment and development challenges of our time.

METHODOLOGY

This report was researched and written during 2021–24 while developing and launching the Nature Crime Alliance hosted by World Resources Institute (WRI). This multistakeholder coalition brings together governments, intergovernmental organizations, nongovernmental organizations (NGOs), centers of technical and scientific expertise, and Indigenous Peoples' organizations. During this process, the lead author and colleagues interviewed some 150 people on a one-on-one basis and also gained insights and information through small convenings managed by WRI's partner the Meridian Institute. The list of Nature Crime Alliance members provides a good representative sample of the organizations from which the authors have gained insight and gathered information (Nature Crime Alliance 2024a). In addition, the authors amassed and reviewed hundreds of peer-reviewed journal articles, gray literature reports, and journalistic pieces, as reflected in the report's list of references. The material was found through authors' review of the literature, the use of reporting services such as Mongabay, the Organized Crime and Corruption Reporting Project, and the websites and recommendations of relevant nongovernmental and intergovernmental organizations. Finally, the report builds on a 2021 peer-reviewed report that our lead author wrote for the Climate and Land Use Alliance (CLUA) entitled "Nature Crime: Understanding and Tackling a Key Threat to the Climate and Land Use Agenda." The CLUA report is part of a CLUA-led effort to articulate priority elements of the climate and land-use agenda to 2030 for philanthropic and institutional donors (Barber et al. 2021).

Findings: Types of nature crime

Illegal forms of mining, logging, fishing, wildlife trade, and land grabbing wreak destruction on some of the world's most crucial ecosystems and visit violence and fear upon communities. These crimes are complex and rely on corruption at local levels and criminality within global financial systems and supply chains.

ILLEGAL GOLD MINING

> *"The true worth of precious metals and minerals . . . lies not only in the histories behind them, their timeless beauty and high value, but also in the destructive forces they inspire." (Zabyelina and van Uhm 2020).*

The history of illegal gold mining is interwoven with environmental degradation, worker exploitation, and criminality. More recently, a sharp rise in mineral prices during the 1990s prompted organized criminal groups (OCGs) to heavily infiltrate this sector. High profits and a low risk of prosecution ensure that OCGs can secure a steady return. The International Criminal Police Organization (INTERPOL) estimates that the annual profits of this industry may be as high as US$48 billion (INTERPOL 2022). The line can be blurry, however, between "illegal" mining and artisanal and small-scale gold mining (ASGM), in which some 16–20 million people engage, generating approximately 15–20 percent of global mineral production (de Haan and Turner 2018; Maier et al. 2014). In many cases, ASGM and truly criminal forms of mining intersect and overlap.

Illegal gold mining is a global phenomenon, afflicting communities from Mongolia to the Congo Basin (Zabyelina and van Uhm 2020). Illegal gold mining in South America's Amazon Basin provides a clear and globally significant example of the growing nexus between illegal mining, environmental damage, and other forms of criminality (International Crisis Group 2024). Accordingly, this section focuses mainly on illegal gold mining in the Amazon.

What is illegal mining?

For this report, we define the scope of illegal mining to be mining carried out in violation of the law, either by operating in legally protected areas and/or by failing to comply with related environmental, tax, and labor regulations. The involvement of OCGs in an operation also qualifies an operation as illegal.

Informal gold mining is a traditional form of livelihood for many rural communities. Approximately 100 million people worldwide depend directly or indirectly on informal gold mining as a source of income. Criminalizing all AGSM would thus extinguish the income of highly vulnerable people. It is therefore crucial to target powerful OCGs rather than ASGM operations. This can be tricky because OCG miners often co-opt and employ—sometimes forcibly—ASGMs. What may appear at first look to be a small-scale operation may be one of dozens of such linked operations under the control of an OCG (Zabyelina 2023).

Widespread informality in the gold mining sector is often linked to the negative environmental and social consequences so often associated with the sector, including the pernicious environmental and health effects of mercury, which is widely used in the sector to separate gold from other materials. There is thus a strong effort to formalize the ASGM sector, a process "that seeks to integrate the ASGM sector into the formal economy, society and regulatory system" and thereby alleviate its negative impacts (de Haan and Turner 2018).

Conversely, a significant proportion of gold mining is directly controlled by OCGs, as is the case in Ecuador. Starting around 2022, an Ecuadorian criminal gang—Los Lobos—which is an affiliate of the Mexican New Generation cartel, has become increasingly involved in illegal gold mining in at least seven of the country's provinces. Los Lobos preys on ASGM operations, entering their areas and taking control of nearly all stages of the supply chain. The gang has also entered remote regions, including national parks (Torres and Collyns 2024). The Punino area—the heart of the Ecuadorian Amazon—has been significantly damaged since illegal mining began in 2019, with nearly 1,500 hectares affected, nearly a third of that in the first half of 2024 alone (MAAP 2024b).

This trend is not restricted to Ecuador. In the words of one former Chilean police intelligence official, "In regions of Peru, Bolivia, Ecuador, Venezuela and Colombia [illegal gold mining activities] are being controlled by criminal networks and transnational organizations that submit people to extortion, exploitation and semi-slavery, as well as [causing] significant environmental devastation" (Torres and Collyns 2024). One study (Pardo-Herrera 2022) concluded that about 67 percent of gold production in Colombia and 25–30 percent in Peru was illegal, with much of the profits from illegal mining in those two countries flowing into the United States.

In some places, illegal gold mining is the institutionalized lifeblood of whole cities, despite close links to organized crime, environmental destruction, and violence, as in Itaituba, Brazil, which has been termed the country's "illegal

gold capital." Concerted efforts by the Brazilian federal government to crack down in Itaituba have been met with fierce local resistance (Wenzel 2024).

How does the illegal gold trade work?

Gold is particularly attractive for OCGs (see Box 1). OCGs first became involved in gold mining during the US-driven "War on Drugs" during the 1980s by creating shell companies to disguise the proceeds of drug trafficking (Massé and Munevar 2017). As gold prices increased fourfold between 2002 and 2021, illegal gold mining became a highly profitable venture in its own right (Seccatore et al. 2014; Tubb 2015). In 2016, the value of illegal exports of gold surpassed cocaine in Colombia and Peru, respectively the largest and second-largest producers of cocaine in the world (Wagner 2016).[1] Countries such as Venezuela and Ecuador are now reporting large increases in illegal gold mining, especially since the price of gold has increased significantly since the COVID-19 pandemic (not less than $1,500 per ounce) (Collyns 2023; *The Economist* 2023).

Before gold is sold to consumer-facing companies, the metal is first refined into *pure* gold. Refineries are therefore the major buyers of Latin American raw gold. The transaction between gold traders and refineries is a key step in the chain of "cleaning" dirty gold. Once refined, gold is easily placed onto mainstream legal markets (see Figure 1).

No data can precisely reveal the destination of illegally mined gold since it is often imported under the guise of legality. Customs data can, however, reveal the direction of major flows of gold. The countries that routinely rank high in gold import customs data include Switzerland, the United States, the United Arab Emirates (UAE), China, and India (UN Comtrade n.d.).

The UAE is a rapidly emerging transit point for gold. This is partly attributable to the large influx of precious metals being smuggled from Africa, Latin America, and now Russia. Although the UAE has recently strengthened due diligence requirements and anti–money laundering laws, implementation is still notoriously laissez-faire (Blore and Hunter 2020). Their refineries, however, lack the accreditation from the London Bullion Market Association that other reputable refineries have, which is a prerequisite for selling internationally to reputable dealers (Ruchti 2023).

A 2023 Al Jazeera investigation demonstrated that various gold smuggling operations in Africa target Dubai as part of their money laundering operations (Ritzen 2023). Raw gold is often refined in the UAE, only to be re-refined in Switzerland. In 2016, Switzerland was the UAE's largest destination country for gold; by 2021, it made up 10 percent of Switzerland's total gold production (Spence 2021).

Currently, Swiss gold refineries account for 65-70 percent of annual worldwide gold refinery output (Contreras 2018; Ruchti 2023). Once refining is completed in this hub, gold is then sold to markets in Europe, the USA, Hong Kong, and elsewhere. In 2021, the Swiss government had been applying pressure to Swiss gold refineries to ensure verification of gold bullion is legitimate (Spence 2021). However, following the Russian invasion of Ukraine and the ensuing sanctions, imports from Dubai skyrocketed to 36 metric tons, worth CHF 2.1 billion in March 2022 (the largest single month import in six years) (Swissaid 2022). Swissaid considered there to be a significant risk that Russian gold was making its way into Switzerland via Dubai and China, indicating that government efforts to improve traceability have been fruitless.

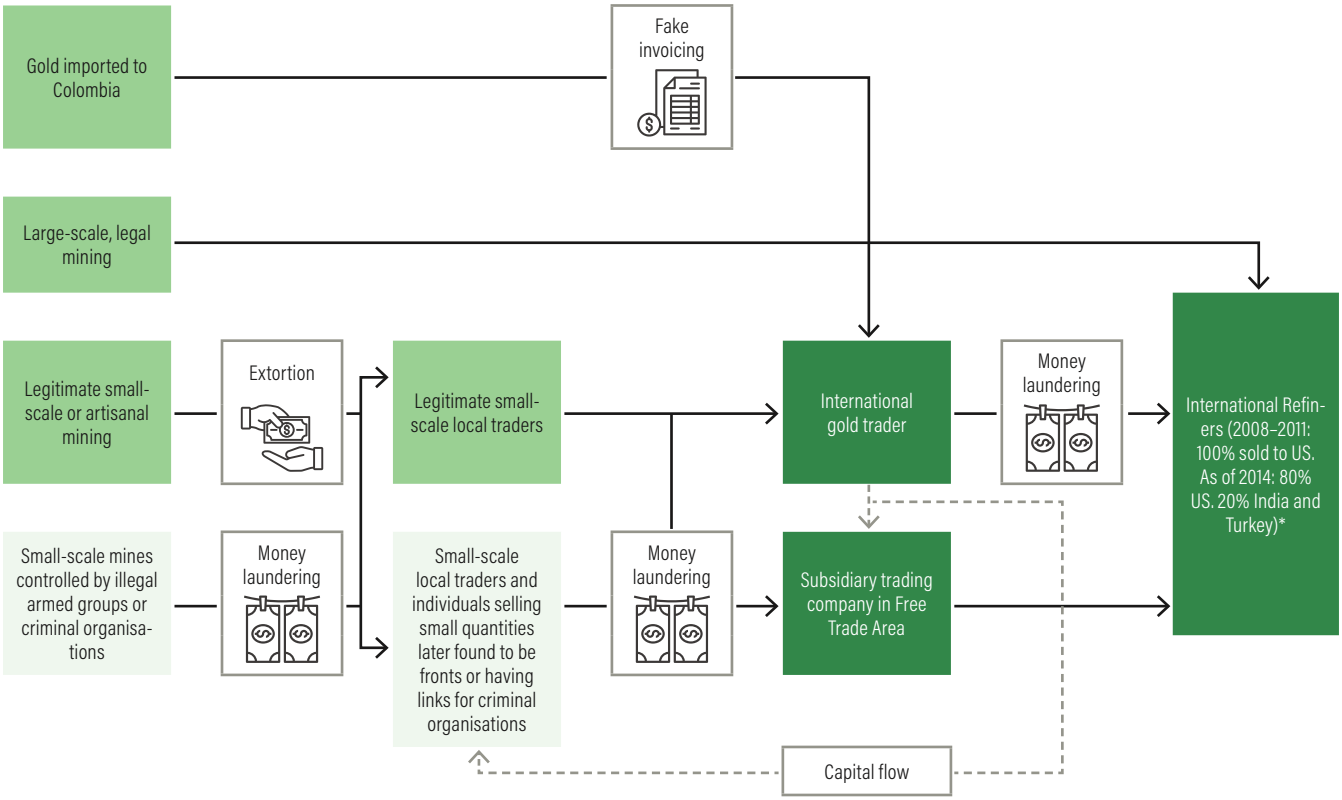
BOX 1 | Why gold?

Gold possesses certain features that attract organized criminal groups (OCGs). First, unlike most illicit drugs, gold is not an inherently illegal substance. It can be laundered into formal supply chains—as is the case with some wildlife, timber, and fish. Second, once gold is refined, it is almost impossible to ascertain its source. Third, gold can serve as unofficial stores of value, almost substituting as currency. Fourth, illegal gold mining is a low-risk, high-reward market. Illegal gold mining is not as tightly monitored nor as severely punished as drug trafficking. Information and sources reviewed for this report indicate that, for these reasons, OCGs have increasingly turned to illegal gold mining to diversify their income.

OCGs gradually shifted to sourcing gold themselves by running gold mines, purchasing gold from artisanal and small-scale gold miners or smuggling it across borders. The gold is then sold to legitimate small-scale traders or to shell companies working with OCGs. Then, the gold is sold to international gold traders, who trade with international refineries.

Source: Massé and Munevar 2017.

FIGURE 1 | Typology of illegal gold mining in Colombia



Source: Massé and Munevar 2017.

What are the consequences of illegal gold mining?

Illegal gold mining is by no means a victimless crime. Its impacts can be felt from rivers in Peru to global financial institutions.

Environmental. Illegal mining is a key driver of deforestation and mercury contamination. In the Guiana Shield, gold mining is responsible for more than 90 percent of total deforestation, a sizable portion of which is illegal (Howard et al. 2011). Between 2010 and 2020, illegal mining expanded its footprint in Indigenous territories in Brazil by nearly 500 percent (Modelli 2022). The effects of deforestation are compounded by illegal extraction methods, particularly the use of mercury (Galvis 2019). Mercury is added to excavated soil to amalgamate and extract the gold. The mercury is then burned off into the atmosphere, leaving the residual gold. ASGM activities are estimated to account for 37 percent of global anthropogenic mercury emissions (Esdaile and Chalker 2018). Mercury emissions also directly affect surrounding forest ecosystems, with substantial accumulation in soils, fauna, and flora, including bird populations (Gerson et al. 2022).

Alluvial gold mining also degrades river ecosystems due to intensive excavation and sediment processing along riverbanks. The resulting sediment pollution affects water clarity and causes siltation that harms both fish and other aquatic life and damages human infrastructure downstream (Dethier et al. 2023). ASGM and illegal gold mining are also often correlated with increases in wildlife poaching (Chakuya et al. 2023; Erickson-Davis 2022).

In Ghana, Africa's top gold-producing nation, industrial mining—some legal, some not—was the leading cause of forest loss between 2000 and 2019, with 200 active mining permits overlapping with forest reserves. Despite the ongoing environmental damage, the government actually relaxed restrictions on mining in environmentally sensitive natural areas. Many companies granted "exploration" permits then illegally commenced large-scale mining activities using heavy equipment (Vyawahare 2024).

Social. Illegal gold mining is replete with devastating consequences for the health and safety of local communities, particularly Indigenous ones. With regard to health, miners are routinely exposed to mercury through direct touch and inhalation, with significant negative health effects on individuals and their children as well as on wildlife (Zabyelina and van Uhm 2020). Mercury bioaccumulates in local food sources, posing an additional health risk (WHO 2017).

Despite international efforts to curtail the mercury trade (see Box 2), OCGs routinely provide it to their miners (Zabyelina and van Uhm 2020). Regarding social welfare, illegal gold mining is associated with worker exploitation, sex trafficking, and intimidation of local communities. In Venezuela, illegal miners were found with slave numbers tattooed on their shoulders. In a mining town in Peru, 60 percent of sex workers interviewed were also miners (Wagner 2016).

Legal. Illegal gold mining contributes to the erosion of the rule of law, both in exporting and importing countries. In mining countries, the industry creates incentives for corruption, disguises the proceeds of drug trafficking, feeds into human rights abuses, and strengthens the grip of organized crime. In destination countries, illegal gold mining fuels money laundering schemes, which threaten the integrity of the global financial system (FATF and APG 2015).

ILLEGAL, UNREPORTED, AND UNREGULATED FISHING AND FISHERIES-RELATED CRIME

The ocean is Earth's lifeblood. It covers 71 percent of the planet's surface, supplies over half of its oxygen (GOMO n.d.), and is home to 15 percent of the world's described species (Grosberg et al. 2012; Zhang 2017). But the ocean's living resources are also in a state of crisis. According to the Food and Agriculture Organization of the United Nations (FAO), the fraction of marine fisheries within biologically sustainable levels decreased to 62.3 percent, the lowest level ever (FAO 2024). FAO also reports that although aquaculture production has surged in recent years, marine capture fisheries—with a 43 percent share—remain the major source of global aquatic animal production, with 80 million metric tons captured in 2022.

Even those figures may underestimate the problem. A 2024 analysis of global fisheries data argues that current fisheries stock assessment models overestimate their productivity and recovery trajectory (Froese and Pauly 2024). The authors note that "given the importance of fish as food and livelihood for a growing human population, as well as the importance of functioning marine ecosystems for carbon capture in the face of climate change, the apparent global failure of applied fisheries science to correctly advise

BOX 2 | The pernicious effects of mercury in gold mining and the Minimata Convention

Mercury, a toxic chemical that does not break down once released into the environment, is commonly associated with illegal and artisanal and small-scale gold mining. Gold deposits are often found near rivers and streams. Mercury is used to extract gold from rock and soil; therefore, it often ends up in waterways, eventually moving up the food chain into human diets, especially in fish. High levels of mercury in humans cause birth defects and nervous system damage. Miners are also directly exposed to toxic mercury fumes during the gold amalgamation process, during which heated mercury evaporates.[a]

Recognizing the threat posed by mercury to human health and the environment, governments negotiated the Minimata Convention on Mercury.[b] It was adopted in 2013, entered into force in 2017, and, as of 2024, has 148 Parties. The convention includes a specific article creating general obligations for Parties to take steps to reduce and, if feasible, eliminate use of mercury and mercury compounds in gold mining. It also seeks to reduce the international mercury trade. Despite this international commitment, trade in the chemical, much of it illegal, remains widespread due to demand from the illegal and informal gold mining sector. One study estimated that 185 metric tons of mercury of unknown origin may have been used in Brazil alone during the period 2018–22.[c] The illegal mercury trade is also thought to be massive in Indonesia, where informal and illegal gold mining are also widespread.[d]

Notes and Sources: a. UNEP 2019; b. To learn more about the Minimata Convention on Mercury, see https://minamataconvention.org/en; c. Instituto Escolhas 2024; d. Jati and Wulandari 2023.

managers is troubling" (Froese and Pauly 2024). Illegal fishing is thus exacerbating a global problem that may be considerably worse than we think it is.

The scope of fisheries crime

A substantial proportion of marine fisheries capture falls into the category of illegal, unreported, and unregulated (IUU) fishing, as defined by the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (FAO 2001). Not all IUU fishing is illegal fishing, and not all illegal fishing is criminal, but much of it is.

The FAO definition of IUU fishing is somewhat complex (see Box 3), but it basically refers to a variety of detrimental fishing practices that, put simply, amount to fishing without permission or outside prescribed limits (Poling and Cronin 2017). High demand for fish, low start-up costs, and low risks of penalties created ripe conditions for this nature crime to rapidly propagate across the world's oceans and seas.

But crimes associated with the fisheries sector are broader than just illegal fishing and can be divided into three distinct groups of crimes (Mosnier et al. 2021):

- **IUU fishing** as per FAO's definition
- **Fisheries-related crime**, which is closely linked to IUU fishing but not directly linked to seafood production; examples include license and other document fraud and forgery, tax evasion, money laundering, and illegal working conditions
- **Crimes associated with the fisheries sector,** including drugs, human or arms trafficking, and piracy, when such crimes require or are facilitated by fishing vessels or use fishing companies as a front

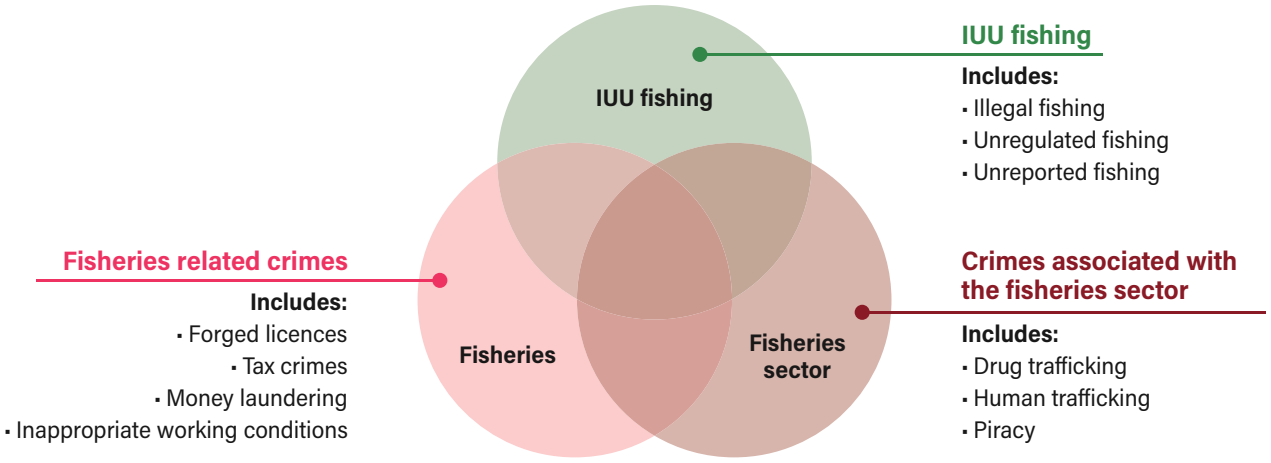
These three types of crime may overlap, as illustrated in Figure 2.

Although not every instance of IUU fishing is a crime, and not all crime associated with the fisheries sector is IUU fishing, we follow Temple et al. (2022) and use the term *IUU fishing* in this report as shorthand for that broader set of crime types, with the caveat that our particular focus is on illegal fishing as well as associated forms of criminal activity, particularly those related to abuses of labor and human rights.

