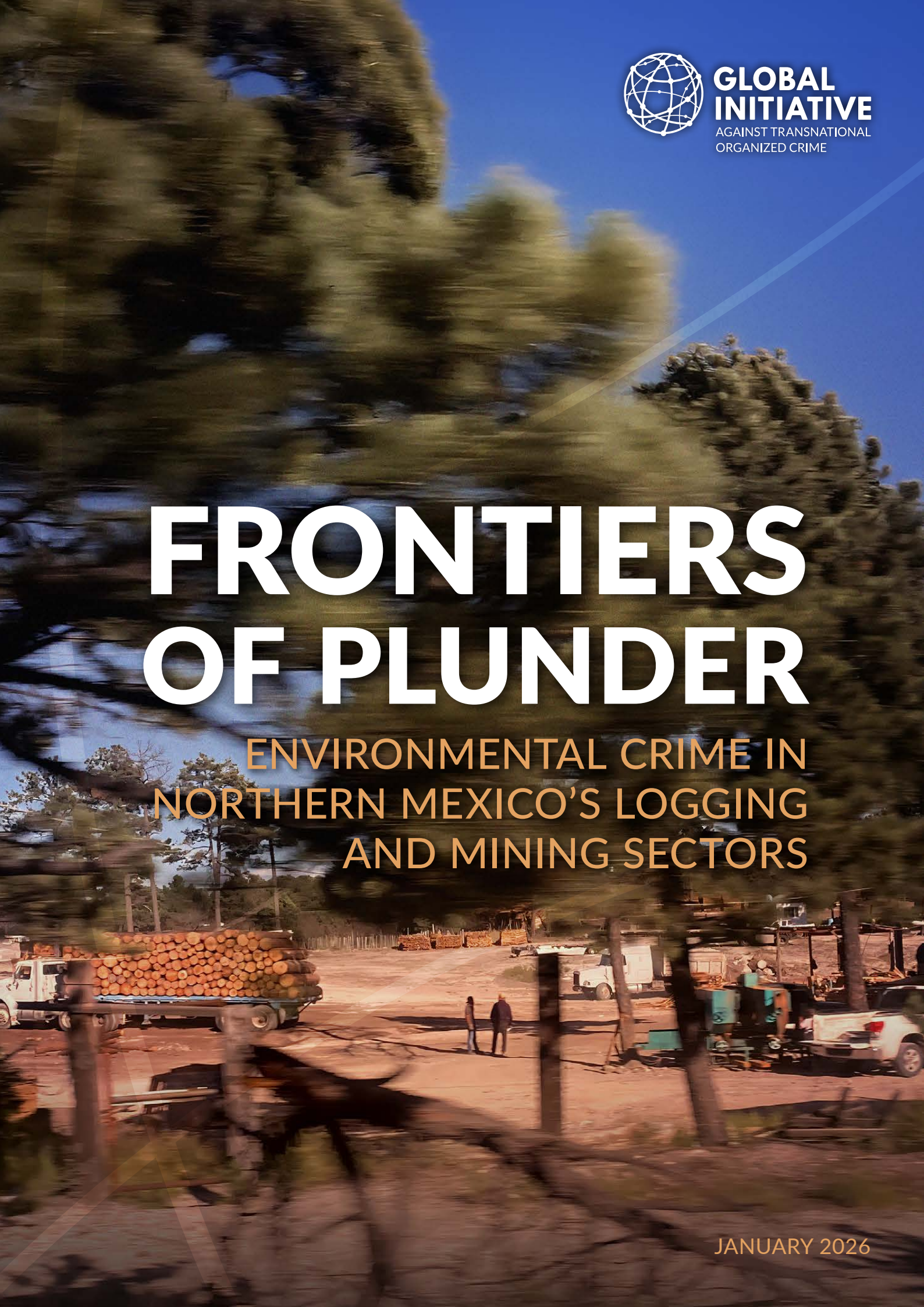

GLOBAL INITIATIVE
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FRONTIERS OF PLUNDER

ENVIRONMENTAL CRIME IN NORTHERN MEXICO'S LOGGING AND MINING SECTORS

JANUARY 2026

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The authors would like to pay tribute to José Luengo-Cabrera, whose expertise was integral to the development of the maps presented in this report. We honour his memory and the enduring impact of his contributions to the field.

Cover: *Photo supplied*

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EXECUTIVE SUMMARY

Environmental crime in northern Mexico poses an existential threat, sitting at the nexus of organized crime, environmental degradation, corporate malfeasance and community vulnerability. This report examines illegal logging in Chihuahua, one of the region's most pressing challenges, and the underexplored criminal dynamics of mining in Sonora.

In Chihuahua, the mountain range of Sierra Tarahumara ('Sierra') is home to one of North America's most biodiverse forested areas but has become a centre of escalating violence and unauthorized timber extraction. In recent years, transnational criminal organizations, most notably factions of the Sinaloa Cartel and the Jalisco New Generation Cartel (Cartel de Jalisco Nueva Generación, CJNG), have competed for control of the lucrative trade, transforming logging into a multimillion-dollar revenue stream, with illegal timber in Chihuahua now worth the same as the licit market, around US$172 million annually. Most often, criminal groups threaten local communities or collude with landowners to log beyond legal limits, with much of the wood manufactured into pallets for the export of goods to the US. The result is an increase in tree-cover loss, forest fires and forced displacement of indigenous communities, underscoring the profound human and ecological toll of illegal logging. Alarmingly, there is evidence of sexual violence being used as a form of criminal governance in the Sierra.