IUU fishing is a key driver of fish stock depletion and is estimated to account for over 20 percent of all fishing activity worldwide, valued between $10 billion and $23 billion (Widjaja et al. 2023). Another study estimated that globally "between 8 and 14 million metric tons of unreported catches are potentially traded illicitly yearly, suggesting gross revenues of US$9 to US$17 billion associated with these catches. Estimated loss in annual economic impact due to the diversion of fish from the legitimate trade system is $26 to $50 billion, while losses to countries' tax revenues are between US$2 and US$4 billion" (Sumaila et al. 2020).

IUU fishing undermines national and regional efforts to conserve and manage fish stocks and, as a consequence, inhibits progress toward achieving the goals of long-term sustainability and responsibility. Moreover, IUU fishing

FIGURE 2 | Overlap between IUU fishing, fishery-related crimes, and crimes associated with the fisheries sector



Source: Mosnier et al. 2021.

greatly disadvantages and discriminates against those fishers that act responsibly, honestly, and in accordance with the terms of their fishing authorizations. If IUU fishers target vulnerable stocks that are subject to strict management controls or moratoria, efforts to rebuild those stocks to healthy levels will not be achieved, threatening marine biodiversity, food security for communities who rely on fishery resources for protein, and the livelihoods of those involved in the sector.

How does IUU fishing work?

The first step in the process of IUU fishing is to obtain a licensed fishing vessel. Fishing operators tend to register their ships in countries that have lax labor, tax, and environmental regulations (Hutniczak and Delpeuch 2018). Countries not typically involved in waterborne trade may become maritime registers for ships to profit from licensing fees. This practice is known as *open registries* or *flags of convenience*. For example, Panama, a nation of only

BOX 3 | Defining illegal, unreported, and unregulated fishing

The term *illegal, unreported, and unregulated (IUU) fishing* captures a wide variety of fishing activity. IUU fishing is found in all types and dimensions of fisheries; it occurs both on the high seas and in areas within national jurisdiction. It concerns all aspects and stages of the capture and utilization of fish, and it may sometimes be associated with organized crime. It is thus a "catch-all" term for all fishing that is not legal, documented, or managed.

The Food and Agriculture Organization of the United Nations uses the following definition for IUU fishing:[a]

- **Illegal fishing**
  - Conducted by national or foreign vessels in waters under the jurisdiction of a state, without the permission of that state, or in contravention of its laws and regulations
  - Conducted by vessels flying the flag of states that are parties to a relevant regional fisheries management organization but operate in contravention of the conservation and management measures adopted by that organization and by which the states are bound, or relevant provisions of the applicable international law
  - In violation of national laws or international obligations, including those undertaken by cooperating states to a relevant regional fisheries management organization
- **Unreported fishing**
  - Fishing that has not been reported, or has been misreported, to the relevant national authority, in contravention of national laws and regulations
  - Fishing undertaken in the area of competence of a relevant regional fisheries management organization that has not been reported or has been misreported, in contravention of the reporting procedures of that organization
- **Unregulated fishing**
  - Fishing activities in the area of application of a relevant regional fisheries management organization that are conducted by vessels without nationality, by those flying the flag of a state not party to that organization, or by a fishing entity in a manner that is not consistent with or contravenes the conservation and management measures of that organization
  - Fishing activities in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with state responsibilities for the conservation of living marine resources under international law

One may also speak of a broader set of "crimes associated with fishing," which would include forced labor and other violations of labor laws, human trafficking, smuggling of contraband using fishing vessels, and so forth. A recent study shows that of 7,000 "crimes associated with fishing" incidences examined from 2000 to 2020 (a fraction of the incidences likely occurring), 80 percent were illegal fishing activities, 11 percent were labor issues, 3 percent were transshipment of fish, and 4 percent were smuggling of illegal contraband.[b]

Sources: a. FAO 2001; b. Belhabib and Le Billon 2022.

3 million, was for decades host (flag state) to the greatest number of large vessels until Liberia tied Panama in 2023 (*Maritime Executive* 2024).

Once registered, a vessel can begin fishing. IUU fishing can take on various forms. Common ones include fishing in areas under national jurisdiction without authorization, fishing in contravention of the jurisdiction's regulations, and failure to meet reporting requirements (Vidas 2010). It is also common for IUU vessels to engage in "fish laundering" at sea. Fishing vessels sometimes offload their illegal catches onto a central vessel that has not itself engaged in IUU fishing. This "mothership" transshipment carries a mixture of legally and illegally captured fish that cannot be distinguished once the fish are processed and packaged (Shah et al. 2021). Some vessels may engage in both legal and illegal fishing.

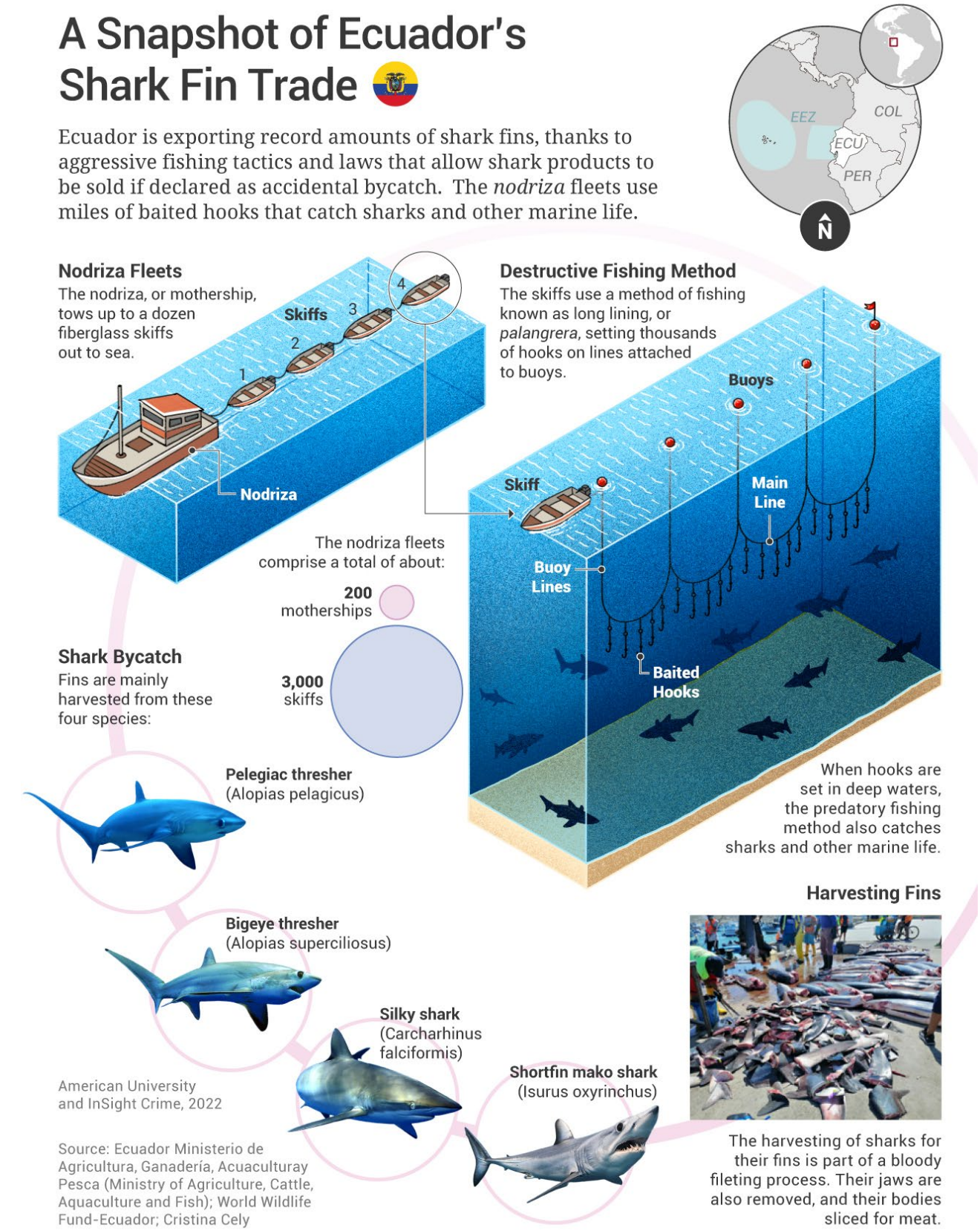
Once vessels have harvested fish illegally, IUU vessels will often offload their fish at "ports of convenience," where customs regulations can be more easily evaded. Once the fish catch passes through customs, it can be laundered into larger batches of fish and re-exported under the guise of legality. The five port states where this practice is most common are China, Russia, Cambodia, Vietnam, and Singapore (Macfadyen et al. 2019).

As concern over IUU fishing rose over the past two decades, countries agreed, under the auspices of FAO, to negotiate the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (PSMA), which entered into force in 2016. The treaty requires Parties to place tighter controls on foreign-flagged vessels seeking to enter and use their ports to land or transship fish (Pew Charitable Trusts 2018). Although some 80 countries have ratified the PSMA, China has not yet done so, despite operating by far the most fishing ports on the planet and operating the largest distant-water fishing (DWF) fleet. This is unfortunate because a comprehensive assessment of port state IUU performance and risk concluded that China remains the highest risk port state for IUU in Asia (Hosch et al. 2023). This low score mirrors China's bottom-ranking position (along with Russia) in the 2021 *Illegal, Unreported and Unregulated Fishing Index* report (MacFadyen and Hosch 2021).

Shark finning. Some illegal fisheries are highly specialized, targeting particularly high-value species. The killing of sharks for their fins (considered a delicacy) is particularly widespread and wasteful because generally only the fin is taken and the fish is left to die in the sea (thus taking up less space in a vessel and enabling increased catches of sharks) (Cardeñosa et al. 2022). Some vessels may take tuna and other species legally but also take sharks illegally for their fins. Some countries, including the United States, require that any sharks landed have "fins naturally attached" (NOAA 2024), but that has by no means solved the problem. Latin America is one region particularly hard-hit by the illicit shark fin trade. A five-year investigation detailed five case studies covering 10 transnational criminal networks operating from Latin America to Asia (Byrd et al. 2024). Panama seized nearly 7 metric tons of fins in July 2023, and a June 2023 seizure in Brazil amounted to nearly 29 metric tons, the world's largest-ever such seizure (Ramírez and Dalby 2023). Ecuador is a particular center for this illicit trade (see Figure 3).

The United States banned shark fin sales as of January 2023, but a late 2023 investigation by Al Jazeera discovered that significant illegal fin imports, mostly from Peru and Ecuador, were still entering the country (Alberts 2023).

FIGURE 3 | A snapshot of Ecuador's shark fin trade



Source: Ramírez and Dalby 2023.

Destructive fishing on tropical coral reefs. Tropical coral reefs—the epicenter of global marine biodiversity—are especially prone to two illegal and highly destructive fishing practices: blast and poison fishing. Blast fishing—fishing with explosives that indiscriminately kill all marine life within the blast radius and destroy the structure of reefs—is, according to one review of 212 scientific papers, "widespread, misreported, and ongoing" (Hampton-Smith et al. 2021).

In Southeast Asia in particular, the use of cyanide to stun and capture fish favored by the international aquarium trade (as well as the live reef food fish market in Hong Kong) has persisted despite being universally prohibited by law (Madeira and Calado 2019). One study reported that 6 million live aquarium fish imported into the United States (the world's largest market) each year have been exposed to cyanide in the course of their capture, and that an additional 14 million fish likely died from cyanide exposure in the course of bringing those 6 million fish to market (Center for Biological Diversity 2016). The cyanide, squirted out of plastic bottles to stun target fish, also harms and kills nearby corals, shrimps, crabs, mollusks, and other invertebrates.

Fish maws (inflatable swim bladders). The swim bladder (maw) of some fish species—notably the totoaba (*Totoaba macdonaldi*), a species endemic to the Gulf of California—are so highly valued in China as cuisine, as traditional Chinese medicine, and as an ingredient in cosmetics that they are nicknamed "the cocaine of the sea." The wholly illegal trade in the species is controlled by OCGs and is closely intertwined with other organized criminal activity in the region (Cuamea 2023). Capturing totoaba requires the use of illegal gill nets, which also ensnare other species, most notably the highly endangered and endemic vaquita (*Phocoena sinus*), the smallest porpoise in the world (EIA 2024; Radwin 2024a).

One global study reported that fish maws in Hong Kong and mainland China are sourced from over 100 countries, and some 58 percent of the volume and 70 percent of the value come from just five countries: Brazil, Uganda, Tanzania, Vietnam, and India (Abdulrahman et al. 2021). In Brazil, trade in maws from the Atlantic croaker species (*Micropogonias spp.*) is growing along the country's north and northeast coasts (Hui and Reed 2022). Although not illegal in Brazil, the high price for the species' maw (some $500 per kilogram [kg]) makes it likely that OCGs may become involved. It is noteworthy that maw use in China is not "traditional"; it is a relatively new phenomenon, with its roots in the 20th century (Abdulrahman et al. 2021).

Numerous marine species other than finfish are illegally harvested and traded, particularly from tropical coral reef areas, and are discussed in the "Wildlife Trafficking" section of the report.

What are the consequences of IUU fishing?

Environmental. IUU fishing poses an acute threat to the integrity of marine ecosystems, which are already in a state of crisis. From 1980 to 2003, fishery biologists and managers estimated that 11–26 million metric tons of IUU fish were caught annually (Agnew et al. 2009). A 2016 study further argued that fishery catches reported by countries to FAO were systematically underreported by a factor of up to 50 percent from 1950 to 2010 (Pauly and Zeller 2016). Therefore, the real IUU figure is likely to be much higher.

In addition to IUU fishing placing additional pressure on fish stocks, illegal operations often target endangered species with a higher market value, as previously discussed. IUU fishing crews also regularly use banned techniques that are particularly detrimental to marine ecosystems (Liddick 2014). For that reason, the negative impacts of IUU fishing extend beyond the number of fish caught.

Food security. The environmental impact of IUU fishing is closely connected with another concern: food security. The global population is projected to grow to 9 billion by 2050, raising the question about how to feed the world's population without endangering the planet (Garcia and Rosenberg 2010). Fish are a crucial component of that equation. Fish provide over 3.3 billion people with nearly 20 percent of their average intake of animal protein (FAO 2022). However, as discussed earlier, IUU fishing poses a severe threat to the sustainable management of fish stocks. It undermines governments' ability to regulate fishing activities and undermines sustainable economic development. Moreover, coastal developing countries are disproportionately affected by IUU fishing. Across West Africa, for example, where IUU fishing levels are as high as 37 percent, an estimated 6.7 million people depend directly on fisheries for food and livelihoods. The communities closest to IUU fishing operations are therefore most endangered by its effects (EJF 2022). To avoid food insecurity, it is imperative to combat IUU fishing.

Economic. The economic consequences of IUU fishing are far-reaching. First, IUU fishing deprives governments of tax revenue and other fee collection. Indonesia, for example, has lost an estimated $4 billion in annual revenue to IUU fishing (Palma et al. 2010). Second, IUU fishing

increases pressure on legitimate local fishing communities. Illegal operations circumvent regulations to lower their costs. The crewmen are usually underpaid and overworked, so illegal operators can economically undercut legitimate operators. The introduction of illegally harvested fish into the market generates an additional loss of local economic activities related to legitimate fisheries. The fruits of IUU fishing are estimated to total $10–$23 billion, which enrich transnational criminal groups instead of legitimate fishing operations (Widjaja et al. 2023).

Convergence with other crimes. Not only does IUU fishing enrich the coffers of criminal actors, but the United Nations Office on Drugs and Crime (UNODC) also reports linkages between IUU fishing and other criminal activities, including drug trafficking, human trafficking, slavery, and arms smuggling (UNODC 2023). Fishing vessels are sometimes also used for the purpose of transporting drugs (primarily cocaine), illegal migrants, and weapons (Hutniczak and Delpeuch 2018). Official corruption may also be entwined with illegal fishing, as in the case of the Cook Islands (see Box 4).

The expansion of DWF fleets. The DWF industry has expanded dramatically in the past several decades. It is shrouded in secrecy and is dominated by a small number of countries. Just five countries account for 90 percent of DWF: China and Taiwan together account for 60 percent, and Japan, South Korea, and Spain account for about 10 percent each (Yozell and Shaver 2019). China is home to the planet's largest DWF fleet, which is a driving force globally for IUU fishing (EJF 2022; Planet Tracker 2024). A multiyear investigation of China's DWF fleet revealed systematic and pervasive human rights and labor violations (Urbina 2023a). The investigation concluded that China "is largely unresponsive to international laws, and its fleet is the worst perpetrator of illegal fishing in the world, helping drive species to the brink of extinction. Its ships are also rife with labor trafficking, debt bondage, violence, criminal neglect, and death." The report also noted the aggressive security posture of the fleet: "This may look like a fishing fleet, but, in certain places, it's also serving military purposes." The labor and human rights abuses associated with the Chinese fleet extend onto land, where reports indicate that tens of thousands of laborers from North Korea are forced to work in prison-like seafood processing plants within China (Urbina 2024).

BOX 4 | Corruption and illegal fishing in the Cook Islands

The Cook Islands—a small island nation in the southwestern Pacific—is self-governing while in free association with New Zealand. Consisting of 15 islands with a total land area of 91 square miles and a population of less than 20,000, the Cook Islands' marine exclusive economic zone covers some 750,000 square miles of ocean—an area nearly five times the size of California.

In June 2012, a New Zealand maritime patrol vessel was reported to have discovered three tons of shark carcasses aboard a fishing vessel in Cook Islands waters owned by Chinese company Luen Thai. The Cook Islands Marine Resources Minister intervened in the case, and the vessel was released without a fine, despite what appeared to be serious violations of Cook Islands laws. Soon thereafter, in 2013, Luen Thai was fined nearly $170,000 by the Marshall Islands government for shark finning after shark fins and skins from some 50 sharks were found onboard by fisheries surveillance personnel.

Despite the 2012 shark fishing incident, then-minister Teina Bishop appointed a member of the family that owned Luen Thai as his honorary fisheries adviser and signed a memorandum of understanding with Luen Thai's Cook Islands subsidiary company. Numerous alleged incidences of Luen Thai bribing Bishop then followed. Among other things, Bishop received a $1 million loan from a Leun Thai subsidiary, which Bishop used to purchase a resort on the island of Aitutaki. Bishop was prosecuted for allegedly granting 18 fishing licenses to Luen Thai's local subsidiary in exchange. Bishop was sentenced to jail in December 2016 but later settled out of court, agreeing to pay $254,000 to the Cook Islands Ministry of Finance and Economic Development.

Source: Taylor 2017.

WILDLIFE TRAFFICKING

In its quadrennial *World Wildlife Crime Report*, UNODC stated, "There are signs of progress in reducing the impacts of trafficking for some iconic species, elephants and rhinoceros, but UNODC's assessment of available evidence gives no confidence that wildlife trafficking overall is being substantially reduced" (UNODC 2024). Between 2015 and 2021, documented seizures in 162 countries involved 13 million items from about 4,000 plant and animal species—more than 3,000 of which were listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) appendices. The report notes that actual wildlife trafficking levels are, of course, far greater than the recorded seizures (UNODC 2024). Seizure information is indeed only a minimum "snapshot" of the numbers of species and products in illegal international trade because governments often underreport and only seize or confiscate a small proportion of animals, plants, and products traded illegally, most of them among the 38,000 or so species listed for varying levels of protection by CITES. That is, of course, a mere fraction of the nearly 8 million species on Earth (Barber et al. 2021).

Due to the illicit nature of wildlife trafficking, it is difficult to get a true sense of its breadth and scale. Understandably, seizure data is often used as the proxy for determining scale. However, much illegal trade continues with impunity, beyond the control or reach of law enforcement, due to either a lack of capacity or political will or, sometimes, endemic corruption within the ranks of relevant customs, investigative, and enforcement authorities. Thus, using only seizure data to estimate the scale of the illegal wildlife trade is a flawed methodology. A lack of seizures in a particular port or country, for example, may not mean there is no illegal trade. Rather, it often points to the absence of effective efforts and methods to detect—let alone interdict—illegal trade (Barber et al. 2021).

What is wildlife trafficking?

Despite the considerable political and popular focus on "wildlife trafficking," there are a variety of definitions for the term embedded in the national laws and policies of different countries. UNODC (2019) adopts a fairly narrow definition: "The illegal trade, smuggling, poaching, capture, or collection of endangered species, protected wildlife (including animals or plants that are subject to harvest quotas and regulated by permits), derivatives, or products thereof." That formulation, however, only focuses on endangered species and protected wildlife. We therefore adopt a simpler and broader definition of wildlife trafficking: any illegal use of wildlife that includes an element of commercial trade, usually for economic profit.

As with other types of nature crime, wildlife trafficking can involve a variety of predicate offenses (e.g., setting traps or snares) and is often linked to other types of crime (e.g., illegal weapons possession, money laundering, falsifying documents, assault, homicide, etc.).

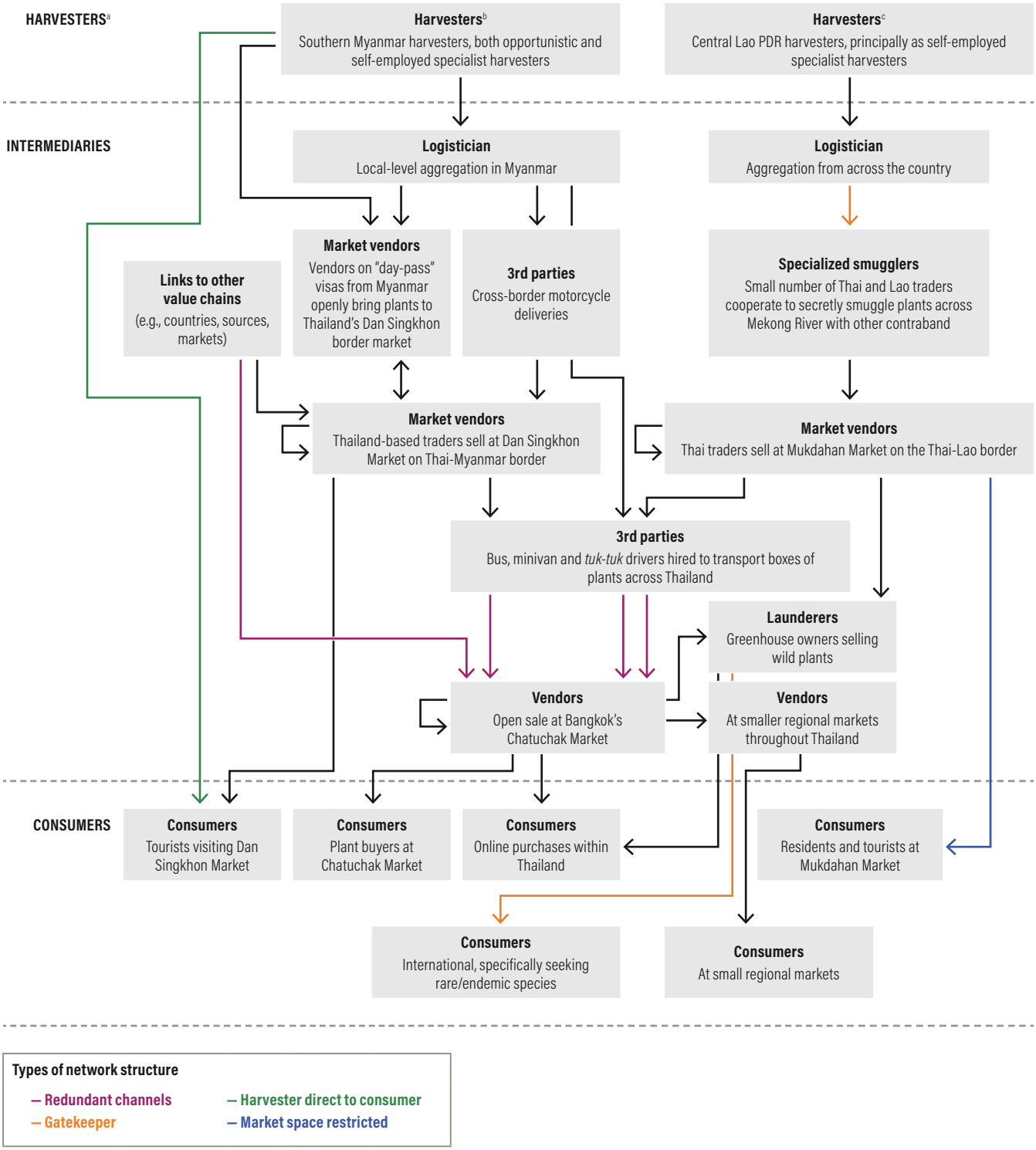
Despite its illegality, a considerable proportion of wildlife trafficking is carried out fairly openly over the Internet and, more recently, on social media. The Coalition to End Wildlife Trafficking Online (2021) reported that more than 11,631,819 posts and listings for illegal wildlife for sale had been removed from social media and other tech platforms between 2018 and 2021. Removal of such online posts, however, is no guarantee that the traffickers will stop doing business. There is little if any tracking of subsequent behavior by those formerly soliciting business online. So presumably, although these actors may still be doing business, we just have less opportunity to observe it and potentially intervene. And much of the online trade continues in the open, like the widespread sale of taxidermized rare bat species on commerce sites including eBay and Etsy, some mounted in "miniature coffins with shiny fittings" (Nuwer 2024).

How does wildlife trafficking work?

Wildlife trafficking can take many forms depending on the flora or fauna being traded and the countries involved, but most commonly it involves criminal syndicates spanning multiple countries and continents, making it truly a global problem. (World Bank 2019). This transnationality of supply chains is what makes tackling wildlife trafficking so difficult. Every jurisdiction has different regulations and legislation as well as law enforcement. For species listed on CITES Appendix I, all commercial trade is illegal. Species listed on CITES Appendix II may be commercially traded subject to compliance with specified quotas and procedures but otherwise may not be legally traded. Yet other species may only be protected at the national level, meaning that illegal trade may hide behind the legal trade.

Figure 4 shows an example of how orchids are trafficked from Laos and Myanmar into Thailand. Although this example is specific to orchids in Southeast Asia, this model

FIGURE 4 | Network of illegal trade in protected ornamental orchids harvested in Southeast Asia



Notes: [a] Overview of trade network of plants from Lao People's Democratic Republic (PDR) and Myanmar for sale in Thailand and internationally; [b] Ornamental orchid *Eria ornata* commonly harvested in Myanmar; [c] Ornamental orchid *Dendrobium lamyaiae*, a narrowly distributed (possibly endemic) species harvested in Laos.

Source: Phelps et al. 2016.

is broadly representative of how other wildlife species are trafficked from Africa and South America into Asia, the European Union, and the United States.

In summary, wildlife trafficking works through

- local collectors or poachers going to the field to source wildlife, either systematically or opportunistically;
- suppliers arranging to sell live wildlife or wildlife parts on domestic and/or international markets either directly or via one or more brokers;
- transport of the products to market either overland (motorbike, car, truck, train), by sea (shipping or fishing vessels), or by air (commercial or chartered plane); and
- delivery to buyers, who may be demand-side brokers or the ultimate buyer.

Many steps in these supply chains are also facilitated by corrupt officials who are either embedded within the network or paid to look the other way (Wildlife Justice Commission 2023). Another common feature of the illegal wildlife trade is the laundering of wild-caught specimens into the legal trade system, often through corrupt and fraudulent abuse of the CITES permitting system (Outhwaite 2020; UNODC 2019), which, in effect, amounts to state-sanctioned wildlife trafficking in many circumstances. Misidentifying wild-caught species as "captive bred" (and therefore legal to buy and sell) is another common tactic (Bittel 2016). The struggle to combat the illegal trade in live cheetahs from Africa to the Gulf states, as described in Box 5, provides an example of the weaknesses of the CITES regulatory system.

What are the consequences of wildlife trafficking?

Environmental. The widespread loss of biodiversity is the main environmental impact of this trade. In 2019, a global operation covering 109 countries, Operation Thunderball (INTERPOL 2019b), seized almost 10,000 turtles and tortoises and 1,500 other reptiles; 4,300 birds; 440 pieces of elephant tusk and 545 kg of additional ivory; 23 live primates and 30 big cats; 7,700 wildlife parts; over 2,600 plants; 74 truckloads of timber; and almost 10,000 marine wildlife items, such as coral, seahorses, dolphins, and sharks. The operation also arrested 582 suspects, all in less than a month (Gore et al. 2019). Whenever collaborative operations such as this—between customs, law enforcement, environmental departments, and CITES management authorities—are conducted, the sheer volume of contraband seized and the number of people involved have been of comparable scale,[2] highlighting the global impact of this trade (INTERPOL 2015, 2017, 2018).

Unfortunately, this also means that for the other 11 months of the year when these operations are not being run, this is the level of trade being missed. The removal of species at this level depletes species and can skew sex ratios, resulting in reduced reproductive success and reduced ability to recover from the losses. The removal of keystone species, such as sharks, wolves, lions, or bears, can have severe impacts on the trophic levels below, throwing off ecosystem balances; for example, when herbivores overgraze on plants because of the removal of lions or wolves or when smaller fish are in overabundance due to the removal of sharks for the shark fin trade (Ferretti et al. 2010; Myers et al. 2007).

In addition to plundering the earth's forests, savannahs, and oceans, wildlife criminals further compound environmental degradation through the destructive methods often used to capture wildlife. Practices such as long-lining for shark finning (Winfield 2021); baiting lions and other big cats with Temik or other poisons to kill them prior to removal of their parts (Banda et al. 2023; Stolton and Dudley 2019; Williams et al. 2017); or slaughtering entire primate troops to capture infants (Clough and May 2018; Ward 2019) have detrimental impacts on ecosystems that can cause cascading effects (Monk and Schmitz 2022; Myers et al. 2007; Nforngwa 2015; Sieben et al. 2011). The poisons used in lion bait can contaminate waterways and often result in other predators, such as jackals, hyenas, and vultures becoming collateral damage (Odino and Ogada 2021).

Socioeconomic. Wildlife trafficking not only affects individual species and their wider ecosystems but also robs local communities and Indigenous Peoples of what may be key local sources of animal protein and cultural practices. In addition, it reduces their ability to benefit from livelihood opportunities offered by ecotourism and other sustainable wildlife or ecosystem-based economic activities. It has been estimated that wildlife trafficking costs $7–$12 billion annually in lost revenue for the countries from which the wildlife resources are extracted (World Bank 2019). However, the true economic costs of this trade have been valued at $1–$2 trillion when accounting for nonmarket-based resources such as ecosystem services, carbon storage, biodiversity, water filtration, and flood retention (Blarel 2019).

Wildlife trafficking can also increase instability and insecurity within villages where poaching is run by OCGs that recruit or traffic locals to enter the protected areas to poach and bribe local officials (UNODC n.d.). In many cases, the poachers are recruited from outside the areas where the wildlife is exploited. Wildlife trafficking has also been linked in some places to terrorist groups and their financing (Nellemann et al. 2016), funding activities that create instability and conflict. Wildlife trafficking also complicates efforts to restrict and regulate the hunting and human consumption of wild bird and mammal species, a practice that has been linked to the emergence of novel zoonotic diseases, including HIV-AIDS, SARS, Ebola, and possibly COVID-19 (Dobson et al. 2020; Gunyup et al. 2020).

The example of major wildlife trafficking suspect Teo Boon Ching, a Malaysian national, demonstrates the difficulties of bringing even egregious offenders to justice. In October 2022, almost 4 months after his arrest in Thailand, Ching, a major wildlife trafficking suspect for over 20 years, was extradited to the United States to face wildlife trafficking and money laundering charges; in the United States, the maximum penalty for wildlife trafficking is 5 years in prison, and the money laundering charge has a 20-year penalty (*Malay Mail* 2022). Despite these large potential sentences, Ching pled guilty to only one count of conspiracy to commit wildlife trafficking and received only an 18-month prison sentence (DOJ 2023). Although it is encouraging that a higher echelon within the OCG was arrested, prosecuted, and convicted, this short prison sentence is hardly a deterrent and is not at all commensurate with the scale of the damage or the resources expended to bring the case to trial in the first place.

The Environmental Investigation Agency (2022) reported that Ching is a major facilitator of shipments from Africa to Asia, boasting that he has facilitated the shipment of over 80 containers with only one seizure during his operation. Given the scale of his involvement in the illegal wildlife trade, it is difficult to understand the equity of an 18-month sentence for conspiracy to traffic 70 kg of rhino horns, a crime that cost the lives of between 23 and 70 rhinos[3] (Emslie et al. 2019).

It should be noted that Ching was arrested in Thailand in 2015 in relation to the seizure of 135 kg of ivory—however, there is no record of a conviction or any outcome of a court trial. It is presumed he used his connections to bribe his way out of a conviction, as has been the case with several high-profile wildlife trafficking cases in Thailand, including the Chaimat wildlife trafficking syndicate[4] (Global Initiative against Transnational Organized Crime 2021b). In May 2024, Indonesian prosecutors sought only a five-year jail sentence for a poacher who confessed to participating in killing seven Javan rhinos from 2019 to 2023, essentially wiping out at least 10 percent of the species' global population (Hance 2024).

These minimal sanctions are hardly a deterrent. More consequential punishments are needed to effectively deter high echelon nature criminals and further motivate law enforcement to act with the knowledge that its efforts can lead to more lasting consequences.

This is why many organizations have been advocating for several years to "follow the money" and conduct proper and in-depth money laundering investigations in parallel to the wildlife trafficking investigations—because the penalties for money laundering are so much higher than for destruction of nature.

BOX 5 | The illegal trade in cheetahs and the failure of governments to control it through the Convention on International Trade in Endangered Species of Wild Fauna and Flora

The iconic cheetah (*Acinonyx jubatus*)—the planet's fastest land mammal—was listed for protection under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) at the treaty's inception in 1975 and has been a particular CITES focus of concern for over a decade. The species is only found in 9 percent of its historical range and is now limited to fragmented pockets in Africa and Asia. Only 6,500 mature individuals are thought to remain in the wild.[a] Nevertheless, trafficking in cheetahs continues. From 2010 to 2019, according to one study,[b] there were 1,884 incidents involving 4,184 cheetahs (87.1 percent live, 12.9 percent parts or derivatives).

Growing demand in the Gulf states of the Middle East—the key destination countries[c]—has seen a steady supply of cheetah cubs being trafficked from the Horn of Africa through typical wildlife smuggling operations and from South Africa and Botswana,[d] where many specimens appear to be laundered through captive-breeding operations and shipped overseas with official CITES permits.[e] In recent years, a significant proportion of the illicit trade in wild cheetahs for the pet trade has moved online.[f]

Cheetahs are accorded the highest level of CITES protection (Appendix I), requiring that any international trade in the species is "subject to particularly strict regulation in order not to endanger further their survival" and "must only be authorized in exceptional circumstances." This is not the reality, however. Based on the authors' regular participation in the CITES process and interviews with dozens of other experts and CITES participants, it is clear that cheetah cubs are routinely traded across the world using loopholes in the CITES system:

- First, the treaty's provisions on international trade in animals bred in captivity allow specimens of Appendix I species bred in captivity to be treated as if they are Appendix II species (which may be traded with CITES permits). Illegal traders thus fraudulently declare animals to have been "captive bred" and legally send them to rich private collectors in Middle Eastern and other destination countries. However, this is only allowed if the facility is officially registered through the CITES Secretariat, and there are only two such facilities registered for cheetahs.
- Second, another loophole allows export for "noncommercial" purposes (breeding and zoos). In reality, though, many animals are destined for private collectors' backyard "zoos" or to "pseudo-zoos" that buy and sell the animals on a commercial basis.
- Third, CITES has established schedules of both "purpose" and "use" codes that must be entered on export/import permits, but in the case of cheetahs, these codes are regularly misused to falsely claim a noncommercial purpose for animals that are being trafficked on a commercial basis.

CITES has established various working groups—on "purpose codes," "captive-bred and ranched specimens," "appropriate and acceptable destinations" (to address the "pseudo-zoo" problem), and "trade in Appendix I species"—but none of these groups has been able to resolve these loopholes, largely due to intransigence on the part of importing countries. CITES also established a Cheetah Working Group in 2013 that deliberated for some six years, but action by countries involved in the trafficking, particularly importing countries, has been weak.

Although the CITES process has had some notable successes (e.g., reduction in trafficking of elephant ivory and rhino horn), the CITES Parties have failed cheetahs, particularly those in the critically endangered populations of the Horn of Africa. Continued requests for CITES action by key countries from which cheetahs are trafficked (Ethiopia, Kenya, and Somalia) have failed to elicit action, and at the most recent CITES Conference of the Parties (December 2022), they were deferred to a newly created "big cats taskforce," which met once in 2023 but has not spurred any meaningful action to disrupt trafficking of cheetahs or other big cats. Action by the importing countries is lacking.

Sadly, this situation is not restricted to cheetahs, but this species is emblematic of the problems of CITES across a range of taxa. Like most international treaties, however, CITES is only as good as its implementation at the national level, and species and local communities suffer when importing countries deny or ignore the problem and authorities are corrupt or indifferent.

Sources: a. TRAFFIC 2024; b. Tricorache et al. 2021; c. Collins et al. 2022; d. Durant et al. 2016; Kraai 2018; Marnewick et al. 2007; Nowell 2014, 2018a, 2018b; Tricorache and Stiles 2021; e. Tricorache and Stiles 2021; f. TRAFFIC 2024

ILLEGAL LOGGING

Illegal logging is a key driver of forest degradation in many parts of the world and often serves as a catalyst for deforestation (the wholesale clearing of forest cover). The precise extent of illegal logging is difficult to determine. The United Nations Environment Programme (UNEP) and INTERPOL estimated in 2016 that the annual value of illegally traded timber at that time was in the range of $30–$100 billion, composing somewhere between 10 and 30 percent of the total global timber trade (Nellemann et al. 2016). No updated global analysis has been conducted since that time. As a general matter, rates of illegal logging appear to have declined in some countries but accelerated in others, including Liberia (Giahyue 2024), Cambodia (Flynn and Srey 2024), and parts of the Brazilian (Franca et al. 2023) and Peruvian Amazon (Vera 2022). Tackling illegal logging is thus critical for conserving forests and biodiversity, reducing greenhouse gas emissions from the forest sector, and sustainably managing legal production forestry where appropriate.

Illegal logging for timber and *illegal deforestation* to make way for expansion of agricultural commodities such as cattle, soy, and palm oil (discussed in the next section) are distinct issues in some ways, including differences in legal violations that may attach to one or the other. But in reality, these two types of forest crime are often sequential and synergistic. Illegal logging for timber is frequently the initial catalyst for wider forest degradation in a particular area due to both the direct removal of trees and the collateral damage to forests caused by roadbuilding and the careless, destructive felling and transport practices (often including wildlife poaching and fire setting) that are characteristic of illegal logging operations. It is also the catalyst for increased wildlife trafficking, often after the building of roads and other linear infrastructure and the opening up of new areas where traders seek previously unexploited populations of wildlife. Such operations are most often followed by clearing, burning, and conversion of forests to agriculture or, all too often, degraded wastelands not even used for crops or pastures (Barber and Canby 2018).

Indeed, a significant proportion of the timber supply in many tropical countries does not come from logging concessions in areas legally allocated for long-term management as timber production forests. In 2016, UNEP estimated that more than 30 percent of the world's timber supply is thought to be "illegal conversion timber" cut during the illegal clearing of forests to produce palm oil and other commodities (Nellemann et al. 2016). Several years earlier, Lawson (2014) estimated that 30–50 percent of the world's internationally traded tropical timber is sourced from forests illegally cleared for agriculture or cattle pasture. A more recent study (Dummett and Blundell 2021) concluded that illegal tropical forest clearing for agriculture has increased since 2014, so one may infer that illegal conversion timber continues to make up a considerable percentage of the tropical timber trade.

Like other forms of nature crime, illegal logging and forest clearing are often associated with corruption, civil conflict, human rights violations, and organized crime. More broadly, poor governance and corruption undermine economic and social development by weakening the rule of law and the institutional foundation on which sustainable economic growth depends—with particular harm to the rights and livelihoods of Indigenous Peoples and other forest-dependent communities. Quite apart from the conservation implications, these are core security challenges that many countries are confronting in their forested hinterlands (Schoonover et al. 2021).

Illegal logging also can stimulate wildlife poaching and trafficking. Loggers may poach animals for subsistence or subsequent sale for local and even international markets (EIA 2021). Illegal logging also increases the risk of human exposure to novel pathogens and pathogen spillover and disease transmission from wildlife to people, other wildlife, and domestic animals and livestock (Plowright et al. 2024).

Illegal logging results in habitat loss and species extinctions, and it contributes to global warming through the dual action of emissions being released from soil during the logging process and through the lost ability to absorb carbon from the atmosphere (Harris et al. 2021). Illegal logging and associated deforestation affect local communities reliant on forest ecosystem services for their survival through reduced biodiversity, loss of access to their resources, and, in many instances, increased security threats from armed loggers and increased likelihood of landslides. In addition, governments lose access to vital tax revenue that could help improve the standard of living of inhabitants (Barber and Canby 2018; Dummett and Blundell 2021).

It is important to note, however, that "legal" does not necessarily mean "sustainable," as is discussed in Box 6.

BOX 6 | If logging is legal, does that mean it is sustainable?

A significant body of scientific and policy research indicates that the great majority of industrial-scale logging in the humid tropics is unsustainable, causing degradation of forest ecosystems and serving as a catalyst and accelerator of forest conversion.[a] Although there are examples of managed, selective tropical logging that has been sustained over time in some places, those places tend to be exceptions to the rule, for two principal reasons: First, truly ecologically sustainable logging involves such low harvest rates that it is not economically profitable, creating strong incentives to increase logging intensity or to clear forests for agriculture. Second, where government oversight capacity is low—and corruption is a factor—the ideals of "sustainable forest management" fall by the wayside.[b]

On the other hand, well-managed logging concessions may in some cases be the "least destructive" alternative, ecologically speaking, because the alternative is often piecemeal or systematic degradation and clearance for agriculture or pasture. The Brazilian government announced in mid-2024 that it was taking this gamble,[c] deciding that granting logging concessions in some state-owned forest lands not allocated for either protection or conversion in the Amazon was the best strategy for reducing widespread forest "land grabbing" and clearing (as discussed in the subsequent section of the report).

This report does not try to resolve this broader issue because our focus is on nature crime. But it is important to keep in mind that "legal" logging is not necessarily "sustainable." In addition, a significant proportion of legal violations related to logging are linked to cutting and other operational practices within logging concessions that may have been granted in accordance with the law.

Sources: a. Mackey et al. 2022; b. Barber et al. 2020; c. Maisonnave 2024.

What is illegal logging?

The term *illegal logging* lacks a clear, agreed international definition. For the purposes of this report, it refers to the harvest, sale, and/or trade of timber felled in violation of applicable local, national, or international laws and regulations. There are a number of crimes associated with illegal logging that relate to how the timber is sourced (as shown in Figure 5), how the timber reaches its final destinations and markets (i.e., illegally traded, log smuggling, document fraud, mispricing and misreporting, tax evasion, etc.), and how the proceeds of sale are handled (e.g., money laundering). All of these practices can be characterized as forest-related crime where the underlying "predicate" offense is the actual illegal logging itself. Some jurisdictions include these additional crimes in their definition of *illegal logging* as well.

For this reason, it can often be difficult to compare studies conducted by different organizations on rates of illegal logging around the world (Bösch 2021). Nellemann et al. (2016) identified over 30 different methods to conduct illegal logging and launder the associated wood. A significant proportion of these crimes are conducted by highly sophisticated organized crime networks that take advantage of weak enforcement capabilities, poor regulatory systems, and poor governance of the forestry and export industries and use bribery, corruption, and intimidation tactics to facilitate their activities.