In Sonora, which is Mexico's largest mineral-producing state, criminal dynamics in the mining sector present a distinct but troubling pattern of environmental harm, corruption and state complicity. Large mining companies have been accused of collusion with local authorities, which facilitates permit approvals, water rights concessions and lax environmental impact assessments. High-profile incidents, such as the 2014 toxic spill by Grupo México into the Sonora River, illustrate a blend of corporate negligence and regulatory complicity that perpetuates environmental injustice.[1] At the same time, Sonora is the centre of a new 'golden triangle' of fentanyl production and firearm-related homicides, as criminal groups compete for control of smuggling corridors along the US border. Specific cases, such as *ejido*[2] El Bajío in Caborca, demonstrate how these groups also use violence to retain control of mining activities. Although the level of collusion is debatable, there are examples of financial agreements between criminal groups and large mining companies.

In juxtaposing these two extractive economies, logging and mining, the report demonstrates how the frontier regions of northern Mexico have become battlegrounds. Criminals compete for revenue streams from illegal logging and mining, while the state is (for the most part) wilfully negligent in the face of criminal innovation and corporate rent-seeking. Mitigating environmental crime in Chihuahua

FIGURE 1 The states of Sonora and Chihuahua in northern Mexico have become hotspots of environmental crime in the region.

and Sonora requires a holistic strategy that integrates law enforcement, anti-corruption measures, sustainable development and indigenous stewardship, to safeguard one of Mexico's most vital ecological and cultural landscapes.

This report is based on primary research, including multiple freedom of information requests, as well as interviews with a range of sources, including communities impacted by organized crime, Mexican public officials and experts with in-depth knowledge of organized crime dynamics in Chihuahua's timber industry and Sonora's mining sector.

This report makes the following recommendations:

- **Mexican authorities:** Strengthen inspections and judicial capacity in Chihuahua and Sonora; publish all permits and concessions in transparent online registries with grievance mechanisms; enact binding due-diligence laws for companies in high-risk sectors; expand protection programmes for indigenous and environmental defenders.
- **Private sector:** Map and disclose mineral supply chains per Organisation for Economic Co-operation and Development (OECD) standards; integrate environmental and indigenous rights safeguards into environmental, social and governance (ESG) policies; tie financing to verified anti-corruption and environmental compliance.
- **Civil society organizations:** Support community land rights; fund local monitoring networks to detect and report illegal activity.
- **International partners:** Embed environmental-crime mitigation in trade and foreign policy frameworks; provide technical assistance to strengthen Mexico's monitoring and forensic capacities.

CRIMINAL DYNAMICS OF LOGGING IN CHIHUAHUA

Chihuahua is Mexico's largest timber-producing state, harvesting wood valued at MX$3.3 billion (US$172 million) annually, or a third of the country's total production.[3] Chihuahua's timber predominantly comes from the mountain range of the Sierra Tarahumara, which is one of the largest and most biodiverse forested areas in North America. The Sierra contains around two-thirds of the standing timber left in Mexico and a wide variety of flora and fauna, including jaguars, American black bears, thick-billed parrots and other endemic species.[4] It is also one of the world's most threatened ecological hotspots.[5] Locally, legal and illegal logging are perceived as the main driver of deforestation.[6] In 2018, tree-cover loss in Chihuahua more than doubled, coinciding with increased illegal logging activity by criminal groups.[7]

Organized criminal groups have a long-standing presence in the Sierra, where they use the remote terrain for drug production.[8] For decades, local mafia-style groups in the Sierra have engaged in illegal logging, operating on a small-scale, mainly as familial clans, and rarely resorting to violence.[9] However, in recent years they have been pushed out by criminal organizations that control large swathes of the Sierra and are seeking to diversify their income streams to include illegal logging.[10] The involvement of these organizations in illegal logging has escalated violence and exacerbated other social and environmental problems. According to local experts and those living in the area, drug trafficking organizations are fighting for territorial control in the Sierra, principally the Sinaloa Cartel, the CJNG and their local affiliates (Figure 3).[11] According to local media, and a criminal expert interviewed in May 2024, after 2021, the bloody conflict for territorial control intensified between local factions of the Sinaloa Cartel and La Línea, a faction of the Juárez Cartel, when the CJNG entered the region and allied itself with La Línea.[12] In addition, local *caciques* (powerful regional landowning families) often coerce residents to cooperate or offer their services to these criminal organizations, including for illegal logging.