How does it work?

Illegal logging and associated crimes (some discussed above) are often referred to as "forestry crime."[5] Additional crimes not mentioned above include exploitation of high-value endangered and/or protected species, such as rosewood, and laundering of illegally logged timber into the legal supply chain through mixing with legally harvested timber and plantation timber.

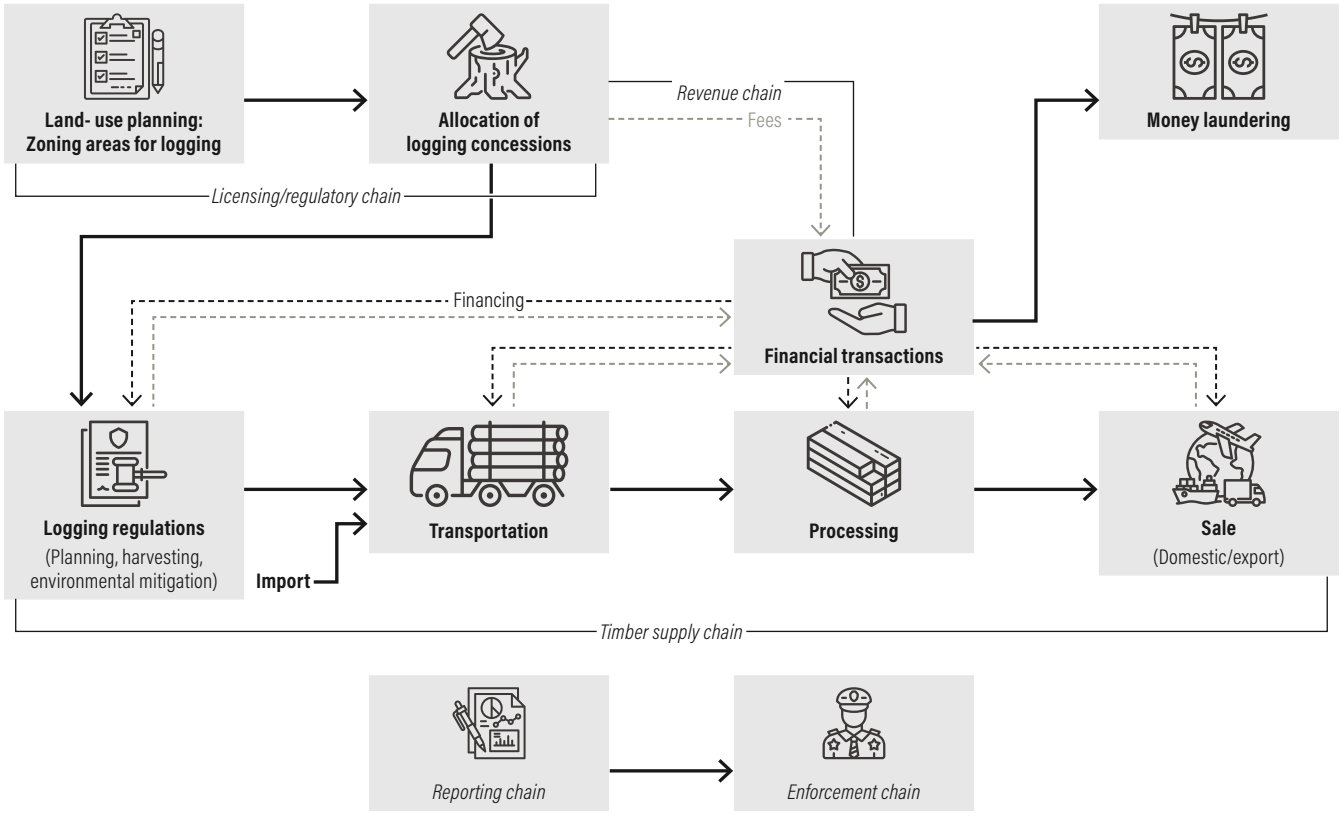
Due to the clandestine nature of illegal logging and associated trade, getting estimates on the number of OCGs operating, their modus operandi, smuggling routes, and total volumes being traded is difficult and dangerous, as with other illegal commodities. Although networks and country environments vary, the extensive review of reporting and literature conducted for this report indicates that OCGs involved in illegal logging tend to share some common features (Figure 6):

- **Core networks.** OCG core networks are often close family members. These individuals will do much of the location scouting and brokering of deals as well as

recruiting new employees. Beyond the core networks, there is usually a wider trusted network of extended family and friends who may join on scouting trips to give an appearance of legitimate business travel or a family holiday, depending on the setting. Trusted individuals will handle cash drops and take ownership of timber (or other illicit commodities being traded—OCGs rarely specialize in only timber.)

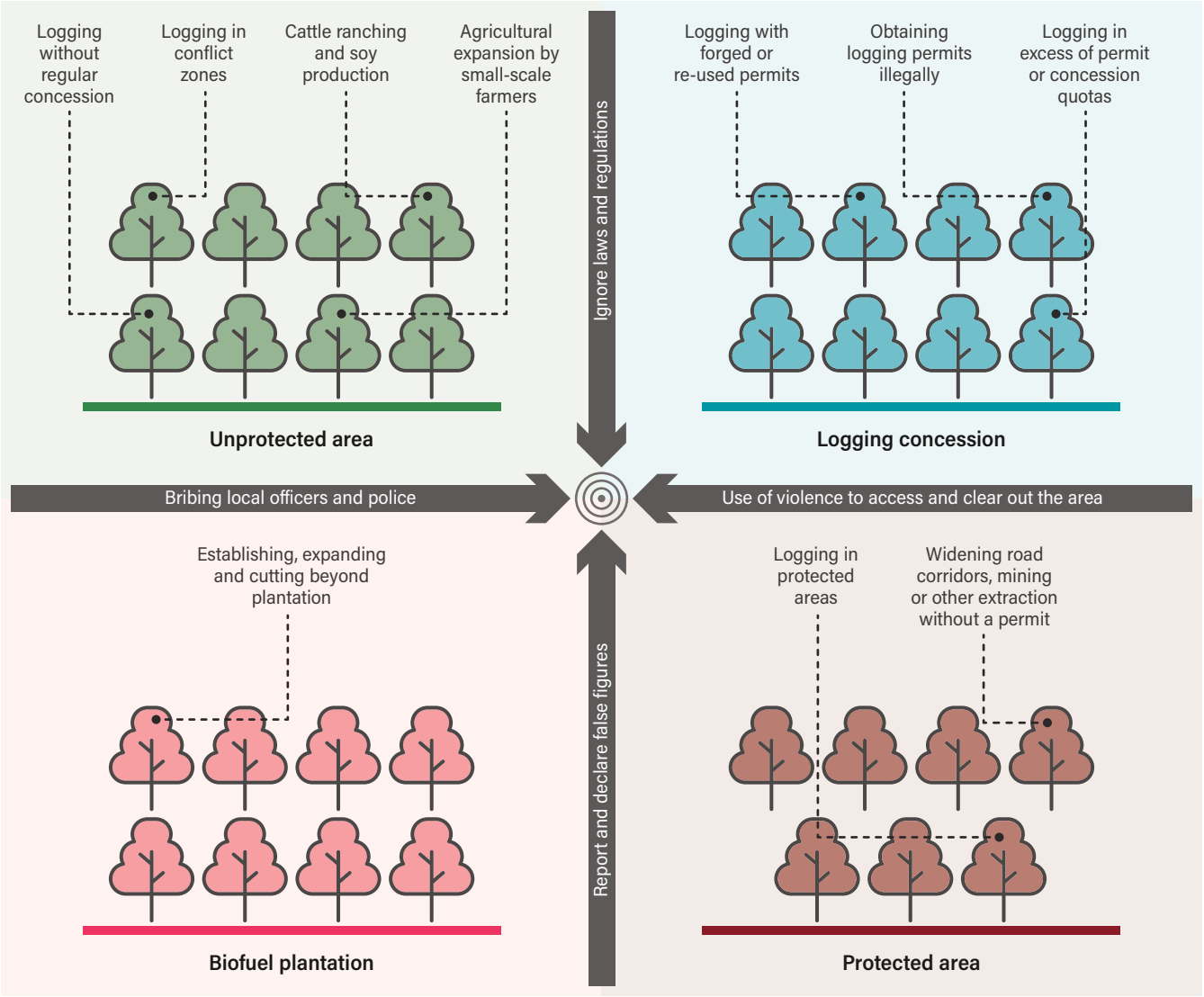
- **Businesses.** OCGs also work with various businesses—both legitimate and shell companies—to transfer and/or launder funds and take care of logistical needs (e.g., logistics, shipping, logging and mining companies, and financial institutions). Ownership of these companies is often "nested," with companies owning or partially owning each other in a circular manner. Some will be registered in offshore locations to hide the identities of the beneficial owners and obscure those of the ultimate owners. Others operate cash-based "legitimate businesses" where high turnover is possible, such as nail salons, massage parlors, car dealerships, pet stores, sawmills, and more. Many networks appear to have connections to casinos, which are often used for money laundering.
- **Corrupt officials.** In many cases, illegal logging and associated trade are facilitated by corrupt government officials within forestry and wildlife departments, law enforcement, customs, and the banking institutions used by OCGs. In some cases, high-level officials and politicians have been implicated. In Gabon, for example, following a four-year investigation and major exposé by the Environmental Investigation Agency (2019), the president sacked both his vice president and forestry minister for their involvement in a systematic illegal logging scheme with Chinese companies (AFP 2019). In Indonesia, the national Corruption Eradication Commission (Komisi Pemberantasan Korupsi, which was established in 2002) had by 2016 exposed the extent of corruption and loss of state revenue due to illegalities in the forestry sector (KPK 2015) and successfully prosecuted dozens of cases against senior subnational officials and politicians (Schütte and Syarif 2020) before the body was gutted in 2019 by the administration of President Joko Widodo, who came to power in late 2014 (Mulholland and Sanit 2020).

FIGURE 5 | A generic representation of the forestry sector and its constituent chains



Source: Adapted from Program on Forests, 2011. Forests, Fragility and Conflict.

FIGURE 6 | Ten ways to conduct illegal logging



Source: Fedorov et al. 2017.

What are the consequences of illegal logging?

Illegal logging causes extensive forest degradation and serves as a catalyst for further widespread deforestation, and it makes up a significant proportion of the global wood production and trade. INTERPOL (2019a) estimates that illegal logging accounts for 15–30 percent of global timber production and asserts that some 50–90 percent of logging in tropical countries is illegal in one way or another. Its negative consequences are environmental, economic, and social.

Environmental. Tropical primary forests are "ground zero" for biodiversity and its loss and are, unfortunately, the type of forest most intensively targeted for illegal logging. A review by the US Congressional Research Service (2019) concluded that "the percentage of illegal logging is highest in Cameroon, Indonesia, Brazil, Democratic Republic of the Congo (DRC), Myanmar, Papua New Guinea, Ghana, Peru, and Laos." Those countries, of course, represent the majority of the remaining areas of primary tropical rainforest on the planet, including most of the Amazon and Congo Basins and insular and mainland Southeast Asia.

Tropical primary forests hold up to two-thirds of all terrestrial species, providing unique habitat characteristics critical for large numbers and a wide variety of plants and wildlife, including the hidden biodiversity—invertebrate and fungal diversity and soil biota—that underpins the productivity and stability of forest ecosystems. Many unique, specialized features are only found in primary forests and within forest interior microclimates, and we are still discovering new species in them (Barber et al. 2020).

When forest habitats for endangered species and high-biodiversity regions are completely destroyed, species suffer from range reductions, being captured and used in a secondary illegal wildlife trade, and increased competition within the remaining habitats. This places more pressure on already endangered species and pushes species previously not threatened toward threatened status (Faria et al. 2023). Apart from simply removing critical habitat for species, illegal logging can impact the migration patterns of species, which has a snowball effect of impacting breeding success and survivability, as in the case of monarch butterflies (see Box 7).

In addition to the damage to trees and forest-dependent species, illegal logging causes degradation of soils and waterways that may be less obvious to the casual observer but are critical for forest ecosystem functions and for Indigenous and other forest-dependent human communities (de la Paix et al. 2013; Lal 1996; World Bank 2019). Logging removes root systems that are vital for ensuring that topsoil and nutrients are maintained. Their removal creates unstable soils, which, when combined with heavy rains during tropical monsoonal seasons, can cause landslides. Soil runoff from the land also smothers marine life in coastal marine environments (ISRS 2019).

It is well recognized that forest conservation is a critical component of any effective global strategy to both reduce GHG emissions and sequester atmospheric carbon dioxide. In particular, conservation of remaining tropical primary forests is essential for achieving the Paris Agreement target of limiting global temperature increase to 1.5°C degrees above preindustrial levels. Tropical primary forests protect the largest living biomass carbon stocks, most of which are stored in big old trees. Mackey et al. (2020) calculated that primary tropical forests store 49–53 percent of all tropical forest carbon, with roughly another 25 percent stored in forests that have been subject to some land-use disturbance and a further 25 percent or so in more severely degraded forest.

BOX 7 | The impact of illegal logging on the monarch butterfly

Sierra Chincua is a reserve established to protect critical overwintering habitat of the monarch butterfly (*Danaus plexippus*) on the border between the states of México and Michoacán, approximately 100 miles to the west of Mexico City. It is part of a larger United Nations Educational, Scientific and Cultural Organization World Heritage Biosphere Reserve that hosts an estimated 60 million of the butterflies during their legendary migration to and from the United States. The butterflies form colonies in November at the headwaters of streams within the reserve; as the season advances, they move to lower elevations before remigrating to the United States in the spring.

In mid-2015, local inhabitants reported to authorities that 10 hectares of forest in the lower-elevation end of the butterflies' territory had been illegally cleared. Later that year, the authorities conducted raids in the area, arresting 35 illegal loggers and seizing 147 cubic meters of wood.[a] In 2020, further illegal logging destroyed an additional 33.4 hectares of habitat.[b] Although not a large area in global deforestation terms, the illegal clearing occurred right in the middle of critical habitat that the butterflies have been using since 1977. Given that monarch butterfly arrival numbers have been declining, however, every hectare of this particular forest is critical for the future survival of this beloved species.

Sources: a. Brower et al. 2016; b. Stevenson 2021.

The destruction of primary forests contributes to climate change, of course, whether the destruction is legal or not. But illegal logging affects places like protected areas that would not otherwise be logged. And it affects the viability of initiatives that seek to conserve such forests and generate the finances necessary to do so. Policy solutions such as REDD+,[6] biodiversity credits, and the like will not realistically function in the lawless, thinly governed and violent forest frontier areas where illegal logging and other forms of nature crime are prevalent.

Socioeconomic impacts. INTERPOL (2019a) estimates the value of the illegal timber trade at $51–$152 billion, and the World Bank (2019) concludes that total annual ecosystem service losses from the forest sector due to illegal logging are in the range of $42–$88 billion. These are huge numbers. But the impacts play out for

the economies and livelihoods of particular countries and communities and some of the world's poorest and most vulnerable people.

In 2004, the World Bank estimated that 90 percent of the world's poorest inhabitants[7] (1.2 billion people) relied on forests for at least part of their livelihoods. As of 2013, it is reported that 350 million people rely directly on forests for subsistence. Sixty million people within this group—mostly Indigenous communities—are completely reliant on forests (World Bank 2013). Illegal logging, therefore, has serious social and economic impacts for some of the most forest-dependent and often vulnerable people in the world.

These impacts are beginning to dwarf other trafficking and nature crimes in terms of value. In Africa, the annual net profit value of the charcoal trade—mostly based on the illegal cutting of trees—is estimated at $2 billion, compared to $2.65 billion for heroin and cocaine local value (Browne et al. 2022). Impacts on Indigenous and local communities include livelihood impacts through oss of access to resources, environmental damage and biodiversity loss of biodiversity (Global Initiative against Transnational Organized Crime 2021b), increased security threats (Brown 2022; Evans 2022), increased poverty (Seymour and Busch 2017; Shyamsundar et al. 2021), and increased health concerns (Robbins 2016; Zimmer 2019).

Impacts at a countrywide scale include impacts to the economy, lost tax revenue (Grobler 2020; Mousseau 2015, 2018; Nellemann et al. 2016; Vit 2015), and increased political instability and national security threats (Forest Trends 2022; Habibe et al. 2019; Schoonover et al. 2021).

ILLEGAL LAND ACQUISITION AND DEFORESTATION FOR AGRICULTURE

According to a comprehensive global study (Sims et al. 2024), permanent agriculture for crops such as soy, palm oil, rubber, cocoa and cattle was the leading driver of tree cover loss in tropical forest regions, accounting for approximately 70% of loss in Latin America, 60% in Southeast Asia, and 50% in Africa. These findings accord substantially with a previous study (Dummett and Blundell 2021) which also estimated that almost three-quarters of this conversion was conducted n violation of national laws and regulations. Large-scale illegal acquisition of lands for commercial and/or speculative purposes—sometimes called "land grabbing" (Allard International Justice and Human Rights Clinic 2018)—is often connected to illegal logging and to the illegal clearing of forests, but the connections are complex and nuanced. It is often difficult to determine whether forest degradation or conversion is primarily the result of illegal logging, the encroachment of subsistence agriculture, or large-scale conversion for commercial crops or livestock. And in some cases, forest conversion to cattle pasture, for example, is done primarily to establish a claim over land for speculative purposes, with the income from timber or livestock serving as both evidence of occupancy as well as a lucrative side hustle (Filho et al. 2021). Fire is often both a tool for land grabbing and a result of the forest degradation caused by land grabbing (Barber and Schweithelm 2000; WRM 2021).

Here, we focus primarily on the illegal or fraudulent acquisition of land as the primary illegal activity, acknowledging that such property may be intended for some combination of logging, clearing for crops and livestock, and speculation in the value of the land itself.

Neef (2020) found that 80 percent of land acquisitions in tropical forest regions between 2000 and 2018 (over 80,000 land deals) targeted forested areas, with half of the acquisitions causing accelerated forest loss.

Land grabbing first became a topic in international development discourse nearly two decades ago. It was thought to be primarily conducted by foreign actors, coming into mostly developing countries and purchasing land for agriculture through questionable mechanisms and deals, sometimes in breach of existing land rights and without

free, prior, and informed consent of Indigenous and other local landowners (see Figure 7 on global scope of transnational land acquisitions for agriculture).

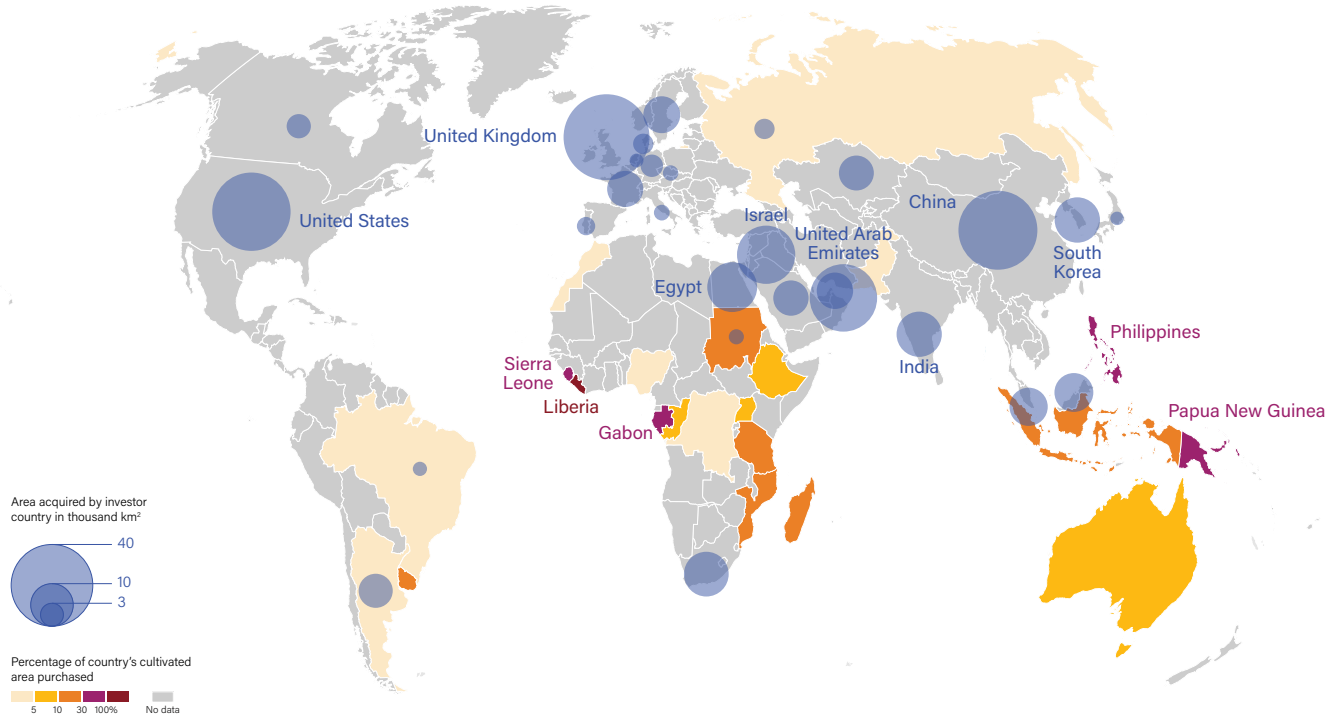
More recently, numerous studies and reports have highlighted the role of domestic actors with considerable focus on forest land grabbing in the Brazilian Amazon (Carrero et al. 2022; Moutinho and Azevedo-Ramos 2023). Forest land grabbing by Mennonite agricultural colonies in Latin America (le Polain de Waroux et al. 2021) has become a significant driver of deforestation in Bolivia (MAAP 2023a) and Peru (MAAP 2023b), and in 2022 it spread to Suriname (Soria 2024). In Burma, the military has played a significant role (Global Witness 2015). In Indonesia, land grabbing has long been associated with the expansion of palm oil plantations (Human Rights Watch 2019). In Mexico, which provides 80 percent of avocados to the United States, the crop is increasingly grown on illegally deforested land (Radwin 2024b) and is closely linked to violent criminal cartels, involving threats, abductions, and killings as well as illegal deforestation (Romero and Mega 2023).

What is land grabbing?

The authors understand *land grabbing* in its simplest form as the acquisition of large tracts of land by a government, organization, or individual illegally or fraudulently, often under the guise of agricultural development. In a more extensive definition, the International Land Coalition Global Assembly (2011) defined it as acquisitions or concessions that are one or more of the following:

- In violation of human rights, particularly the equal rights of women
- Not based on free, prior, and informed consent of the affected land users
- Not based on a thorough assessment, or are in disregard of social, economic, and environmental impacts, including the way they are gendered
- Not based on transparent contracts that specify clear and binding commitments about activities, employment, and benefits sharing
- Not based on effective democratic planning, independent oversight, and meaningful participation

FIGURE 7 | Map of transnational land acquisitions



Source: Gironde 2019.

Forest land may be "grabbed" from the state or, in many cases, may be forcibly taken from current occupants, often Indigenous Peoples or other local communities. There has been a considerable amount of reporting and gray literature related to land grabbing, particularly since 2007, when the concept rose to prominence. There had been limited peer-reviewed scientific analysis on the global patterns of land grabbing until a comprehensive review by Yang and He (2021). They analyzed 128 case studies from across the world[8] to determine patterns in geographical distribution, roles of investors and local actors, and the observed outcomes with regard to environmental, economic, and sociocultural impacts.

How does it work?

The mechanics of land grabbing vary across country and local contexts: key variables include legislation and regulations governing landownership, the nature of agricultural and forestry production systems, and the level of corruption and degree of government complicity, as discussed below.

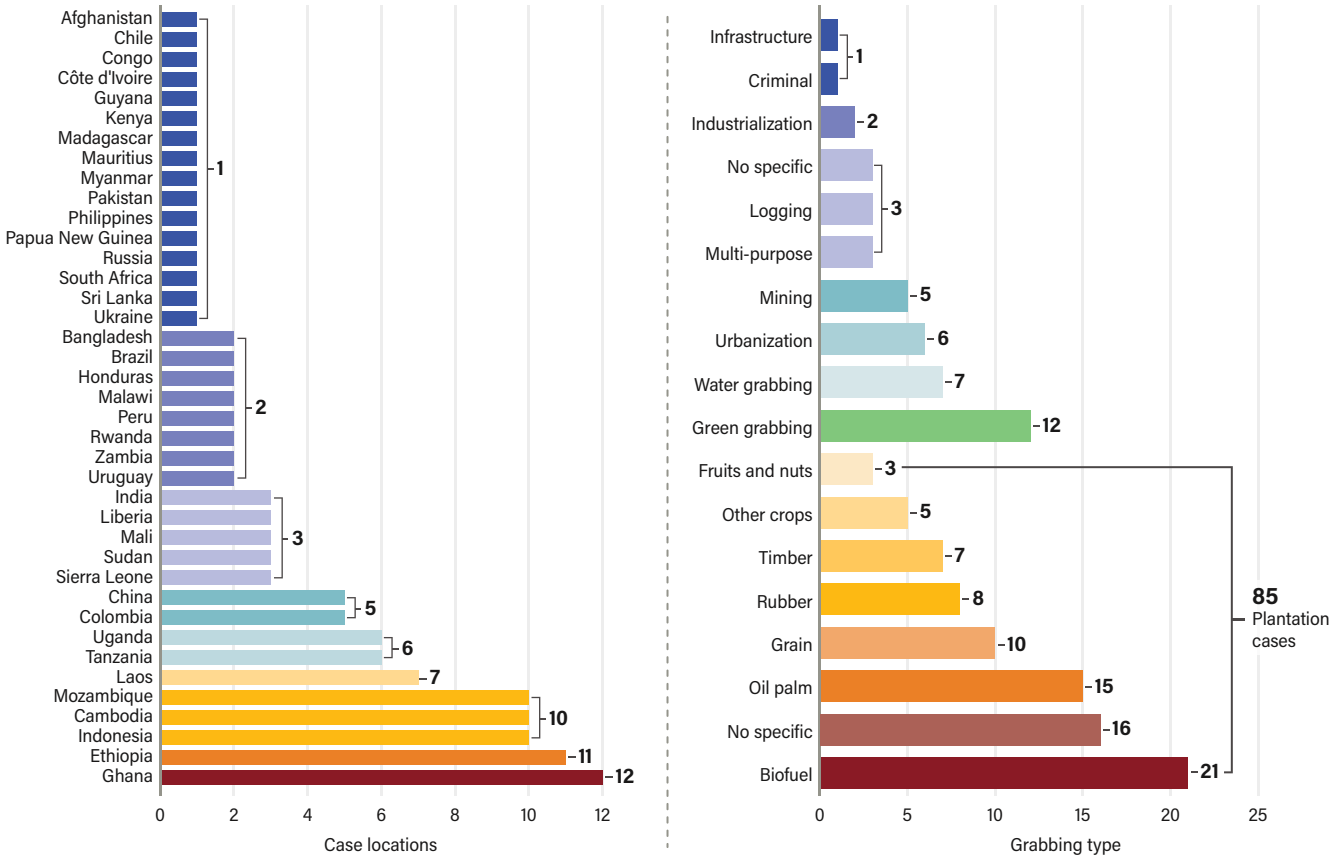
As summarized in Figure 8, Yang and He (2021) found that the majority of scientific case studies available in the literature (2007–20) were in Africa and were overwhelmingly related to converting forested land to plantations primarily for biofuels and palm oil. Logging and timber were only mentioned in 10 case studies out of 128, however, the paper does not consider gray literature or even legal cases or government inquiries focused on, for example, the vast forests of Papua New Guinea (PNG) (Filer 2012; Global Witness 2017).[9]

Reviewing extensive reporting and literature, the authors conclude that land grabbing, however defined, often has the following common features:

- **Negotiations with government officials.** Investors (i.e., land grabbers) may negotiate with government officials to acquire large tracts of land at a low price or with favorable terms. These negotiations often occur without the participation or input of Indigenous Peoples or local communities who may be impacted by the land acquisition and may even be against local environmental or landownership laws.
- **Coercion and intimidation.** Some land grabbers may use coercion or intimidation to obtain land from local communities. This can include threats of violence, destruction of property, or other forms of harassment. Many environmental defenders lose their lives yearly fighting against land grabbers (Global Witness 2022, 2023, 2024).
- **Deceptive contracts.** Investors may use contracts that are written in a language that local communities do not understand or that contain clauses that are unclear or misleading. In some cases, investors may pay off local leaders to sign agreements that are not in the best interests of the community and/or fake signatures of villagers to make it look like free, prior, and informed consent has been given when it has not.
- **Displacement and resettlement.** Land grabbers may forcibly displace local communities from their land, often with little or no compensation. This can have devastating consequences for the affected communities, who may lose their homes, their livelihoods, and their cultural heritage. This is most often related to mining operations, both legal and illegal.
- **Corruption.** Land grabbing can be facilitated by corrupt officials who accept bribes or other incentives to grant land concessions to investors. They may also be incentivized to amend laws to make illegally acquired land "legal," as was the case in PNG (Global Witness 2017).
- **Lack of legal protection.** In many countries, land rights are poorly protected, and local communities do not have legal recourse to challenge land acquisitions. This can make it easier for investors to acquire land without the consent or compensation of local communities. It can take years or decades to fight landholders of illegally acquired land; meanwhile, they are able to deforest and/or exploit the local resources on the land for themselves.

As noted by Yang and He (2021) in Figure 8, some forest land grabbing takes the form of "green grabbing"—a term coined by Vidal (2008) to denote the acquisition of forests and other land in violation of laws or local rights for ostensibly environmental purposes such as biodiversity conservation, carbon sequestration, or production of renewable energy.

FIGURE 8 | Case locations by country and grabbing types



Note: n = 128.

Source: Yang and He 2021.

What are the consequences of land grabbing?

Land grabbing has significant environmental, social, and economic consequences, particularly in developing countries. These include environmental degradation, displacement of communities, loss of cultural values and identification, loss of livelihoods, and food insecurity. Research has shown that land grabbing disproportionately affects marginalized groups, including Indigenous Peoples and small-scale farmers. It also undermines local governance systems and exacerbates global inequality. As such, it is a complex and pressing issue that requires urgent attention and action (Anseeuw et al. 2012; Borras et al. 2012). Land grabbing also facilitates other nature crimes, as discussed below.

Environmental. The environmental impacts of land grabbing are complex and interconnected. It often results in clearing of forests, wetlands, and grasslands that are rich in biodiversity and also play a critical role in mitigating climate change. The conversion of natural ecosystems to monoculture crops (e.g., oil palm, soy, rubber) or pastureland results in habitat fragmentation and degradation, which in turn results in species extinctions; loss of ecosystem services such as carbon sequestration, pollination, and water regulation; and increased emissions of carbon dioxide and other greenhouse gases. Water resources are often particularly affected by pollution from livestock waste and fertilizer runoff, blockage of river and stream navigation, declining fish catches, and increased extraction of groundwater from aquifers for agricultural and human settlement needs (IPBES 2019).

Land grabbing for palm oil plantations in Indonesia and has led to extensive deforestation, which has contributed to greenhouse gas emissions, loss of habitat for endangered species such as orangutans, declines in many species due to both habitat loss and wildlife trade/trafficking, and

conflicts with Indigenous communities (Carlson et al. 2012; Koh and Wilcove 2008). Likewise, land grabbing for commercial agriculture has resulted in the displacement of small-scale farmers and pastoralists around the world, leading to overgrazing and soil erosion as well as water depletion from irrigation projects. This has contributed to food insecurity and environmental degradation (Deininger and Byerlee 2011; Mousseau and Sosnoff 2011).

Ironically, land grabbing is also being carried out in Brazil for the ostensible purpose of mitigating climate change. A 2024 investigation by the *Washington Post* (McCoy et al. 2024) found that "carbon credit" projects covering an area six times the size of the US state of Maryland—which have generated tens of millions of dollars—overlapped with illegally seized, formerly public lands. These credits have been purchased as offsets by major international companies, including the likes of Netflix, Spotify, Boeing, Airbnb, and several major airlines.

Social. Land grabbing has significant social impacts, including displacement of Indigenous Peoples and local communities, loss of traditional livelihoods and cultural values, and the inability to live a subsistence lifestyle—thus creating and increasing rural poverty, food insecurity, and reliance on government welfare or foreign aid. Violations of human rights cause cultural damage and trauma from loss of access to customary lands or cultural practices connected to their forests (see Box 8).

Conflicts between local communities and land grabbers have been reported around the world, from Africa (Cameroon, Ethiopia, and Uganda) to PNG to Central and South America (Brazil, Colombia, and Mexico) (Allen and Monson 2014; Del Río Duque et al. 2022; Ennes 2021; Global Atlas of Environmental Justice 2022; Gumisiriza 2018; Malkamuu 2016; Ndi and Batterbury 2017).

In 2021, Central and South America accounted for over half of the attacks on local environmental defenders speaking out primarily against land grabbing actors (Global Witness 2022). In 2023, 85 percent of the documented global cases of murders of land and environmental defenders occurred in Latin America (Global Witness 2024). Land grabbing also increases instability, which can result in worsening security situations for local communities; in other cases, war and conflict are used to facilitate land grabs, as has been occurring in Myanmar in recent years (Fishbein 2023).

The trauma of land grabbing and deforestation does not end with the demise of the forest. Journalist Eliane Brum (2023) writes of the "deforested peoples" forcibly displaced from the rainforest to marginal lives in the Brazilian city of Altamira:

> *Before living in Altamira, I would just pass through the city, getting off a plane to catch a boat into the deep forest, and then a second time, boarding a plane to return to Sao Paulo. [After moving to Altamira] . . . I was captured by the deforested peoples, overcome by immense tenderness for the human and nonhuman ruins, and invaded by the understanding that a modern city is, by definition, ruins of nature. Up until then, I had thought that I could understand the forest without understanding the ruins of the forest, that I could tell about forest peoples without telling about deforested peoples. Living in this Amazonian city, I could almost feel these connections being completed within my body, the bridge between a forest already buried by the ruins, called city. All of this is the Amazon.*

Economic. The environmental and social impacts all result in economic losses for local communities and countries as a whole that are suffering from land grabbing. The dispossession of customary land and forced removals of Indigenous Peoples increase poverty and economic inequalities (Borras et al. 2012). The environmental degradation results in reduced agricultural productivity and nonmarket valuation losses associated with biodiversity loss and increased climate change impacts that historically have been overlooked (Lawrence and Vandecar 2015).

The worsening security situations in regions with high levels of land grabbing results in the government having to commit more resources to maintaining security and stability of its regions, which takes money away from necessary services such as education, hospitals, or welfare for the previous subsistence farmers increasingly reliant on government resources to survive. Overseas investments through land acquisitions for agriculture or mining is often seen as a positive outcome, but the negative impacts caused far outweigh these benefits (de Schutter 2009). They serve only to make a minority of corporations and corrupt government officials rich while customary and traditional landowners and countries as a whole bear the consequences.

BOX 8 | Land grabbing in the Brazilian Amazon rainforest: Corruption, violence, and impunity

In Brazil's Amazonian state of Pará, land grabbing and associated violence and corruption have become normalized. The case of the mayor of São Félix do Xingu, João Cleber Torres, provides a chilling example, as documented in a comprehensive *Washington Post* investigation in 2022.[a] Torres has been accused by many, including the Brazilian federal attorneys' office, of being one of the major land grabbers in the region, making his fortune by establishing a criminal network to steal timber from the forest before illegally seizing the land and selling it off for conversion to agriculture lands.

According to McCoy and do Lago, Torres was first investigated beginning in 2003 concerning suspected crimes, including illegal seizure of land, mostly in the Indigenous territory of Apyterewa; illegal logging; and ordering the murder of locals who refused to give up their land or wanted payment for work they had performed. Full reports from investigators were provided to law enforcement leadership in Brasília. This led to federal charges for the killings, but there has never been a wider follow-up investigation over the past two decades. Previous case records of murder accusations and the various reports from the federal attorneys all mysteriously vanished from their respective organizations, as did the men who had carried out previous murders and had provided statements that Torres had ordered the killings.

In Brazil, Indigenous territories provide one of the only protections against deforestation and land grabbing in the Amazon: Indigenous lands constitute 13 percent of Brazil, but less than 2 percent of deforested land lies within these areas. But this has not been the case in the Apyterewa territory in Pará. Prior to legal establishment of the territory, three-quarters of the São Félix region was "unclaimed public land" or "*terra sem dono*"—land without an owner. Despite this, Torres and other farmers and loggers have long disputed the 2001 Justice Ministry legal declaration of the territory. In 1983, these land-grabbing actors were the first to contact the Parakanã people, who live in the territory. They argue that they have more right to the land than "a few hundred Indigenous people."

In 2016, the Brazilian government ordered the removal of people who were illegally occupying the territory. Torres fought this decision by rallying opposition among farmers and visiting encampments, stating, "The federal government wants to remove 2,000 families to benefit 300 [Indigenous People], I will fight until the end to reverse this."[b]

Now, upon this site sits a large illegal city, with dress shops, grocers, butchers, bars, and other commercial developments, with residents all willing to resort to violence against the Indigenous Peoples to protect their newly stolen land. Torres was elected as mayor in October 2016 with 37.5 percent of the 47,933 votes cast.

Torres and his brother Torrinho have been implicated in a number of murders, but no charges have ever been brought. José Gomes, also known as Zé do Lago, and his family appear to be one of the latest victims of the land grabbing crisis in Brazil. He was found by his son shot to death in late 2021 at their home after refusing to sell his land to Torrinho, who "owned" a farm that encapsulated Zé do Lago's home. Although Torrinho is the prime suspect, no one expects the authorities to do anything about it.

Sadly, this case of land grabbing, deforestation, violence, corruption, and impunity is only one of many in the Brazilian Amazon. The *Washington Post* analysis found that over a 20-year period, 1,189 elected officials in the Amazon had been cited by federal attorneys for environmental infractions. It found that an additional 236 officeholders were owners of companies that had been accused of environmental wrongdoing. In the same period, almost US$37 million in campaign contributions had been paid by 1,590 individuals and 717 companies that had been implicated in environmental wrongdoing—which was mostly defined as deforestation, land grabbing, or illegal mining.

A 2022 report found that violent crime linked to illegal land grabbing, mining, and logging had soared in many regions of the Brazilian Amazon, which now have some of the highest murder rates in Brazil.[c] A Human Rights Watch (2019) report provided details of over 300 murders of land rights activists in Brazil that have occurred since 2009, many of which remain unsolved. Human Rights Watch reported that it was able to obtain credible evidence—from villages and federal attorneys alike—that 28 killings and 40 death threats, which occurred mostly since 2015, had been carried out because the victims were vocal opponents of criminal gangs involved in deforestation and illegal land grabbing.

Sources: a, b. McCoy and do Lago 2022; c. Brown 2022.

Convergence: Financial crime, corruption, and human rights violations

Nature crime is entangled with corruption, human rights abuses, drug and arms trafficking, and financial crime. In some regions, it funds violence and exacerbates political instability. Understanding these convergences can offer a solution in ending nature crime.

The tentacles and impacts of the nature crimes described in the previous section reach far beyond the critical ecosystems where they occur. Nature crime typically involves more than the "predicate offenses" that directly impact natural resources and ecosystems, such as felling trees, killing pangolins, or cutting the fins off sharks. This is particularly true when one looks beyond the "foot soldiers" of nature crime and focuses on the bosses, their accomplices in government, and their strategies and mechanisms to turn stolen natural resources into hard, untraceable cash, often far away from the scene of the crime (Crosta et al. 2023).

GAMING THE SYSTEM: FINANCIAL CRIME

Nasdaq's *2024 Global Financial Crime Report* estimated that in 2023 more than $3.1 trillion in illicit funds flowed through the global financial system. Much of that was assessed to be linked to drug trafficking ($783 billion), human trafficking ($347 billion), terrorist financing ($11.5 billion), and various fraud and bank fraud schemes ($486 billion). But it has become increasingly clear that nature crime is also closely intertwined with misuse and abuse of the global financial system. As with drug or human trafficking, OCGs and other perpetrators of nature crime are constantly seeking ways to "launder" the proceeds of crime into legitimate and/or untraceable assets (e.g., cash, securities, gold, or real property). Actors involved in these crimes vary from individuals to large OCGs to multinational companies. Financial institutions may be unwitting accomplices in nature crimes—or they may be active coconspirators.

The United Nations and other international bodies have recognized that there is an urgent need to better address the financial flows from crimes affecting the environment. In 2020, the Financial Action Task Force (FATF)—the global money laundering and terrorist financing watchdog—published a report focusing on money laundering linked to wildlife trafficking (FATF 2020). In 2021, FATF published a report focusing on a broader set of crimes affecting the environment (FATF 2021). These reports highlighted that neither governments nor financial institutions were treating this convergence of financial and nature crime with gravity proportionate to the scale of the problem.

FATF notes that financial crimes can include a range of criminal activities, such as over- and underinvoicing (known as trade-based money laundering), tax fraud, document fraud, corruption, and money laundering. Nature criminals frequently rely on cash-intensive sectors, trade-based fraud, front companies located in offshore centers, third-party transactions, and complicit intermediaries to conceal and launder their financial gains. According to FATF (2021), illegal logging and deforestation and illegal mining are the highest-value crime types linked to associated financial crimes. Depending on the region and crime type, major players are commonly corporations engaged in illicit activities, OCGs acting on their own, or some combination of the two.

Money laundering is probably the most common type of financial crime linked to nature crime. It typically involves four sequential elements (Stewart et al. 2023):

1. **Predicate offense:** An initial criminal activity that generates illicit proceeds
2. **Placement:** Introducing the illicit proceeds into the legitimate financial system by some means
3. **Layering:** Carrying out various financial transactions to camouflage the illegal source of the funds (e.g., using offshore "shell companies")
4. **Integration:** Reacquiring the wealth in an outwardly legitimate form

Transfer pricing—manipulation of prices at which goods or services are transferred between related parties or companies within a multinational group to evade taxes and other duties—is another form of financial crime linked to forests and other natural resources, as in a prominent 2023 case in PNG (Oakland Institute 2023). In that case, government tax authorities imposed a $40 million fine on a major logging company (name withheld by the government), an important signal for a country that is one of the largest exporters of tropical timber.

The legislation for addressing financial crimes is often stricter than those of "softer" environmental crimes, which are often dealt with administratively (e.g., with fines) rather than as a criminal matter. Financial crime investigations, and subsequent prosecution, disruption, or sanctioning, therefore, may have significant advantages in some jurisdictions compared to addressing purely environmental violations. However, due to the transnational and complex nature of these crimes, following the financial flows associated with nature crimes can be a complex, expensive, and time-consuming process. The number of successfully prosecuted cases therefore remains limited.

Box 9 illustrates how elevated attention to financial crime linked to nature crime can have material impacts on threats to nature—in this case, the tropical rainforest of PNG.

Large and influential conglomerates involved in the destruction of habitat in tropical rainforest countries are typically funded through investments—including via pension funds and real property—and are listed on global

BOX 9 | Correlation between a major financial crime investigation and the deforestation rate in Papua New Guinea

In October 2020, the Financial Analysis and Supervision Unit (FASU) of Papua New Guinea (PNG) conducted its first-ever Sectoral Risk Assessment (SRA) on money laundering and terrorist financing, supported by the United Nations Office on Drugs and Crime and the International Criminal Police Organization's Law Enforcement Assistance Programme (LEAP). One week after LEAP held a workshop with FASU and all major banks in PNG on the development of the SRA, Rimbunan Hijau (PNG's major logging conglomerate) issued a letter that it was reducing activities in the country effective immediately. This conglomerate is considered to be the largest logging perpetrator in the country. In 2020, exports from this conglomerate declined by 63 percent compared to 2019.