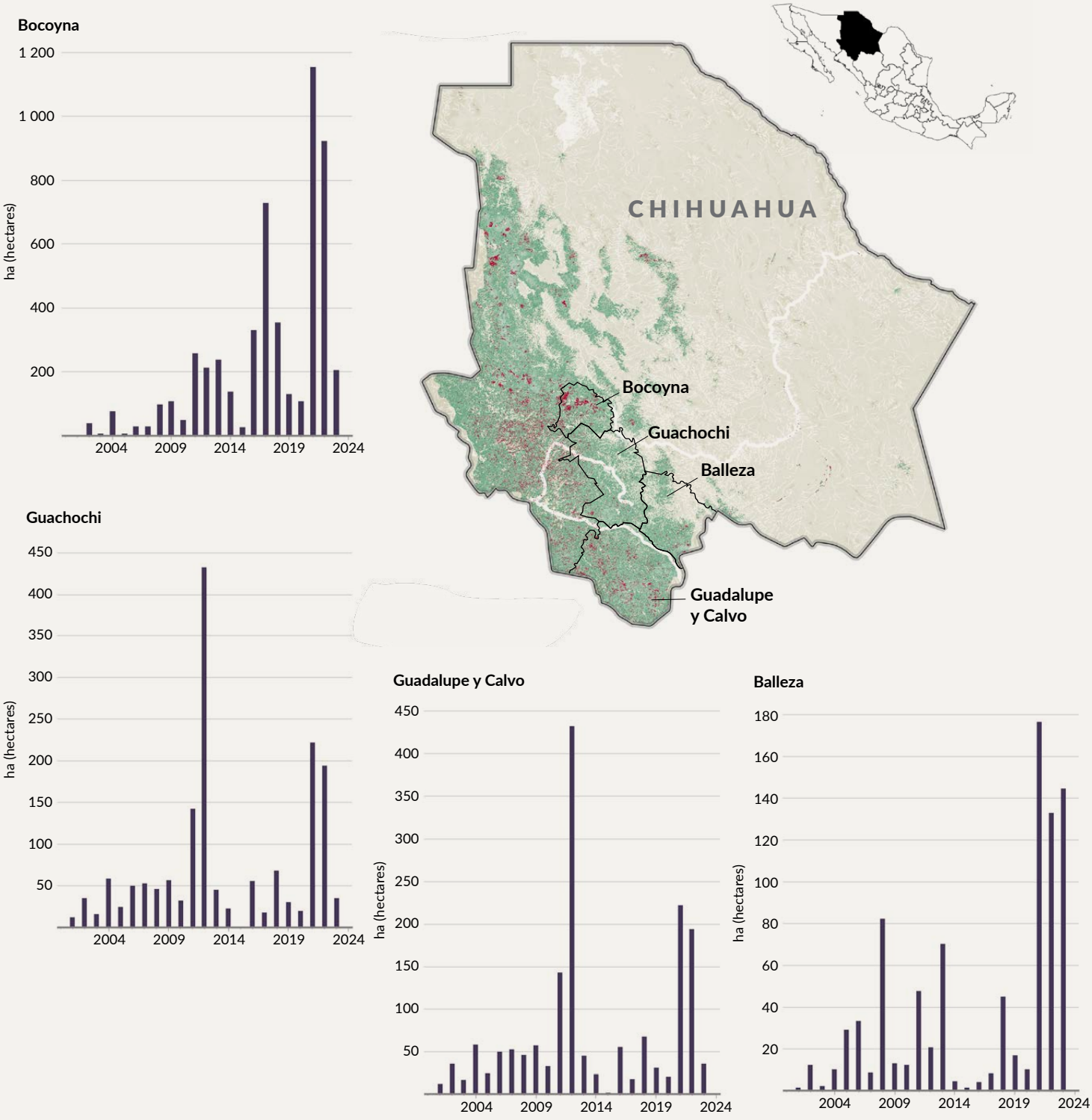

FIGURE 2 Forest loss in Chihuahua (2001–2024), highlighting municipalities most affected by illegal logging.

SOURCE: Global Forest Watch

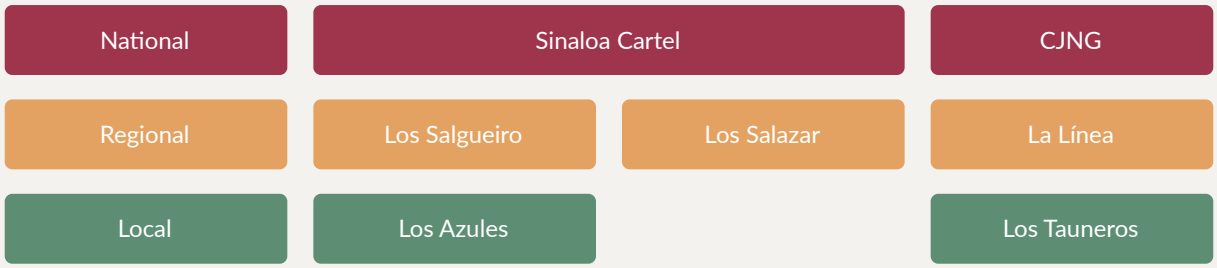

FIGURE 3 Criminal organizations and local factions operating in the Sierra.

The upsurge in violence has adversely affected indigenous groups, such as the Rarámuri and Ódami, who live in the Sierra, especially in remote regions affected by illegal logging. Over the past eight years, 14 indigenous people from the community of Coloradas de la Virgen have been killed, allegedly for defending their forests from criminal groups.[13] The violence has also resulted in the displacement of 300 members of Coloradas de la Virgen, with many forced to flee after the CJNG's arrival in 2021.[14] In the same year, Chihuahua was classified as one of five illegal logging hotspots in the country.[15]

Officials recognize that illegal logging is a significant problem in the Sierra and that the situation is worsening, despite the establishment of an illegal logging working group in 2022.[16] The working group is made up of government agencies from law enforcement and environment protection and meets monthly to coordinate operations. According to the official who coordinates the working group, about half of all wood produced in Chihuahua is illegal,[17] whereas the head of the National Forestry Commission (Comisión Nacional Forestal, CONAFOR) believes that 'there is definitely more illegal logging than legal'. Indeed, it is estimated that 70% of wood nationwide is of illegal origin,[18] and that the state loses about US$125 million because of the illegal wood trade.[19]

Members of *ejidos*, which are communal-administered territories, can apply for permits to log legally but also play a key role in illicit logging, both through colluding with criminal groups and as extortion victims (see box). In the Sierra, *ejidos* have 248 permits covering 1.44 million hectares, or around 80% of the forest area where logging is legally allowed.[20]

The *ejido* system

Ejidos are communal land holdings established under the 1917 Mexican Constitution, primarily for the benefit of rural communities, and are an important part of the country's agrarian structure. In forested areas, such as the Sierra Tarahumara, *ejidos* are able to apply for logging permits on their land. The *comisariado* (commissariat) is the governing body responsible for administering the *ejido*, managing land use, resources and ensuring the interests and participation of the *ejidatarios* (members of the *ejido*). Every three years, the general assembly of *ejidatarios* elects the commissariat, whose members can be from indigenous and *mestizo* (non-indigenous) communities. As with other local governing structures, *ejidos* are vulnerable to infiltration by organized criminal groups, which collude with or force the *comisariados* to engage in illegal logging or hand over their forest resources. This is further compounded by restrictions on buying and selling *ejido* land, which create a grey area where organized crime can coerce, corrupt or manipulate communities to gain access to land and resources.[21] ■