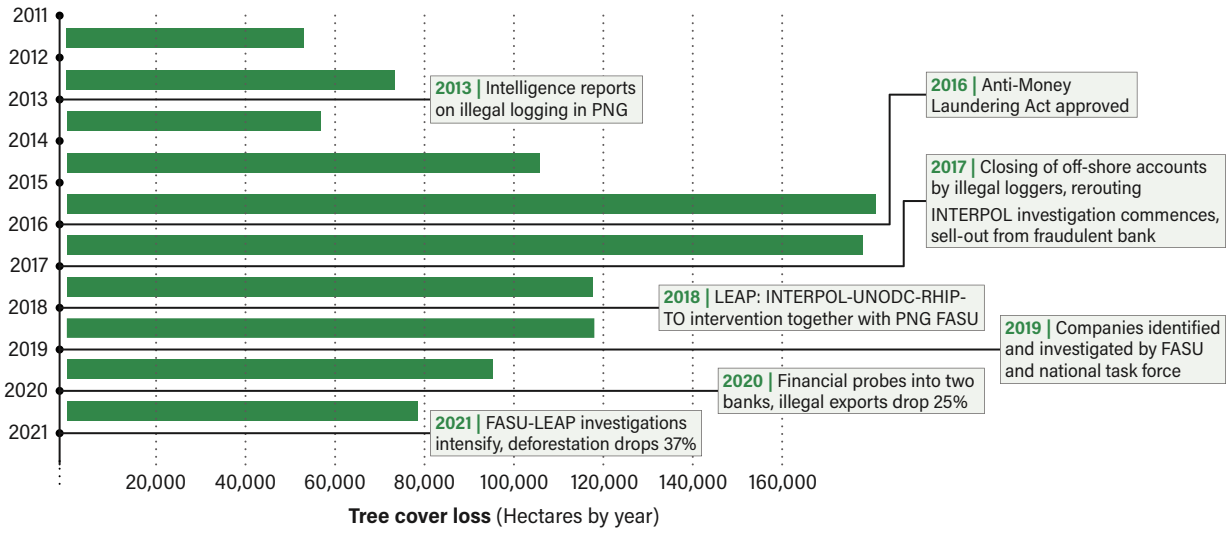
The SRA report concluded that if only timber trade with China is considered, US$1.8–$2.0 billion in foreign currency inflow and possible taxable revenues were lost between 2014 and 2019. Additional losses of foreign currency inflow, apart from those related to trade with China, amounted to $800 million. Following the SRA report, financial probes into two of PNG's largest banks for breaching anti–money laundering legislation took place. Both banks now risk sanctions, and several bank accounts have been closed due to the customers' suspected links to illegal logging operations.

Overall deforestation in PNG has declined by at least 37 percent in 2020 compared to the years prior to LEAP intervention (2014–18), as illustrated in Figure B9-1.

According to the latest data available, this decline in deforestation has continued, with a 35 percent decrease in export of timber during June–September 2021 compared to the same period during 2020.[a]

In June 2023, it was reported that a major logging operator had been charged approximately $39 million for engaging in illicit tax evasion. Further to this event, in July 2023, a memorandum of understanding was signed between the PNG Forest Authority and the Internal Revenue Commission to enhance cooperation between the two parties to effectively carry out their respective and mandated obligations and provide an avenue for information sharing to address tax issues in the sector.

FIGURE B9-1 | Interventions to reduce illegal forest loss in PNG



Notes: FASU = Financial Analysis and Supervision Unit; INTERPOL = International Criminal Police Organization; LEAP = Law Enforcement Assistance Programme; PNG = Papua New Guinea; RHIPTO = Norwegian Center for Global Analyses; UNODC = United Nations Office on Drugs and Crime.

Sources: Ilaitia 2023; UNODC 2022; UNODC-INTERPOL Programme LEAP Progress Reports (2020–23).

Note: a. See Papua New Guinea's Forest Reports website to learn more about log export monitoring reports: https://pngforests.com/sgs/.

stock exchanges. These types of conglomerates often control the entire supply chain related to the commodities that they are dealing with, including acquiring and deforesting a concession area; marketing of timber cleared; development of a plantation or cattle ranch; providing ancillary services, such as insurance, equipment, and banking; commodity transportation; and, ultimately, placing the commodities on domestic or international markets. Some large conglomerates even control large shares in the banking sector and media in source countries (e.g., Global Witness 2021a; Levicharova et al. 2016; Mighty Earth 2022).

Control of the entire financial chain, and use of a vast body of subsidiaries, often in tax havens, provide major challenges in "follow the money" investigations or in identifying beneficiaries or even investors. It is not uncommon that some companies own their own auditing companies and even banks. By using thousands of subsidiaries, such as local logging companies with reported high costs and virtually no reported taxable incomes, the parent company shields itself from legal risks of direct involvement with tax fraud, fraudulent documents, bribery, and corruption while still securing a continuous flow of natural resources to its processing industries located abroad. Many companies secure payments to local enterprises by funneling investments or payments for equipment or "consulting" fees by filtering them through law firms, other subsidiaries, or offshore accounts—and they also conduct sale transfers in the same manner, exploiting "third party" shell and front companies abroad (FATF 2021).

There are deep, inherent challenges associated with investigating financial crimes linked to nature crimes. The most important tools involve financial investigations of tax fraud, complicity in organized crime, or money laundering. Here, a lot of countries already have sufficiently strict laws to investigate, prosecute, and sentence—but only if the predicate crime is detected.

The types of financial crime linked to different nature crime sectors vary. Financial crime linked to wildlife trafficking, for example, has particularly distinctive characteristics, as explained in Box 10.

BOX 10 | Distinctive elements of the wildlife trafficking/financial crime nexus

Financial crimes related to wildlife trafficking (as distinct from illegal logging, mining, and fishing) tend to be somewhat different from other nature crime sectors because they tend to involve much higher numbers of much smaller-scale transactions.

In 2020, the Financial Action Task Force (FATF) reported that despite billions of dollars generated from the illegal wildlife trade, most efforts taken by countries to date have rarely focused on the financial aspect of this crime.[a] Across the entire US banking system, analysis conducted by the US Treasury concluded that between 2018 and 2021, on average fewer than five suspicious transaction reports related to the wildlife trade were filed per month. There are several reasons for this weak response by the financial sector and governments' financial intelligence units. As with the timber trade, there are challenges with investigating the wildlife trade; often, illegal wildlife is mixed with the legal trade, with many specimens being fraudulently laundered into the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) permitting system. Furthermore, as the FATF report highlights, both the private and public sector have less-developed knowledge concerning trends, methods, and techniques used to launder proceeds from international wildlife trafficking compared to other major transnational organized crimes. Interestingly, FATF also found that the convergence of wildlife trafficking with other types of transnational organized crime appears to take place only occasionally.

Stewart et al. (2023) discuss an alternative explanation for the low level of financial investigations to date associated with the illegal wildlife trade in the case of the European Union: The value of the average transaction associated with illegally obtained wildlife often falls below the €10,000 threshold that would normally require a bank to generate a suspicious transaction report. Based on seizure data reported by EU Member States for 2019 and 2020, the average value of CITES seizures (containing multiple specimens), was estimated at €3,992. The prices paid for individual specimens are well below this level. The cost for wildlife at the low end can be €10–€70 (for some birds, amphibians, or reptiles), and at the high end up to €10,000 for rare snakes and exotic mammals. The average amount paid for amphibians in the European Union is €62 and a single reptile specimen is €86. The proceeds from the illegal wildlife trade therefore are typically generated through numerous small-scale transactions, cash, and mobile-pay payments. This makes the laundering of those proceeds relatively easy through cash-based businesses such as shops. In addition, most of the wildlife and timber trafficking cases in the European Union are enforced with administrative sanctions only (fines and seizures).

Source: a. FATF 2020.

Often, tax fraud or money laundering investigations never take place, simply because the predicate crime is never documented or investigated because it takes place outside of the national jurisdiction of the recipient country, such as gold mining in African conflict zones or illegal fishing in waters far from Europe, China, or the United States (FATF 2021).

ABUSING POWER FOR PLUNDER: CORRUPTION AND NATURE CRIME

Corruption is the grease that allows the wheels of nature crime to turn with impunity. Transparency International defines corruption as "the abuse of entrusted power for private gain" (Baez Camargo and Burgess 2022; Transparency International 2020). Williams (2021) provides a slightly broader definition that includes power over natural resources, exclusions (failure to act), and the relationship between formal institutions and informal power brokers.

There are countless examples across the nature crime spectrum where officials entrusted with enforcing the law, managing the resource, or regulating the trade have participated in the illegal activity—either embedded within an OCG or being paid to look the other way. This has been extensively reported in the international wildlife trade:

- In 2015, the former wildlife director and head of the Guinea CITES Management Authority was arrested for issuing fraudulent permits to ship live great apes to China as "captive-bred" specimens. He was convicted and sentenced to 18 months in prison. He appealed the conviction but was granted a presidential pardon while awaiting the outcome of the appeal, in contravention of local laws requiring court outcomes to be finalized before such a pardon could be bestowed (CITES Secretariat 2022; PEGAS 2017).
- In 2022, a top Cambodian wildlife official was arrested in the United States in transit to attend the CITES meeting of the Conference of the Parties in Panama for his role in a smuggling ring that was shipping primates from Cambodia to private facilities in the United States. At the CITES meeting, Cambodian CITES Management Authority officials addressed the delegates, stating that there was no illegal trade for primates in Cambodia (Maron 2022).
- Between 2017 and 2022, various North Korean diplomats have been implicated in ivory and rhino horn trafficking across five African countries and Switzerland (Nuwer 2017).
- Special agriculture and business lease licenses in PNG were illegally issued by government officials from 2008 to 2013 primarily to Malaysian logging companies on Papuan local communities' customary lands (Numapo 2013).
- In 2013, two Indonesian Air Force officers were caught attempting to smuggle Australian parrots on a cargo aircraft gifted by Australia to the Indonesian government. They were detained and questioned in Australia but were freed with a warning after the Australian prime minster intervened. (This happened because Australia was embroiled at the time in a dispute with Indonesia over spying and did not want to further fray the relationship with its neighbor to the north.)
- In 2006, the Dalai Lama told Tibetan people to stop wearing animal pelts, primarily of tigers, otters, and leopards because it was an embarrassment to the Tibetan identity that they were trying to preserve (Yeh 2013). Tibetans began burning their ceremonial pelts across the country. The Chinese government responded by making it an offense for Tibetans to burn their stockpiles and to *not* wear fur trims—in contravention of China's own endangered species environmental protection laws (International Otter Survival Fund 2014).

These are a small subset of the known and reported cases of corrupt government officials who facilitate nature crimes. However, corrupt conduct can be much broader than this, particularly when considering the conduct of public officials in charge of implementing the law and regulations or negotiating on the various international UN instruments aimed at controlling trade in natural resources (e.g., CITES and the United Nations Convention against Corruption [UNCAC]). Baez Camargo and Burgess (2022) enumerate the various forms of corruption, including bribery, extortion, embezzlement, trading in influence, nepotism, patronage, and state capture.

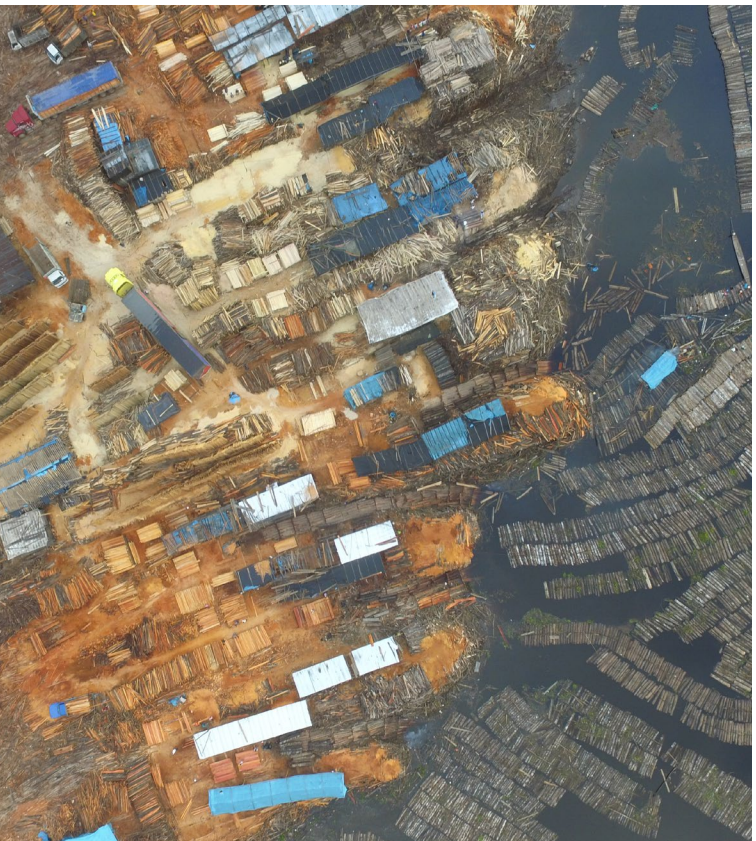
These are obvious forms of corruption, and anti-corruption efforts have historically concentrated on them. There are less obvious forms of corruption, related to institutional blindness, incompetence, and deliberate policies of state agencies to obfuscate regulations and prevent progress to close legal and regulatory loopholes. Another form is

corruption by omission, which involves state agencies, law enforcement, and judiciaries that undermine capacity-building or willingly fail to do their jobs to enforce the law due to laziness or apathy.

The major players

It should be relatively self-evident from the examples provided above that government officials and often the leaders and ruling parties of governments in countries all around the world are major players in nature crime-related corruption, especially with respect to higher-value natural resources and commodities. Natural resource extraction and international trade are authorized through government departments. Therefore, to participate legally requires permits and authorizations. Even endangered species in many countries can be caught, killed, and traded in contravention of local and national protection laws at the discretion of the government of the day. Thus, the political landscape and economy of a country give indications of the likelihood of corruption occurring. Transparency International annually releases its Corruption Perceptions Index (CPI), ranking countries' likelihood of corruption based on a variety of data sources and stakeholder views. It does not require detailed analysis of the CPI to conclude that countries with a poor CPI score also tend to be hot spots for various kinds of nature crime (as well as hot spots of biodiversity itself).

Wealthy individuals who provide money to political parties or wield significant power and connections are often catalysts for corrupt government behavior. Often, as shown in the case above of the pardoned Guinea CITES Management Authority official, law enforcement authorities may expend significant resources to apprehend corrupt actors, only to see senior politicians intervene to let them off.



In judicial processes, it is sometimes difficult to draw the line between legitimate judicial discretion on the one hand and undue favoritism or outright corruption on the other. In New South Wales, Australia, for example, a court fined a logging violator, Forestry Corporation, only AU$20,000 for a crime with a maximum penalty of AU$2 million despite the fact that the firm had repeatedly breached the terms of its logging permits (Nature Conservation Council of NSW 2022). Although "corruption" in the narrow sense may not have been a factor, it is clear that the court, for whatever reason, had no interest in deterrence.

Historically, Australia has been thought of as a relatively corruption-free country. Over the last decade, however, it has been sliding down Transparency International's global rankings regarding perceptions of corruption in the public sector, ranking 18th in 2022 (Transparency International 2022). If a developed country with supposedly effective laws and law enforcement and functioning judiciary and governments cannot eliminate corruption from its systems, as highlighted by the Forestry Corporation case above, it can be appreciated how poorer countries with greater governance challenges face a daunting task in taming nature crime and associated corruption.

In Liberia, a globally important forest biodiversity hot spot, a comprehensive review of the country's forest concessions found "widespread non-compliance across all stakeholders, including government" (Forest Trends 2024). Previous investigations, under way since at least 2012, resulted in termination of 63 "private use permits" (logging concessions) and some prosecutions of Forest Development Authority managers, but the newest review found that no actual logging operators have been punished, despite rampant illegality.

In a recent effort to address the demand side of corruption, where foreign officials ask for bribes in order to do business in their country, the United States passed the Foreign Extortion Prevention Act (FEPA) in December 2023. This law criminalizes foreign government officials who extort bribes from US businesses operating abroad and provides an incentive for legitimate businesses to provide information to US authorities on officials who solicit bribes. It complements the nearly 50-year-old Foreign Corrupt Practices Act (FCPA), which penalizes US businesses who offer or pay bribes abroad. Because many other countries

with significant business presence abroad do not have a law comparable to FCPA, the US business community and anti-corruption advocates have long sought such a reciprocal "demand-side" measure, which has been hailed by many as one of the most significant piece of anti-corruption legislation, anywhere, in decades.

Although not specifically focused on corruption linked to nature crime, FEPA is potentially a powerful tool against nature crime actors, if diligently enforced. As such, it is a powerful complement to demand-side natural resource–specific laws such as the US Lacey Act and the EU Timber Regulation (now superseded by the EU Deforestation Regulation).

It is important to understand the important role that "enablers" play in facilitating the financial crime, fraud, and corruption associated with nature crime. These are "the professionals around the world, from accountants and lawyers to realtors and art dealers, who each day (wittingly or unwittingly) facilitate illicit financial flows of money, which in turn allows crime and corruption to flourish" (Arshinoff et al. 2022). Certain nations, in turn, provide an enabling legal environment for this kind of criminal activity and for the individual enablers who serve criminal interests. These enabler nations may score low on the CPI, but they nonetheless facilitate and enable crime and corruption elsewhere due to lax regulatory measures and loopholes. Rudolph (2021) identifies "the five great enabler nations" as Australia, Germany, Switzerland, the United Kingdom, and the United States. The UAE also scores relatively low on the CPI but plays a critical role in facilitating cross-border corruption (Transparency International 2024).

PROFIT OVER PEOPLE: HUMAN RIGHTS ABUSES AND NATURE CRIME

Forced and bonded labor; human trafficking; lack of free, prior, and informed consent (FPIC); and brutal and inhumane working conditions often leading to death, threats, intimidation, and murder are all routine modi operandi for organized criminal networks orchestrating environmental crime around the world. The following human rights abuses are among those reportedly linked to various forms of nature crime.

Forced and bonded labor (human trafficking)

- **Illegal mining.** In Madre de Dios and Puno, Peru, illegal mining cartels that control remote forest concessions often rely on forced labor (Cortés-McPherson 2020; Verité 2016, 2022). Sex trafficking of women and girls has also been reported to occur in these locations and others like them.
- **Illegal fishing.** The abuse of migrant workers at sea and on land is common for many fleets (McDowell and Mason 2015; Mendoza 2015; Pearson et al. 2006; Urbina 2023a; Walk Free Foundation n.d.). Crew members
  - are recruited by companies pretending to be legitimate recruitment companies; they target workers from at-risk countries, such as Myanmar or Indonesia, or minorities within China (such as Uyghurs);
  - have their passports taken;
  - accrue recruitment "expenses" that must be worked off;
  - are confined to fishing vessels for years in brutal, slave-like conditions;
  - may be docked two days' pay for one day off (or worse);
  - are fed only two-minute noodles or white rice, resulting in a preventable illness called beriberi, resulting from a vitamin B1 deficiency;
  - may be beaten regularly with metal hooks or other fishing equipment, often simply for having a rest;
  - are often refused medical care for months, leading to severe medical issues or death; and
  - may be threatened with beatings and/or forfeiture of payment for time at sea if they ask to leave or go to hospital.

China's distant-water fishing fleet (DWF) has in recent years been reported to be a major forced labor violator. In December 2022, the United States levied sanctions against two Chinese individuals and the networks of entities they control (US Department of the Treasury 2022). The problem is reported to extend to fish-processing facilities on land within China that use Uyghur forced labor to process products; these products then enter US markets despite laws prohibiting entry to products produced

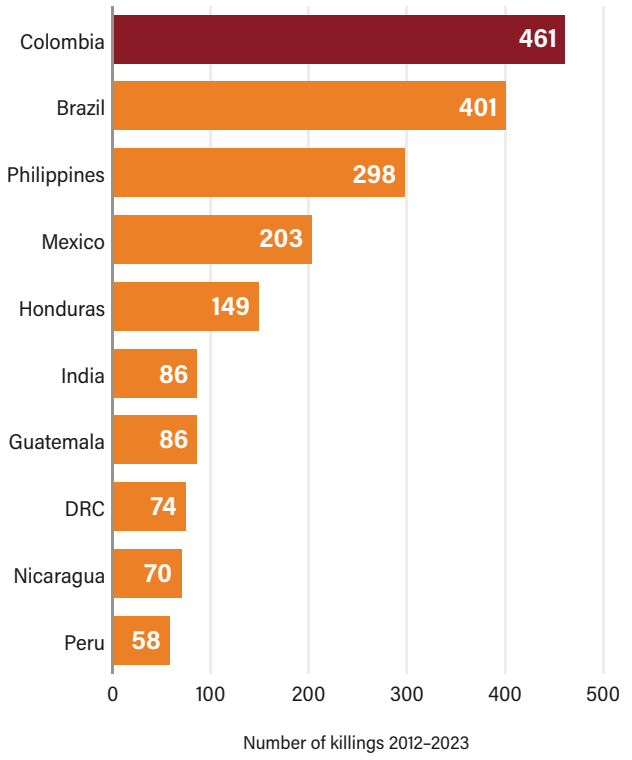
through forced labor (Urbina 2023a, 2023b; Walk Free Foundation n.d.). The European Union has proposed similar prohibitions (COM/2022/453), but the proposed regulation has yet to be passed into law (Methven O'Brien and Weatherburn 2023).