In the Sierra, criminal groups have taken control and expanded illegal logging operations in various ways:

- By laundering illegally felled wood, harvested either by *ejidos* or the criminal groups, through falsifying forestry documents (*guías forestales*), such as logging permits and wood transport documentation. These documents allow the wood to enter the legal supply chain, usually after being processed by local sawmills in San Juanito or Parral. The forestry documents are falsified to obscure the over-exploitation of wood beyond the limits of forestry management plans (including quantities, species and size of trees) and/or the origin of wood harvested illegally in an area without a corresponding permit.
- By misusing forestry documents, sometimes with the collusion (or coercion) of local officials or members of the *ejido*, mostly at the harvesting and transport stages of the wood supply chain. These include forest inventories with fraudulent 'tree markings' made by threatened or corrupt forest engineers; blank *guías forestales* that are completed with over legal harvesting limits; *guías* that are altered to allow for more wood to be exploited or to hide the quantity of wood being transported; and forestry documents from other areas that are stolen, duplicated or reused. Criminal groups also use intimidation to force forestry inspection officials to allow the passage of illegal timber past checkpoints.
- By colluding with or coercing *ejidos* to harvest timber illegally. This is the most common system, especially in the illegal logging hotspots of Guachochi and Guadalupe y Calvo. For instance, Los Salgueiro (a Sinaloa Cartel faction) and Los Tauneros (a local faction allied with La Línea) collude with or coerce *ejidos* to illegally harvest timber. Criminal groups started out by extorting both the *ejidos* who produce the wood and the sawmills who receive the wood, obliging or colluding with them to falsify documents to over-exploit forests. Over time, extortion fees increased until, about three or four years ago, some criminal groups began to keep all revenue from the sale of wood either by forcing *ejidos* to sell to sawmills controlled by the groups or by harvesting the timber themselves. Criminal groups will often ensure compliance by forcibly installing their own members in key decision-making positions on the *ejido* commissariat.
- By clear-cutting forests on *ejido* or private land without permits (legal or otherwise). Clear-cutting (the cutting down of all trees in a designated area) is less common but is found in some municipalities, such as Bocoyna, which is a hotspot of illegal logging. Criminal groups will work day and night for a few days or weeks, using their own machinery, to clear an area of trees, and then often burn leftover vegetation afterwards to make it look like a fire has occurred. In 2017, La Línea started clear-cutting and burning near San Juanito, a small town with around 20 sawmills, of which half are allegedly controlled by La Línea.[22]
- Controlling sawmills is an attractive option in San Juanito, Guachoci and Baborigame, as criminal groups can also use the timber industry to transport drugs and launder drug money.

These methods allow illegal wood, mostly pine, to enter the domestic legal supply chain. The wood is sold to manufacturing companies in various cities, such as Parral, Cuauhtémoc and Chihuahua City, where it is processed into products, such as furniture, that are then sold around the country. In the state of Chihuahua, more than 2 500 companies operate in the wood-processing and manufacturing sector.[23] Much of the wood is manufactured into pallets and used in the export of goods to the US from border towns, such as Ciudad Juárez,[24] with a small percentage of wood, usually the highest quality pine, exported to the US for specialized wood products.[25]

Local illegal timber market

Baborigame, a small town of around 3 000 people, illustrates the potential earnings of illegal logging for criminal groups. The town is in Guadalupe y Calvo, which is one of the municipalities most affected by illegal logging in the Sierra. It is currently controlled by Los Salgueiro, a local Sinaloa Cartel faction, although Los Tauneros, allied with La Línea and CJNG, are gaining ground in nearby localities.[26]

Los Salgueiro force the *ejido* of Baborigame to harvest three times the legal amount of timber, selling around 1 million feet[27] of wood per year at MX$5.50 per foot, of which Los Salgueiro receive MX$1.50 per foot in extortion fees both from the *ejido* and the sawmills, or a total of MX$3 million (US$153 523).[28] Los Salgueiro also earn revenue through extorting neighbouring *ejidos* that have to transport timber through Baborigame. In May and June 2024, local observers counted 15 trucks leaving Baborigame daily,[29] each transporting an estimated 7 000 feet of wood. Assuming 50% of the wood is of illegal origin and similar extortion arrangements are in place, Los Salgueiro can make MX$157 500 (US$8 060) per day.

Profits from illegal logging are estimated to be larger in other areas. In July 2020, the head of the attorney general's office of Chihuahua estimated that La Línea receives MX$75 000–MX$220 000 (US$3 700–US$11 000) for each truck loaded with wood from clear-cutting forests in Bocoyna.[30] ■

The state's response to the increase in illegal logging in the Sierra is alarmingly inadequate. In recent years, the inspections of sawmills and wood-processing sites have decreased. Between 2010 and 2014, 580 sawmills and wood-processing sites were granted an operating permit in the state of Chihuahua.[31] However, in 2022, only 22 inspections took place, equivalent to almost half the number of inspections undertaken in 2019, resulting in just seven fines.[32]

Sembrando Vida programme and criminality

In 2019, then president Andrés Manuel López Obrador's administration initiated the Sembrando Vida ('Sowing Life') programme, whereby rural producers receive MX$5 000 (approximately US$268) per month for agroforestry projects, with the objectives of combating poverty and reforesting degraded land.[33] Despite billions of dollars being paid out, NGOs and local media have criticized the programme for encouraging deforestation and corruption,[34] accusing beneficiaries of clearing forest in order to access the funds.

Another criticism is the lack of government oversight and monitoring to ensure that the cash transfers are used for agroforestry.[35] The government's failure to monitor implementation has enabled criminal groups to exploit the Sembrando Vida programme in the Sierra Tarahumara for additional revenue streams. Additional revenue comes from extortion fees charged to beneficiaries, programme funds received directly as *ejidatarios* and land forcibly grabbed from programme beneficiaries.[36] ■

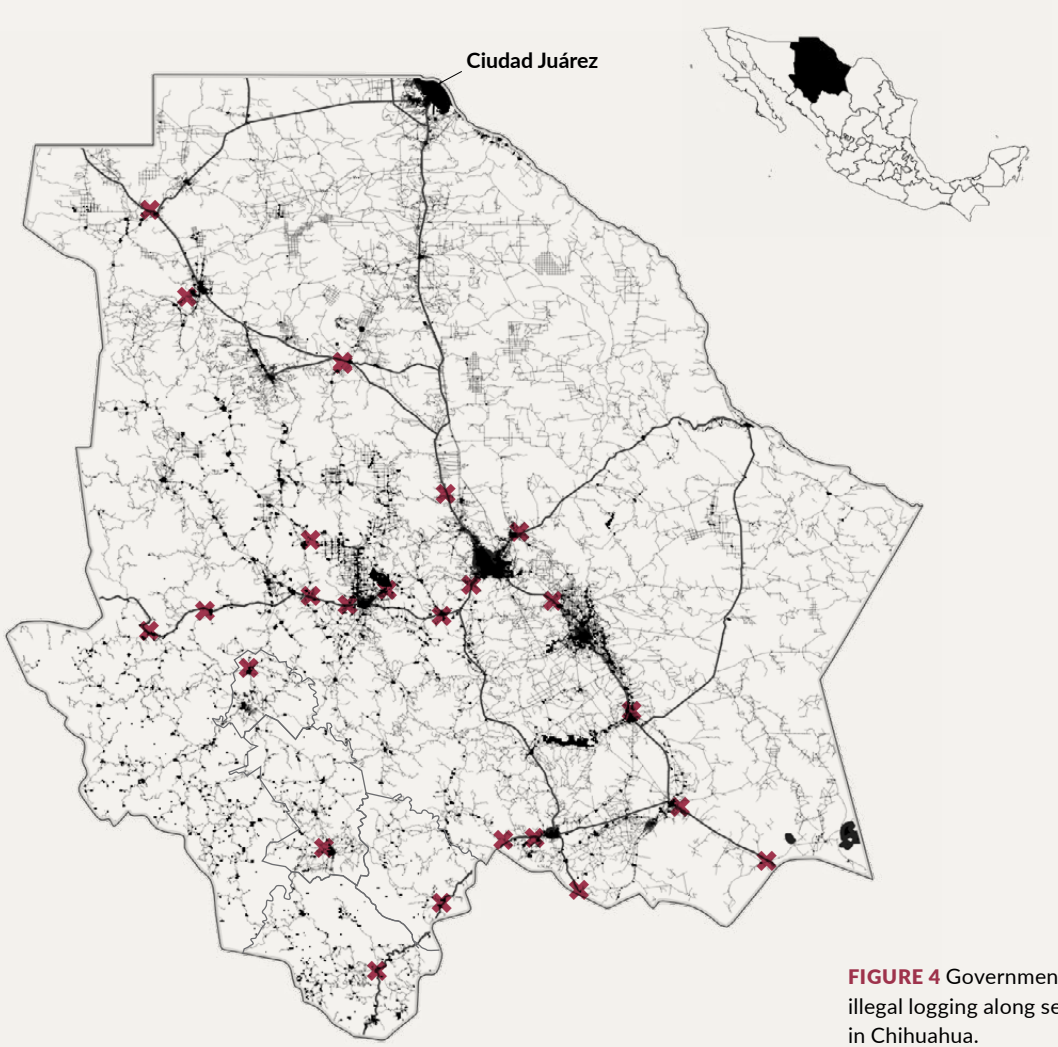

FIGURE 4 Government checkpoints for illegal logging along settlements and roads in Chihuahua.

SOURCE: Forestry Directorate, Chihuahua state government

Across the state of Chihuahua, 16 checkpoints (most located outside the Sierra) monitor logging trucks, checking raw logs that are being transported to large cities such as Cuauhtémoc.[37] Only one checkpoint is found in each of the Guadalupe y Calvo, Guachochi and Bocoyna municipalities, which are among the worst-affected areas,[38] while there is no monitoring of logs transported to local sawmills in the Sierra, which is where criminal groups are most active.[39] In addition, those manning the checkpoints are known to simply let the truckers through if they are armed.[40] In 2024, an official had a gun held to his head when he tried to stop a truck suspected of transporting illegal timber, and subsequently had to move out of San Juanito after receiving threats.[41]

The number of wood seizures and arrests for illegal logging are similarly inadequate. Despite the illegal logging working group meeting monthly, only one or two operations take place each month in response to illegal logging complaints.[42] In 2023, just 7 000 cubic metres of illegal wood was seized (valued at MX$15 million or US$883 000), a fraction (0.007%) of the 886 576 cubic metres produced that year.[43] In the same year, only six fines for logging infractions were issued,[44] and only 10 people were arrested for illegal logging, all of them truck drivers, with no convictions.[45] Enforcement actions increased slightly in 2024, with 19 arrests and two convictions between January and November.[46]

Furthermore, despite a government campaign to raise awareness about a hotline for illegal logging complaints, official complaints decreased in 2024.[47] It is estimated that only 2–3% of illegal logging in

the Sierra is reported to the Federal Attorney for Environmental Protection (Procuraduría Federal de Protección al Ambiente, PROFEPA), presumably because of fear or apathy.[48]