Threats of violence, intimidation, and murder

Across the world, local environmental and human rights defenders face violence and murder for standing to defend nature and their own rights and cultures. These defenders include Indigenous and local communities, local officials, and frontline rangers defending wildlife and protected areas from encroachment and poaching. Perpetrators may be hired thugs in the employ of mining, logging and agricultural interests, armed insurgent or trafficker groups, or wildlife poaching gangs. Most known killings take place in a handful of countries (see Figure 9), and the pace has not slowed, with at least 177 losing their lives in 2022. But more subtle threats of violence and intimidation against defenders are also relatively common in other countries:

- Between 2005 and 2015, over 1,000 park rangers were killed, 80 percent by commercial poachers and armed militia groups (Global Conservation 2016).
- Between 2010 and 2022, an estimated 29 Peruvian environmentalists and Indigenous leaders were killed while defending various parts of the Peruvian Amazon from invaders involved in illegal gold mining and logging, illicit crops (coca), land trafficking, and protesting (MAAP 2024a).
- In 2018, Cambodia, a forest protection ranger, military police officer, and conservation worker with the Wildlife Conservation Society were killed in an ambush in northeast Cambodia (Davies 2018).
- In February 2018, a series of clashes between Ugandan rangers and Sudanese poachers coming over the border resulted in villagers and rangers losing their lives or being injured (Watts 2018).
- In 2021, in the DRC's Virunga National Park, six rangers were killed and several more were injured defending endangered mountain gorillas. At that time, over 200 rangers had been killed in similar attacks (Reuters 2021).
- In May 2023, two more rangers were killed in Virunga National Park in the DRC by hippopotamus poachers believed to be from the rebel group Mai-Mai (Al Jazeera 2023).
- In April 2024, an unidentified armed group in the Central African Republic (CAR) raided a village near a national park and attacked three conservation monitoring and liaison agents, killing one of them.
- In July 2024, the representative of a prominent Mexican fishing industry advocacy group was shot just a few hours after speaking out about illegal fishing and related extortion (Radwin 2024c).
- Human fisheries observers frequently sustain harassment and physical threats, and some are reported to have disappeared at sea under mysterious circumstances (Garcia 2024).

FIGURE 9 | Cumulative known killings of environmental and human rights defenders, 2012–23, by country



Note: DRC = Democratic Republic of Congo.

Source: Global Witness 2024.

Free, Prior, and Informed Consent (FPIC)

Although not legally binding on states, the United Nations Declaration on the Rights of Indigenous Peoples outlines Indigenous Peoples' right to FPIC for activities conducted on their customary land and impacts to their land, culture, and way of life as a result (United Nations 2007).

Illegal logging, deforestation, and land grabbing are often carried out by networks/companies that have received logging permits, mining rights, or other development project approval (e.g., roads) through seemingly lawful means. Project proponents will claim they have consulted with local villages and have received consent to conduct activities on their customary land. In reality, such "consent" is sometimes the result of bullying, fear, or intimidation tactics. In other cases, companies may conduct one-off or cursory consultations in English and then provide documents to villagers for signing that they do not understand, often with the promise of a small sum of money for their signature. In some cases, companies also deliberately divide communities between community members who the company employs and those who do not want the company there. (For detailed examples, see FPP [2015] for Liberia, Global Witness [2017] for PNG, and Griffiths and Jiwan [2021] for Indonesia.)

Once companies obtain this paperwork, it is an uphill battle for landholders to expel these operators or to fight for rights to their land through courts or other regulatory systems. This is highly prevalent in countries such as PNG for illegal logging (Global Witness 2017; Macintyre 2007; Sarawak Report 2020a, 2020b), South American countries where land grabbing and deforestation from illegal logging is rife, and any countries with large forests and local Indigenous populations that rely on them—such as much of Asia and Africa (Colchester 2010; Global Witness 2021b, 2022, 2023, 2024).

Resource exploitation in conflict zones

Sometimes corporations and OCGs may engage in conflict zones—supporting unstable or illegitimate governments and committing human rights violations in the process—in return for resource extraction contracts. The pattern is well documented in reports from the United Nations Security Council sanctions committees and others (Nellemann et al. 2018).

The Wagner Group has illegally extracted literally billions in revenue through mining in gold from African countries, including the Central African Republic (CAR), Mali, and Sudan. According to Berlin et al. (2023), since February 2022 this "blood gold" has funneled some $2.5 billion to the Russian state to finance its war on Ukraine and its "global hybrid warfare infrastructure." Alley (2024) reported that in CAR, "Wagner gradually took control of gold and diamond mines all over the country and by 2023 their mining operations were earning the group around US $1 billion per year, with the gold and diamonds being flown out on Russian military transports helping to alleviate the sanctions that hit Russia following their invasion of Ukraine." Wagner's nature crime focus on timber-rich CAR also extends to illegal logging, following in the footsteps of OCGs that do much the same, often working with China-linked actors to smuggle the logs out of the country and into Asian furniture markets (ADF 2023).

The path to protecting the natural world requires defending human dignity for those most impacted by the relentless pursuit of money, which destroys ecosystems, lives, and livelihoods. Understanding how profits are extracted through these destructive activities reveals in no uncertain terms that human rights abuses are part and parcel of nature crimes across the developing world.

Recommendations: Strategies for combating nature crime

From empowering civil society and strengthening legal frameworks, to targeting financial interests and deploying emerging technologies, there is no shortage of promising approaches to counter nature crime. A multi-sector approach that marshals these diverse solutions can tip the balance against the criminal networks involved.

Since 2020, WRI and its partners have been systematically exploring strategies to more effectively combat nature crime while developing the Nature Crime Alliance, a multistakeholder coalition launched in August 2023 to catalyze political will, finance, and action against nature crime. Based on the extensive consultations undertaken while developing the Nature Crime Alliance as well as the research for this publication, we lay out in this section what we believe to be promising strategies and tactics for confronting and controlling nature crime.

INFLUENCING WHAT WE CANNOT CONTROL

The human systems dominating our planet during the 2020s are fantastically complex and are changing at an unprecedented rate. Some of the troubling features and tendencies of human politics, economies, and societies are, however, stubbornly persistent. To combat and reduce nature crime and its pernicious impacts, we must understand these defects and seek to lessen their impacts without falling prey to the hubris that we can eliminate them. In short, we cannot wait for a perfect world to act, but we can work for a better world in which our actions are likely to have more impact.

These five systemic factors will not come as a surprise after the preceding analysis:

Corruption. Whether grand or petty, corruption remains a persistent affliction for many states and societies, and it is no coincidence that the most corrupt places also tend to be places where nature crime is most prevalent. Corruption may never be eradicated, but experience from around the world shows that it can be fought and reduced.[10] Efforts to combat nature crime need to understand the role of corruption in particular geographies and supply chains, adjust strategies accordingly, and make common cause with anti-corruption activists and legal authorities.

Indeterminate legal status of natural resources. Forests, fisheries, wildlife, and land are all too often "open access" resources in the sense that no one entity controls ownership and access to them, leaving them open for exploitation by criminal elements. This open access status may be legal—as in the case of the high seas—or it may be de facto, as when states decree that forests or coastal waters "belong to the state" under the law but do not possess the will or capacity to actually manage the resources or control access to them. Worse, many states refuse to recognize or effectively protect the rights over land and resources of Indigenous Peoples whose occupancy and use of lands, waters, seas, and natural resources usually predate the establishment of the nation-state in question. Furthermore, as previously discussed, Indigenous Peoples are often very effective stewards and defenders of the planet's remaining natural ecosystems. Efforts to combat nature crime therefore need to be coordinated with ongoing initiatives to clarify land and natural resource ownership, access, and control, with particular attention to the legal recognition and effective protection of the rights of Indigenous Peoples and other resource-dependent communities that are on the front lines of the battle against nature crime.

Low state capacity. Even where governments—or elements within government—are sincerely committed to enforcing laws against nature crime, the reality, especially in many developing countries, is that human and financial resources to act are grossly inadequate. This is not surprising in poorer countries where state capacity and investment across many sectors—health, agriculture, infrastructure, education—is also low. It is therefore important that efforts to combat nature crime incorporate attention to building the capacity of relevant—and honest—elements of government at both the national and subnational levels. Doing so often also requires systemic governance reforms.

Complexity of the modern global economy. The astounding complexity of the global economy and the supply chains and financial and information systems that bind it together poses fundamental challenges to combating—or even detecting—nature crime. For some fruits of nature crime, such as blood diamonds and gold, elephant ivory, or rhino horn, it is a "needle in a haystack" problem. For others, such as illegal timber—or soy or oil palm grown on illegally deforested land—the fruits of nature crime can "hide in plain sight," laundered into legal supply chains and seamlessly blending in. The seemingly endless potential for money laundering and fraud in the global financial system, across multiple jurisdictions, adds yet another layer of complexity. This complexity is one reason why a multistakeholder approach to understanding and combating nature crime is so important.

Insufficient corporate accountability. With the global imbalance of economic power at an all-time high (Moyo 2018) and powerful corporate interests largely writing the "rules of the game," the corporate enablers of and participants in nature crime are rarely caught. And when they are caught, the punishment is rarely commensurate with the harms resulting from the crimes they have commit-

ted. In the words of the United Nations Special Rapporteur on Human Rights and the Environment (Boyd and Keene 2024),

> *Businesses undermine the procedural elements of the right to a healthy environment through greenwashing, sabotaging science, aggressive lobbying, massive political donations, corruption, manipulating public opinion, revolving door hiring practices, regulatory capture and other strategies that exploit their disproportionate economic, social and political power. In exerting undue influence, businesses are aided and abetted by law firms, accounting firms, public relations firms, consultants, banks and other financial institutions.*

Although there are encouraging signs in some jurisdictions that meaningful, binding corporate transparency and accountability measures are being put in place, some jurisdictions remain havens for corporate-linked elements of nature crime such as money laundering. There is no easy solution to this "leakage" problem, but extending the legal reach of more responsible jurisdictions to address corporate misdeeds in other jurisdictions—such as the US Foreign Extortion Prevention Act or the EU Deforestation Regulation—can provide important leverage.

These systemic features of our present world are not reasons to give up hope on the possibility of reducing the pillage of forests, seas, and wildlife. But in crafting strategies, we must take these factors into account—and not just in a generic way. Rather, we must refine our strategies and tactics based on "detailed knowledge of a particular country or area; its history, culture, vegetation, existing situation, and much more besides" (Raikes 1988).

With that spirit in mind, below we offer practical strategies for detecting, preventing, and combating nature crime.

STRENGTHENING LEGAL AND INSTITUTIONAL FRAMEWORKS

Criminal activity tends to respond quickly to changes in the external environment because crime is, by its very nature, unregulated. Transnational nature criminals have therefore adapted quickly to the rapid changes brought about by globalized trade, travel, and financial flows and the explosion of the Internet and online social networks—more quickly than governments and their enforcement agencies. National and international legal frameworks and strategies have not caught up.

Reform of national laws—let alone intergovernmental treaties and agreements—and of the institutions that administer them, requires mobilizing political will, which is an elusive but critical commodity. Generating political will for reform needs to be a coordinated exercise among a variety of actors, including donors, NGOs, civil society activists, the media, policy analysts, and reformers within government and the private sector. Each plays an important role: Donors cannot "buy" political will, but they can support the efforts of civil society and reformist elements within government and the private sector to build the popular support for such reform. Research and policy analysts can provide the evidence and arguments to both highlight problems, incubate strategies, and propose practical solutions and tools. Journalists can highlight the harms of nature crime (and consumer complicity) and focus attention on the deficiencies of official responses and the need for behavior change. The private sector can both model best practices within business operations and supply chains as well as support reforms to strengthen the legal and institutional responses by the state.

Key measures at the national level may include the following:

- Reviewing and promoting reforms to strengthen laws prohibiting nature crimes as well as procedural aspects of law and policymaking in areas like modernizing rules of evidence (e.g., to allow use of remote sensing data in court), expanding the extent to which nature crimes may serve as a "predicate offense" for laws of general application (e.g., money laundering or fraud), modernizing investigative and judicial procedures, revisiting the authority and jurisdiction of various branches of law enforcement and how they coordinate, strengthening whistleblower provisions and protections, and so forth
- Strengthening legal requirements for transparency of information on key legal and policy decisions in areas prone to conservation crime and associated offenses (e.g., forest land-use allocation, issuance of concessions and licenses, wildlife trade and export, flagging of fishing vessels, etc.)
- Strengthening and ensuring effective implementation of environmental and social impact assessment laws and regulations, including provisions for public participation and transparency

- Securing and effectively enforcing land, resource, and human rights protections for Indigenous Peoples and local communities
- Employing the insights and methodological approaches of crime science to better understand, prevent, detect, and disrupt nature crime, particularly wildlife trafficking (Petrossian and van Uhm 2023)

Nature crime is transnational, however, and requires cooperative international action, which can take a number of forms.

We must first strengthen "soft law" on nature crime within the UN system and other multilateral and regional bodies. This includes resolutions by the United Nations General Assembly and its affiliated entities as well as codes of conduct and best practice produced by UN specialized agencies such as UNODC and FAO. None of that is legally binding, strictly speaking. But it can be powerful in focusing political attention, mobilizing funding, and, in the case of codes of best practice, becoming the de facto standard that both governments and businesses adopt and observe.

We also need to strengthen cooperation among existing international bodies and agreements with legal mandates and enforcement authority to combat nature crime. Some long-standing examples include CITES; the International Consortium on Combating Wildlife Crime; and the Norway-supported Law Enforcement Assistance Programme (LEAP), a consortium including UNODC and INTERPOL that combats forest crime in cooperation with government authorities. Two key UN treaties that have increased attention to nature crime over the past decade are the United Nations Convention against Transnational Organized Crime (UNTOC) and UNCAC, both of which are hosted by UNODC.

In addition, governments can develop new international legal instruments that focus on, or include attention to, combating nature crime. International lawmaking is a complex and time-consuming process, of course. But it can be done, as the 2023 negotiation of a new UN treaty on biodiversity beyond national jurisdiction (BBNJ) illustrates. Hailed by many as an "extraordinary diplomatic achievement," the agreement lays the groundwork for cooperative international action to bring some degree of law and order to the (literally) lawless 43 percent of the earth's surface and 90 percent of the ocean's volume and biomass that has previously lain beyond national jurisdiction (Patrick 2023). Effective implementation will be a long road, of course.

But the BBNJ treaty is a dramatic rebuke to skeptics who believe that binding international cooperation is an idealistic but impractical dream of a past era.

In that regard, another measure under discussion would add a new protocol to UNTOC, potentially covering trafficking of wild fauna and flora. First proposed in 2020, the protocol is under active discussion within the United Nations Commission on Crime Prevention and Criminal Justice, the principal UN policymaking body on crime prevention and criminal justice. Several governments have expressed active support for the protocol, and many others have indicated a willingness to formally discuss it.

Cutting across all legal and law enforcement approaches and strategies at national and international levels is the need to instill and observe what UNEP terms the "environmental rule of law"—"the principles of rule of law applied in the environmental context" where "rule of law describes a governance system in which all persons, including public and private individuals and institutions, are accountable to laws that are public, equally enforced, independently adjudicated and consistent with human rights" (UNEP 2023). To that end, UNEP has identified seven core elements of environmental rule of law (see Box 11). Absent at least some level of adherence to these principles, legal frameworks and approaches are not likely to be effective in combating nature crime.

COMBATING FINANCIAL CRIME LINKED TO NATURE CRIME

As noted, it is sometimes productive to pursue and disrupt nature crime networks by targeting associated crimes, such as money laundering, tax evasion, fraud, and corruption, as well as the underlying predicate nature crimes. Some of the key steps follow.

Strengthen general legal frameworks and measures on financial crime. Governments should enact and enforce strict laws and regulations targeting financial crimes related to nature crime, such as money laundering, fraud, corruption, and tax evasion. The intergovernmental FATF has set out a comprehensive framework of measures countries should take (FATF 2023) as well as specific measures directly related to financial crime linked with wildlife trafficking (FATF 2020) and environmental crime more generally (FATF 2021). Cross-border collaboration among law enforcement agencies, financial intelligence

BOX 11 | Core elements of environmental rule of law

Fair, clear, and implementable environmental laws. Environmental rule of law is premised on laws that are fair and nondiscriminatory in their development, application, and impact; easily understood and unambiguous; and able to be implemented to effectively achieve their aims in the particular institutional, cultural, and economic context of the country.

Access to information, public participation, and access to justice. Access to environmental information allows the public to identify violations and determine how to engage. Public participation in environmental decision-making informs the development of fair and implementable laws and improves public support and compliance. Access to justice helps protect access to information and participation and strengthens enforcement by ensuring the public has access to mechanisms for protecting its rights and resolving disputes.

Accountability and integrity of institutions and decision-makers. Environmental institutions must demonstrate accountability, transparency, and integrity to ensure public support and compliance and to deliver effective environmental protection.

Clear and coordinated mandates and roles, across and within institutions. Environmental governance implicates multiple normative systems (statutory, customary, religious, etc.), levels (local, national, and international), and sectors (forests, agriculture, waste management, water, etc.) resulting in institutional overlap and gaps. Clear mandates and cross-sectoral coordination are essential for effective implementation.

Accessible, fair, impartial, timely, and responsive adjudication. Dispute resolution and enforcement mechanisms that are fair, impartial, timely, and responsive increase compliance with environmental regulations, support for environmental initiatives, and public confidence in the judicial process.

Recognition of the relationship with rights. Environmental rule of law has a mutually reinforcing relationship with constitutional, human, and other rights. A healthy environment is necessary for realizing rights to life, property, and health as well as cultural, economic, and political rights. Constitutional, human, and other rights—including both substantive and procedural rights—provide tools for strengthening and enforcing environmental protections.

Specific criteria for interpretation of environmental law. Clear and detailed guidance on environmental laws enable implementing agencies to adopt consistent regulations and enforcement practices and facilitate compliance on the part of regulated communities and the public.

Source: UNEP 2023.

units, and environmental authorities is a key element of what FATF recommends, including measures for sharing information, conducting joint investigations, and facilitating extraditions.

Governments take FATF's views very seriously. Three times a year, FATF identifies jurisdictions with weak measures to combat money laundering and terrorist financing and updates its "black list" and "grey list." Being placed on the black list essentially makes the listed country a pariah in the international finance world. The grey list is more of a "warning light" list, signifying "countries that are actively working with FATF to address strategic deficiencies" and are subject to increased monitoring (FATF n.d.).

Improve financial transparency. Transparency is critical for strengthening accountability for financial crimes linked to nature crime. Two key measures include establishing mandatory beneficial ownership registries, as the United States has done (Carrillo 2024), and strengthening customer due diligence requirements for financial institutions (FinCEN 2020).

Leverage technology. As discussed in detail below, many innovative technologies can assist in detecting and combating nature crime and associated financial crimes. Utilizing advanced data analytics, artificial intelligence, and machine learning, in particular, can help detect suspicious financial transactions and patterns associated with nature crime.

Increase awareness and education. Financial institutions and regulators are relatively unfamiliar with the typologies and "red flags" associated with nature crime compared to, say, illicit drug or arms trafficking. It is thus important to conduct training programs and dialogue processes that engage financial sector professionals, law enforce-

ment and financial regulatory authorities, and experts on nature crime. To meet this need, since 2022 UNODC has cohosted a periodic "Private Sector Dialogue on Disruption of Financial Crime Related to Environmental Crimes" in partnership with the Nature Crime Alliance and INTERPOL.

Strengthen asset recovery mechanisms. Asset recovery is the freezing, seizure, and confiscation of proceeds derived from nature and associated financial crimes and returning them to the country from which they were taken or to their rightful owners, as outlined in UNCAC (UNCAC Coalition n.d.). The recovery and repatriation of stolen assets can be a powerful tool to deter and sanction financial crimes linked to nature crime. Although there have been a few notable asset recovery successes (involving Peru, the Philippines, and Nigeria), there have been many asset recovery failures, including with respect to Indonesia and the DRC—two countries where former dictators Suharto and Mobutu stole billions, much of it linked to the destruction of globally significant areas of tropical rainforest (BBC News 2004).

EMPOWERING AND MOBILIZING CIVIL SOCIETY FOR MULTISTAKEHOLDER SOLUTIONS

Governments, individually or working with other governments, can only do so much. Civil society organizations (CSOs), including national and international NGOs, have become more important actors in efforts to prevent, detect, and combat nature crime, and their potential as sources of intelligence and information has been increasingly recognized by many enforcement authorities. Two developments have been driving this trend. First, the democratization of access to data and information catalyzed by revolutions in earth observation, social networks, traceability technologies, and machine learning have allowed CSOs to carry out more sophisticated investigations and analyses than in the past. Second, growing political attention to environmental crime has not been matched by increased budgets for governmental and intergovernmental crime-fighting institutions, which therefore often welcome or value assistance from civil society researchers and activists.

Based on our analysis for this report, we believe that multistakeholder cooperation between governments and civil society, in all its manifestations, is a large part of any practical response to nature crime, so we go into the matter in some detail.

CSOs active on nature crime fall into four broad categories, with some organizations working across several categories.

Policy and platform organizations. These are generally larger, international NGOs that work in the policy arena to raise the profile of nature crime and have developed numerous relevant data and information tools and platforms. WRI, Global Fishing Watch, Forest Trends, and the Brazil-based Igarapé Institute are a few examples, but there are many more.

Field-based international NGOs. Organizations such as the World Wildlife Fund, Conservation International, The Nature Conservancy, and the Wildlife Conservation Society can be particularly effective actors in addressing nature crime at multiple levels. With a presence in national capitals and on the ground in multiple countries, they work to combat and prevent nature crime in the field with local CSO and Indigenous partners and also often engage in policy advocacy at national and international levels. In many cases, these organizations have good working relationships with key government agencies.

"Name-and-shame" advocacy organizations. Other international and sometimes national CSOs draw on their own investigations—as well as information from intelligence-focused CSOs (discussed below)—to mobilize action against nature crime in particular places and supply chains (e.g., ivory, rosewood, palm oil, gold, high-value fish species), publishing name-and-shame reports that provide the basis for advocacy campaigns promoting legal and policy reforms, consumer boycotts, and the like. Many of these organizations are well-known to donors, journalists, and the public, including Greenpeace, the Rainforest Action Network, Global Witness, the Environmental Investigation Agency, the Wildlife Justice Commission, Earth League International, and Mighty Earth. These international groups frequently team up with national and local counterparts for investigations and campaigns.