According to several officials, the lack of enforcement and impunity for crimes is compounded by collusion between criminal groups and officials at the municipal (local) and state (regional) level. Municipal governments, headed by mayors and supported by councils acting as the local legislative body, are elected by popular vote and are seen as a cradle of corruption. The head of the National Institute of Indigenous Peoples claimed that government institutions collude with criminal groups carrying out illegal logging.[49] In 2023, someone in the illegal logging working group leaked news of a planned operation against illegal loggers in Mala Noche, Guadalupe y Calvo, resulting in those targeted escaping arrest.[50]

Environmental impacts

In the last decade, Chihuahua has lost 22 700 hectares of forest, equivalent to 3.86 million tonnes of CO_2 emissions.[51] Between 2022 and 2023, Bocoyna, which is one of the municipalities most affected by illegal logging, was responsible for almost a third of Chihuahua's total tree-cover loss.[52]

Forest fires are a key driver of deforestation and contribute to habitat destruction, loss of biodiversity and increased carbon emissions. After illegal logging, criminal groups often set fire to the remaining vegetation to conceal evidence of their activities or to clear land for the cultivation of cannabis or opium poppies. The setting of these deliberate fires, especially in Bocoyna municipality, has had a detrimental environmental impact on the Sierra. Shooting between criminal groups also starts forest fires and these groups may burn forests if an *ejido* refuses to cooperate with illegal logging.[53] According to the head of Chihuahua's forestry commission, it is often too dangerous to send firefighters into the forests because of the presence of criminal groups.[54]

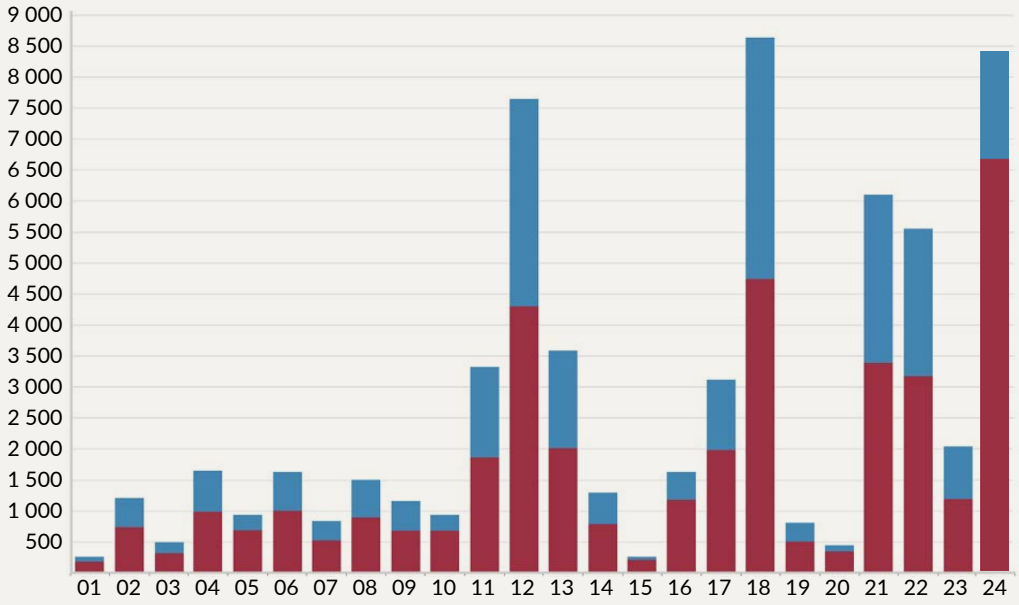

FIGURE 5 Hectares of trees lost (from fire in red) in Chihuahua, 2001–2024.

SOURCE: Global Forest Watch

Chihuahua is the state with the second highest area of forest affected by fires and has seen a large increase in recent years.[55] Official data underlines the link between forest fires and illegal logging in the Sierra, and the problem is worsening. In the first eight months of 2024, around 125 000 hectares of forest suffered degradation by fires in Chihuahua, mostly in the municipalities of Guachochi, Bocoyna, Guadalupe y Calvo, Urique and Balleza, which are all illegal logging hotspots.[56] The final total area of forest affected for 2024 was over 60% more than in 2022.[57] The harm to the environment is significant, given that Chihuahua is home to 30% or 1.8 million hectares of Mexico's forests, meaning that approximately 8% of the state's forested areas was degraded in just one year.[58] In addition, cuts to CONAFOR's budget, which halved in real terms between 2018 and 2024, have further weakened the state's ability to fight forest fires.[59]

Guadalupe y Calvo, which is one of the municipalities worst affected by illegal logging, suggests a potential correlation with forest fires. In 2023, Guadalupe y Calvo accounted for 30% of the forested areas affected by fires in Chihuahua[60] – in May 2023, over just nine days, more than 3 000 hectares of forest was burnt deliberately.[61] The municipality has also experienced some of the most intense conflict over access to forest resources between rival local criminal groups allied with the Sinaloa Cartel and CJNG.

In addition to the climate change impact from carbon emissions, deforestation causes significant environmental harms, including soil erosion and the subsequent loss of fertile land and drought conditions through moisture loss. Deforestation also increases sedimentation in rivers and alters waterways, diminishing water supplies. It can lead to increased temperatures and more extreme weather events, while significantly affecting the livelihoods and way of life of indigenous people, who make up a significant proportion of the Sierra's inhabitants. Furthermore, tree loss adversely affects the habitats of the region's unique flora and fauna, including the thick-billed parrot, an endemic species that nests in the Sierra's pine trees, which has declined at an alarming rate due to illegal logging.[62]

Chihuahua's Sierra Tarahumara, one of North America's most biodiverse forested areas, is now a hotspot for illicit logging, a key driver of deforestation. *Photo supplied*

Illegal logging hotspots

Guadalupe y Calvo

In Chihuahua state, Guadalupe y Calvo is the municipality most affected by illegal logging, with a particular hotspot being Coloradas de la Virgen (an area of 50 000 hectares of pine forests).[63] Indigenous people make up around a third of Guadalupe y Calvo's residents and are disproportionately affected by the environmental and social impacts of illegal logging.[64] Local authorities are suspected of colluding with criminal groups to facilitate illegal logging.[65]

For decades, regional factions of the Sinaloa Cartel, most recently the familial clan of Los Salgueiro, have controlled illicit trades in Guadalupe y Calvo,[66] with illegal logging becoming an important revenue stream for Los Salgueiro from 2016.[67] In 2021, a violent struggle for territorial control began following an alliance between La Línea, a regional cartel, and the CJNG, a powerful criminal group born in Jalisco state but operating nationwide and known for its brutality.[68]

The most common form of illegal logging is criminal groups colluding with or threatening *ejidos* to harvest timber beyond the legal limits. In some areas, the Sinaloa Cartel has allied with *cacique* families who often employ violence or threats to coerce residents to exploit communal-held forest resources. For example, multiple media outlets have reported on allegations that, in Coloradas de la Virgen, the Sinaloa Cartel operates alongside the family of local *cacique* Artemio Fontes.[69] According to community members and local experts, two members of the Fontes family harvest timber illegally with a man known as 'Dios Roger', the local head of the Sinaloa Cartel faction Los Salgueiro, who provides the machinery.[70] A 2022 complaint to the Secretariat of Environment and Natural Resources (Secretaría del Medio Ambiente y Recursos Naturales, SEMARNAT) named several individuals as illegal loggers who were identified as members of Los Salgueiro by community members.[71]

Due to a moratorium on logging in Coloradas de la Virgen, the criminal group launders the wood by using permits from nearby Baborigame, supplied by an individual in the *ejido* commissariat. The lower-value wood is then processed at a sawmill in Baborigame that is controlled by the group, while the higher-quality logs are sold to a company in Parral.

Sinaloa Cartel factions and the Fontes clan are also accused of being behind violent attacks against indigenous people in Coloradas de la Virgen. In October 2018, Julián Carrillo, an indigenous activist who opposed illegal logging in the community, was murdered after receiving death threats for passing information to the authorities.[72] In 2021, a hitman for Los Pintos, a Sinaloa Cartel faction, was found guilty of his murder but has yet to be arrested.[73] According to the legal judgment, seen by this report's authors, Los Pintos were protecting the interests of the Fontes family.[74] In the two years before his killing, five members of Carrillo's family were also murdered.[75]

Carrillo's murder forced many families to abandon their rural homes in the central part of Coloradas de la Virgen and flee to urban areas in Chihuahua seeking the protection of the authorities. In June 2021, an armed group, whom community members claim included members of the Fontes clan, also threatened residents on the periphery of the community, setting fire to their houses, to increase territorial control.[76]

In early 2022, another prominent community member, Trinidad Baldenegro López, was murdered, following the 2017 killing of his brother Isidro, a prize-winning environmental activist, and the murder of his father in 1986.[77] In August 2022, allegedly after refusing to support the Fontes clan's illegal

A truck hauls illegally logged timber near Guadalupe y Calvo. Criminal control of the trade has fuelled violence against indigenous communities, including killings and forced displacement. *Photo supplied*

logging operations, the indigenous governor of Coloradas de la Virgen was threatened and forced to flee his home.[78] By January 2023, the main settlement in Coloradas de la Virgen was almost entirely deserted. Despite decades of complaints to the authorities by community members denouncing the threats, violence and illegal logging allegedly carried out by the Fontes family, the harvesting of illegal timber continues – Artemio Fontes and another family member are even co-owners of a mining concession in the area.[79]

The experience of Mala Noche, another indigenous community in Guadalupe y Calvo, further demonstrates the criminal dynamics related to illegal logging. In 2021, conflict began between local criminal groups Los Azules, allied with Los Salgueiro, and Los Tauneros, supported by La Línea and CJNG.[80] Los Salgueiro had illegally logged 3 000 hectares of private land in Mala Noche without permits, but in July 2023 Los Tauneros gained control of the area and put a stop to the illegal logging, allegedly on environmental grounds.[81] This dynamic, where the presence of illegal logging fluctuates according to which group has territorial control, is also reportedly present in Urique municipality, where logging was banned and then restarted after March 2023, when a different criminal group took over.[82] This conflict over territory has led to the forced displacement of hundreds of mostly indigenous people. Female community members, including from Mala Noche, fled their homes after their husbands and sons were shot, threatened or forcibly recruited to join one of the groups.[83] In just two weeks, in September 2024, over 500 people were displaced to the small town of Baborigame.

Guachochi

In January 2024, the government's working group flagged Guachochi municipality as one of four areas most affected by illegal logging in the Sierra.[84] From 2021, illegal logging increased significantly when Los Salazar began to intimidate and take control of *ejido* commissariats.[85] Several community members allege that the local head of Los Salazar runs illegal logging operations in Guachochi.[86] He allegedly arrived in the Samachique locality of Guachochi in 2011 and, using his own machinery, started logging in areas with the most high-value wood, while extorting MX$200 000 (approximately US$10 000) a month from the *ejido's* own wood trade.

According to the community members, from 2021, the group expanded the extortion ring to at least 15 *ejidos* who each initially paid them 30% and then 50% of their logging profits. The group now controls all the revenue streams from illegal logging. In February 2024, armed men from Los Salazar interrupted at least five separate *ejido* election meetings to forcibly install their own members in the commissariats.[87] Wood transport permits are illegally reused to allow for three times as much wood to be felled and transported.[88] Forestry engineers are also threatened and forced to make fraudulent tree markings on the inventories, allowing for logging above the legally permitted amount. The logs are then taken to sawmills in Guachochi, which are allegedly controlled by Los Salazar, or transported to larger sawmills in Parral or Chihuahua.