Enforcement authorities sometimes complain that high-profile name-and-shame reports and campaigns can hamper official efforts to act by politicizing cases and making it riskier for potential informants to come forward. This may be true in some situations, but in others, it has undeniably been the pressure generated by CSO-led name-and-shame

campaigns that pressured officials to act. This was definitely true in the case of the US Department of Justice action against flooring firm Lumber Liquidators (DOJ 2016). One investigative NGO had for years quietly been providing the agency with ample evidence of the company's violations of the US Lacey Act, with respect to timber illegally cut in Russia, imported into China, and then sold as flooring in the United States. But the Justice Department took no action against the firm until the release of a public report and associated media campaign.

Journalists play a strong role in amplifying the kind of information that name-and-shame advocacy organizations produce. Organizations such as Mongabay, the Pulitzer Center's Rainforest Journalism Fund, Ojo Público, and the Organized Crime and Corruption Reporting Project are just a few examples. More mainstream outlets such as the *New York Times, Washington Post, The Guardian,* and Al Jazeera have also become increasingly influential amplifiers of information on nature crime, in part because the quality of information provided to them by investigative NGOs has improved over time.

Intelligence-focused CSOs. Some CSOs focus on generating and quietly providing intelligence to investigative and enforcement authorities or to private sector firms and financial institutions engaged in improving their own due diligence on potential environmental crime within their supply chains or financial operations. Intelligence-led investigative CSOs who work in collaboration with official intelligence and enforcement agencies have great potential to support action against nature crime as well as influence development of new policy and legal measures. This potential is not, however, always easy to realize.

Although CSOs can gather a great deal of open-source intelligence—and can also employ confidential informants—they have no access to classified information, cannot set up controlled "buy-and-bust" operations on their own, and have no powers of arrest or authority to use force. For their part, enforcement agencies often exhibit an absence of political will—and resulting lack of dedicated financial and human resources—to act on information provided by CSOs, no matter how complete and compelling that information is. Sometimes this is a result of bureaucratic inertia or of enforcement agencies just failing to follow their own protocols and procedures. This lack of follow-through by government, for whatever reason, is frequently the reason why even the most well-documented CSO intelligence dossiers end up languishing without meaningful action by government. This dynamic is sometimes compounded by high staff turnover in government agencies as well as turf battles and structural silos between different agencies (or even branches of the same agency).

Corruption is also a serious compounding problem that impacts efforts by CSOs to gather intelligence on nature crime and see it through to official action. Corruption makes it more difficult and expensive for intelligence-focused CSOs to run operations because the risks of

operatives and informants being compromised increases. Corruption also compromises the very authorities upon which CSOs may have to depend to take intelligence and evidence forward, the classic "fox guarding the henhouse" problem.

Some of the more successful examples of intelligence-led work by CSOs have come from Africa, where NGOs in various countries, including Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe, are creating partnering relationships with their local police and departments of wildlife. These partnerships could be characterized as symbiotic, where the local wildlife departments and police forces receive much-needed resources and capacity-building, and the local NGOs get the much-needed cover that is necessary to conduct operations safely and effectively, on the time-sensitive basis required to interdict wildlife and timber trafficking operations. Reducing the bureaucracy needed to collaborate and run an interception operation is essential to being nimble enough to respond to the changing methods used by traffickers.

Frontline environmental and land defenders. Numerous organizations across the world are embedded in local communities directly impacted by nature crime. Less organized than larger actors, they may be just a nascent organization coalescing around a specific threat and mobilized by a few individual leaders. Whether organizing against illegal logging, fishing, poaching, or land grabbing, these actors typically have extensive knowledge of local political and economic dynamics. But they typically lack the information, skills, and external connections that would enable them to fully understand the bigger picture of what is driving threats to their local environment and how they might best leverage external allies (ALLIED 2022). Such groups are also at greatest risk of legal and economic intimidation, violence, and even murder, and their causes are often as much about human rights and economic justice as they are about the associated nature crime component. Global Witness (2024), an international NGO that collects annual data on violence and intimidation against environmental defenders, reported in 2024 that such attacks had continued to increase in number and intensity over the past few years.

The common thread among these frontline organizations is the clear power imbalance between grassroots defenders and the mining, logging, and fishing companies—and frequently associated criminal enterprises and corrupt officials—that profit from the illegal extraction of resources. Many of these companies are backed by either private militias or government forces keen to make their own money off the projects through export levies or outright bribery. In many cases, forestry, agricultural, or mining projects are legitimized by way of subpar or outright falsification of environmental and social impact assessments in order to provide a veneer of legality and thereby strengthen impunity (Williams and Dupuy 2016).

Given this asymmetric power dynamic, there are two main ways to support and empower grassroots environmental and land defenders: by legal assistance and support and by strengthening operational security.

Legal assistance and support. Sympathetic law firms, donors, and international NGOs can provide environment and land defenders with access to legal tools and mechanisms to resist threats from companies, governments, or criminal actors. The UK-based International Lawyers Project, for example, advances economic and environmental justice and the rule of law through the provision of pro bono legal expertise to civil society, communities, and governments. In 2022, the project received over 105 partner requests for assistance and took on 98 projects spanning five continents. In Australia, the Environmental Defenders Office partners with local legal advocacy groups in Fiji, PNG, the Solomon Islands, and Vanuatu to bring cases to court, mostly related to the environmental and human rights impacts of mining. In 2019, a partner organization in the Solomon Islands succeeded in blocking development of a bauxite mine after a six-year battle (Ramsey and Fonseca 2019).

But fighting entirely on a case-by-case basis is challenging and often tedious. Legal assistance is also needed to mount "strategic litigation" challenges with the potential to leverage more systemic change in national law and policy.

Support is also needed at the international level to amplify the voice of environmental defenders by supporting a stronger role for UN Special Rapporteurs, the Inter-American Commission on Human Rights, and similar human rights entities that promote the rights of environmental defenders, the rule of law, and equal justice.

Strengthening operational security. Many frontline environmental and human rights defenders have little understanding of the basics of operational security and are thus vulnerable to infiltration, intimidation, and violence perpetrated by the powerful actors they confront. Indeed, many view publicity for their cause and its leaders as an important advocacy strategy, but this can make activists easy targets for their adversaries. Defenders thus often need assistance from experts in organizational, cyber, and personal security to safeguard their operations and their

own physical safety. In short, they need to learn to operate more "in the shadows" while still achieving the desired outcomes of their campaigns. Relatively simple steps include obfuscating leadership of campaigns (e.g., by creating multiple fictitious avatars on social media), keeping staff names and contacts confidential and not putting authors' names on reports, and developing campaign tactics that are more nuanced and difficult to penetrate by adversaries. The threat of campaign targets bringing defamation cases against NGOs is a major risk and can paralyze or even bankrupt an organization. For example, after Greenpeace publicly criticized Resolute Forest Products for unsustainable forest management practices, the company sued Greenpeace in a US federal lawsuit that lasted seven years; Greenpeace finally prevailed in April 2023 (Hanson 2023).

A number of international NGOs have scored successes in training frontline activists to heighten their operational security, creating campaigns against targeted individuals that were not able to be traced back to them while still achieving their desired disruption methods. For those activists who implemented the recommendations, formerly frequent death threats were effectively neutralized. The strategy may not be effective for activists who want to serve as the public face, or the "spear point," of public campaigns and feel unable to change their approach.

Unfortunately, relatively few donors have stepped up to support environmental defenders and legal activists to prepare for, confront, and respond to risks inherent in the work of confronting nature crime—for example, funding the costs of legal defense in judicial processes. There is thus an urgent need to scale support for environmental defenders and their allies in the face of rising levels of nature crime and associated intimidation and repression of Indigenous and local communities.

There is a particular role here for private philanthropy, which can take greater risks and be nimbler than bilateral and multilateral aid agencies. Defenders need access to responsive funding sources that can quickly and quietly cover costs associated with both "offense" and "defense" elements of their struggles to resist and contain nature crime.

Donors can also support proactive measures to increase the safety and security of frontline defenders, including through trainings on personal, digital, and organizational security and for longer-term capacity-building work for national- and regional-level CSOs.

There is a particular need to support the security and safety of whistleblowers—those who report waste, fraud, abuse, corruption, or dangers to public health and safety to officials in the position to rectify the wrongdoing. Many laws in the United States and elsewhere contain whistleblower provisions, protections, and financial rewards. But without adequate security, the risks to whistleblowers often outweigh the incentives or rewards of coming forward (NWC n.d.)

DEPLOYING INNOVATIVE TOOLS AND TECHNOLOGIES

A range of innovative technologies are now available to assist in detecting and deterring nature crime on land and sea. These technologies provide not only government enforcement authorities but also NGOs, local communities, and journalists with an unprecedented set of tools and opportunities to put them to use. All of them, however, come with important strategic and practical caveats.

Real-time earth observation data. Advancements in satellite and airborne geospatial sensing capability—and, more recently, advancements in the automated near-real-time processing of these data into products useful to decision-makers—have enabled rapid detection of land cover and land-use changes. Satellite-based forest-monitoring and alerting systems—whether national systems like Brazil's Real-Time Deforestation Detection System (Sistema de Detecção de Desmatamento em Tempo Real; DETER) or independent global systems like Global Forest Watch—are increasingly used to identify illegal logging, mining, and forest clearing. Freely available satellite data, such as from the National Aeronautics and Space Administration and the European Space Agency, offer sufficient resolution to identify features such as illegal logging roads and mining operations, but proprietary high-resolution imagery, such as from Planet, is required to identify more small-scale disturbances, such as selective logging.

In Peru, the Monitoring of the Andean Amazon Project (MAAP) has used remote sensing to support efforts to reduce illegal gold mining and to verify the results of Operation Mercury—a reduction in illegal gold mining by 78 percent from 2019 to 2020 in target areas. In Suriname, MAAP imagery from 2023, combined with reports on a planned primary forest conversion deal between the government of Suriname and Mennonite agricultural colonists drew significant media attention (Radwin 2023b) and the subsequent canceling of the deal by the president in March 2024 (Radwin 2024d).

Wood species and origin identification technologies. Scientists are developing a host of techniques that can identify, variously, the species and geographic origin from wood samples using machine vision, chemical, and genetic "fingerprinting" techniques (Irwin 2019; Van Brusselen et al. 2023). A growing number of enforcement authorities are beginning to use these techniques to screen shipments in ports and identify the species and origin of seized timber. And a multistakeholder consortium, World Forest ID (WFID), is rapidly assembling the first reliable, open-source global timber species and origin reference database as well as cutting-edge analytics to allow for accurate determination of the origin of specimens in trade (Mortier et al. 2024).

This methodology was successfully used in March 2024 to identify and seize 261 metric tons of Russian timber that had entered Belgium in violation of EU sanctions in place due to the Russian war on Ukraine (Carolan 2024). The WFID methodology can also be used to help geolocate the origin of samples of agricultural commodities, a requirement of the EU Deforestation Regulation, which comes into full implementation at the end of 2025 (Preferred by Nature 2023).

Timber and agricultural commodity supply chain traceability platforms. Several initiatives, such as the Open Timber Portal and the Illegal Logging and Associated Trade Risk Data Tool, have assembled platforms that enable stakeholders to analyze a variety of data on timber legality risks in particular supply chains. Others, such as Global Forest Watch Pro, SPOTT, and Trase, are providing unprecedented access to information on supply chains and trade flows for forest-risk agricultural commodities. Fripp et al. (2023) provide a detailed overview of the field, and Stäuble et al. (2023) offer practical technical guidance on design of timber traceability tools.

Radio frequency identification (RFID) tags. RFID tags are often used for tracking merchandise, but they are increasingly used to trace timber and to track animals in the wild. In Brazil's Pará state, where cattle ranching is a key driver of illegal deforestation, a program initiated in 2023 promises to provide real-time location data on the state's permanent herd of 24 million cattle by 2026 (Radwin 2023a). In the sea, a system called SharkTrack is using RFID to identify and trace legally fished shark products from point of capture to end markets. SharkTrack relies on a combination of RFID tags and easy-to-use apps for tracking shark products from ship to shore to shop. Willette et al. (2023) provide a detailed overview of emerging monitoring technologies to address both illegal fishing at sea and entry of fraudulent fish into markets.

Vessel tracking and monitoring. Technology is also enabling monitoring of maritime transport, which is relevant not only to commercial fishing activity but also to the transport of illegal timber and other smuggling activities across the world. Several initiatives—notably, Global Fishing Watch, Vulcan Skylight, and OceanMind—use vessel tracking data from the automatic identification system (AIS), a device that large ships use to broadcast their locations and avoid collisions. This data can be run through sophisticated machine-learning algorithms that look for patterns that may signal illegal activity—such as switching off the AIS or exhibiting movement indicating fishing behavior in no-fishing areas. The data also can be cross-referenced with geospatial information on the location of exclusive economic zones and marine protected areas to identify when potential violations occur. AIS can be evaded, however, and numerous such cases related to illegal fishing have been reported (Malarky and Lowell 2018). Technologies have also emerged that enable vessels to transmit fake locations (Kurmanaev 2022).

Camera traps and acoustic sensors. Motion-triggered trail cameras (also known as camera traps) are widely used to help conservation biologists identify ranges and populations of key species. There are new efforts to quickly automate the identification of species, such as the Google-powered Wildlife Insights platform, which uses advanced algorithms to quickly identify species from camera trap images.

Camera traps are now also being used to detect wildlife poachers in real time. The TrailGuard AI camera-based alert system identifies specific wildlife species, humans, and vehicles, instantly sending real-time image alerts via the global system for mobile communications, long-range radio, or satellite networks. Compact and concealable along trails, TrailGuard AI is being deployed as an autonomous security solution for national parks, monitoring potential threats to both wildlife and local communities. Deployment and trial installation spans 15 countries worldwide as of mid-2024, ranging from Africa's Serengeti to the tropical rainforests of Indonesia and in critical tiger habitats in India and Nepal.

In addition, acoustic sensor-based systems such as Rainforest Connection gather data that can be processed via algorithms to detect not only the location of certain species but also the sound signature of threats such as chainsaws

and gunshots. Government agencies, such as the Thai national parks department, have used these sensors to detect illegal logging, quickly dispatching patrol teams to areas triggered by activity.

Patrol-planning software. Programs such as Instant Wild, the Spatial Monitoring and Reporting Tool, and EarthRanger are easy-to-use field solutions that help protected area managers plan more impactful and efficient patrols. These systems integrate remote sensing data, in situ sensor data from camera traps and acoustic sensors, and historical information on animal movement and ecological threats in order to identify priority areas for enforcement and address human-wildlife conflict.

Drones. Unmanned aerial vehicles are increasingly used to gather species and ecosystem data as well as detect potentially illegal activities on both land and at sea. Use of drones to monitor protected areas and Indigenous territories, as well as species abundance and movements, on land are relatively well-known and expanding, particularly in the Amazon Basin by Indigenous communities in Peru (Romo 2020) and Brazil (Ennes and Chaves 2021). Drones have also been deployed to combat rhino poaching in South Africa (Looby 2021).

At sea, drones are enabling both fisheries compliance officers and CSOs to increase the reach of their monitoring efforts. Illegal fishing watchdog group Sea Shepherd, for example, uses drones to sneak up on illegal fishing ships to document crimes in progress. A spokesperson noted that "drones have been beyond effective because you can never get close enough to a ship that's got some illegal activity going on. They spot us coming and then they'll just turn and burn, over the horizon" (Trethewey 2024). Governments are also deploying drones to help monitor marine protected areas and fishing activity in Australia, Belize, and the Seychelles (Orlowski 2020). Australia's Queensland Department of Agriculture and Fisheries has been using drones for surveillance since 2019.

Artificial intelligence (AI). The rapid development and deployment of AI (including the AI subset sometimes referred to as "machine vision models") is building on, connecting, and strengthening the utility of the other tools and technologies noted above. Pattern-recognition algorithms have been used for some time to process large quantities of data—images, documents, word patterns—to detect anomalies. As AI has rapidly developed in the past few years, models are being trained to analyze a vast array of input data to detect various kinds of illegal activity.

"Geospatial AI" combines the analytical power of AI with vast and growing geospatial data feeds of all kinds (Jacob 2023). AI models can also comb vast quantities of documents such as bills, invoices, and customs statistics to help flag potential anomalies in trade and shipments for further investigation as well as to identify suspicious bank transactions (Twomey 2024). Text-mining algorithms can be used to detect language indicating the illegal sale of certain species on social media platforms and to identify them in online photos posted to social media and e-commerce platforms to identify trafficking patterns.

Finally, with the immense volume of goods moving through ports of entry every day, inspectors are often overwhelmed by the task of scanning all containers for contraband such as illegally trafficked wildlife (Hachemin 2023). AI could be a game-changer to more consistently, accurately, and efficiently analyze scanned images of luggage or shipping containers, alerting the operator to inspect the container's contents (Kulkarni and Di Minin 2023).

It is important to keep in mind that no technology, on its own, can detect, prevent, or suppress nature crime. Too often, attention focuses on the "bright shiny object" of a new platform, tool, or application without considering which tools are right for what purposes and under what conditions; the policy and institutional matrix into which they might or might not effectively fit; capacity and training needs; and initial and recurrent costs. All of that said, these and other technologies do have the potential to fundamentally sway the odds in the battle against nature crime, if thoughtfully deployed at scale in the context of broader reform, advocacy, and capacity-building strategies.

ABBREVIATIONS

AI	artificial intelligence
AIS	automatic identification system
ASGM	artisanal and small-scale gold mining
BBNJ	biodiversity beyond national jurisdiction
CAR	Central African Republic
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLUA	Climate and Land Use Alliance
CPI	Corruption Perceptions Index
CSO	civil society organization
DRC	Democratic Republic of the Congo
DWF	distant-water fishing
FAO	Food and Agriculture Organization of the United Nations
FASU	Financial Analysis and Supervision Unit
FATF	Financial Action Task Force
FCPA	Foreign Corrupt Practices Act
FEPA	Foreign Extortion Prevention Act
FPIC	free, prior, and informed consent
INTERPOL	International Criminal Police Organization
IUU	illegal, unreported, and unregulated
LEAP	Law Enforcement Assistance Programme
MAAP	Monitoring of the Andean Amazon Project
NGO	nongovernmental organization
OCG	organized criminal group
PDR	(Lao) People's Democratic Republic
PNG	Papua New Guinea
PSMA	Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing
RFID	radio frequency identification
SDG	Sustainable Development Goal
SRA	Sectoral Risk Assessment
UAE	United Arab Emirates
UNCAC	United Nations Convention against Corruption
UNEP	United Nations Environment Programme
UNODC	United Nations Office on Drugs and Crime
UNTOC	United Nations Convention against Transnational Organized Crime
WFID	World Forest ID

ENDNOTES

1. Although recent expansions of coca plantations in Colombia saw export revenue of cocaine jumping to $18.2 billion in 2022, second only to oil (Bloomberg 2023). This is a rapid increase from an estimated value of $1.5 billion in 2016 (Global Initiative against Transnational Organized Crime 2016).
2. In 2015, Operation Paws II, conducted across 17 Asian countries, seized more than 13 metric tons of pangolin products representing 1,000 animals at an estimated street value exceeding $2 million. In Singapore alone, 1,800 pieces of elephant ivory, 4 pieces of rhino horn, and 22 pieces of big cat teeth, worth approximately $5.2 million in total were seized. In 2017, the month-long Operation Thunderbird arrested nearly 900 suspects and seized 1,300 illicit wildlife products worth an estimated $5.1 million. In 2018, another month-long operation resulted in 1,974 seizures and the identification of some 1,400 suspects, triggering arrests and investigations worldwide. Total worldwide seizures reported included 43 metric tons of wild meat (including bear, elephant, crocodile, whale, and zebra); 1.3 metric tons of raw and processed elephant ivory; 27,000 reptiles (including 869 alligators/crocodiles, 9,590 turtles, and 10,000 snakes); almost 4,000 birds, including pelicans, ostriches, parrots, and owls; several metric tons of wood and timber; 48 live primates; 14 big cats (tigers, lions, leopards, and jaguars); the carcasses of 7 bears, including 2 polar bears; 18 metric tons of eel meat; and 8 metric tons of pangolin scales.
3. An average rhino horn weighs 1–3 kg, according to Our World in Data, which presents findings from the African and Asian Rhino Specialist Groups of the International Union for Conservation of Nature's Species Survival Commission and TRAFFIC (Our World in Data n.d.).
4. Based on personal communication with undisclosed sources. Several members of the Chaimat syndicate were arrested in 2014, which resulted in their assets being seized by Thailand's Anti-Money Laundering Office. Their assets were returned, however, under court order, and no prosecution has ever progressed despite the large-scale nature of the Chaimat syndicate's network and illicit activities.
5. As defined by INTERPOL as of January 2024 (INTERPOL n.d.).
6. REDD+ stands for "Reducing Emissions from Deforestation and forest Degradation," and the plus sign signifies the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks (Bertazzo 2019).
7. Defined as extreme poverty, which was classified as living on under $1.90 per day in 2004. It is unclear what the current estimate is, as this analysis does not appear to have been conducted again, although this figure is still quoted repeatedly.
8. Although this study reviewed peer-reviewed data, it did not contain any case studies from Brazil or most of the Pacific Islands and only one from Papua New Guinea, which limits the geographical extent of this study.
9. The Yang and He study was also heavily biased toward English-only papers, which discounts many potential papers from Central and South America.
10. See, for example, numerous anti-corruption success stories from organizations including Transparency International (https://www.transparency.org/en/campaigns), the U4 Anti-Corruption Resource Centre (https://www.u4.no/), the FACT Coalition (https://thefactcoalition.org/issues/), and the Basel Institute on Governance (https://baselgovernance.org/).

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OUR CHALLENGE

Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

OUR VISION

We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

OUR APPROACH

Count it

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

Change it

We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

Scale it

We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.

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