The head of Los Salazar in Guachochi also uses sexual violence as a form of territorial control, adding to a long history of women victimization and impunity in Chihuahua.[89] Armed men in his service are ordered to abduct local women and bring them to him where they are raped – a woman interviewed confirmed that the criminal leader had raped her daughter.[90] The use of sexual violence as a form of criminal governance is alarming, especially within the context of Mexico, which has one of the world's highest rates of femicide (the intentional killing of women and girls because of their gender). Ten women are killed daily,[91] and seven in 10 women over the age of 15 years have experienced some form of violence, including 40% who had suffered abuse from a partner.[92] Since 2015, rates of sexual assault and family violence have more than doubled in Mexico.[93]

CRIMINAL DYNAMICS OF MINING IN SONORA

Sonora is a desert-like region in northern Mexico and the country's largest mining state, producing almost a third of Mexico's minerals.[94] It is the largest producer of copper (80% of the national total) and gold (29%), and the second largest producer of iron and barite in Mexico.[95] In 2022, Sonora had the country's highest number of mining concessions, with 4 411 titles covering almost 40 000 square kilometres (21.8% of its territory), double the area, in absolute terms, of the nearest state.[96] Of these concessions, 36 are metal ore mines, with half being open pit mines that harm the environment through habitat destruction, soil erosion, water and air pollution, and waste generation.[97]

In addition to mining, Sonora is a hub of organized crime and violence. In 2024, Sonora's homicide rate of 45.4 out of 100 000 people was double the national average.[98] The state also had the sixth highest number of disappeared people – between 2023 and 2024, the number of cases opened increased by 42%.[99] Together with Baja California and Sinaloa, Sonora is emerging as part of the new 'golden triangle' of trafficking and violence, where fentanyl production overlaps with high levels of firearm-related homicides.[100] Fentanyl production in Mexico is closely linked to firearms trafficking from the US.[101]

As a result of the lucrative smuggling routes along the Mexico–US border, criminal groups compete to gain a foothold in Sonora, mostly to traffic drugs and smuggle migrants from Mexico to the US, and to smuggle firearms and cash from the US to Mexico. As of October 2024, the groups fighting for control over these routes included rival factions of the Sinaloa Cartel: Los Chapitos (the sons of Joaquín 'El Chapo' Guzmán) and Los Mayos (the family of Ismael 'El Mayo' Zambada). Los Chapitos are allied with the regional group Los Salazar and subcontract local criminal gangs, such as Los Cazadores, Los Deltas and Los Pelones, to provide armed support.[102] Another player is the Caborca Cartel, which was established by veteran trafficker Rafael Caro Quintero and is fighting Los Chapitos in alliance with La Línea.[103] The Caborca Cartel has its roots in the Sonoran municipality of the same name, which is home to one of Mexico's largest gold mines, and has been run by family members since Quintero's arrest in 2022.[104] Taking advantage of these disputes is the CJNG, which seeks to gain influence and is playing out its national conflict with the Sinaloa Cartel in Sonora.[105]

The narrative around organized crime's engagement with mining in Sonora is contested. Some sociologists and activists believe that criminal groups exercise control on behalf of mining company interests, using violence to stamp out opposition to mining activities.[106] Yet there is little reliable evidence of

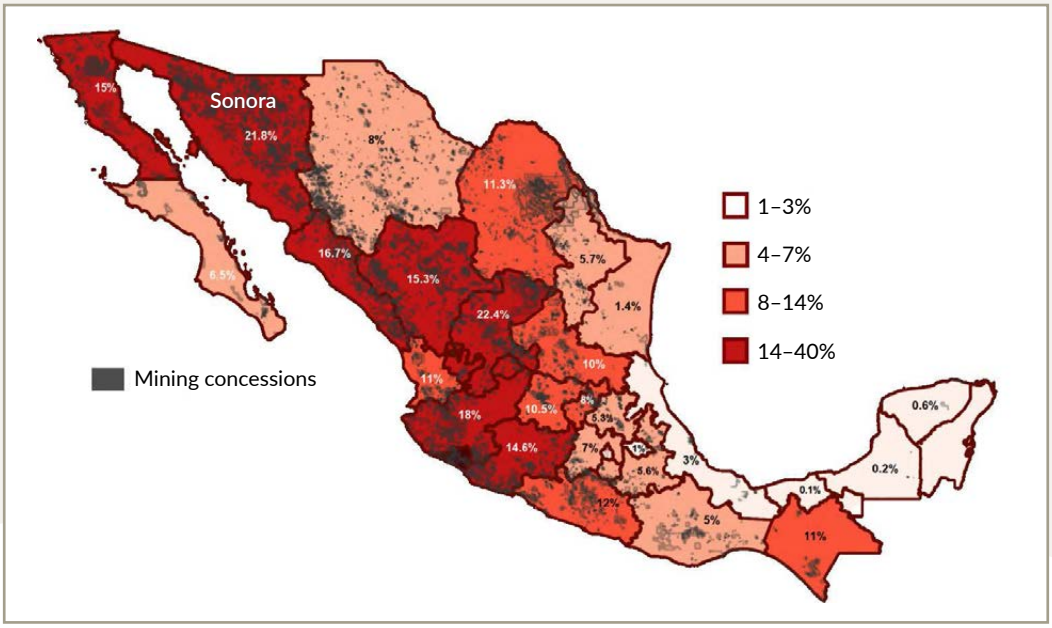

FIGURE 6 Percentage of land area under mining concessions (by state).

SOURCE: Fundar, *Resumen estadístico de la minería en México*, 2023

mining companies employing criminal groups to protect their interests in Sonora, unlike in other states such as Michoacán and Jalisco, where the CJNG is illegally extracting iron ore.[107] Similarly, few criminal groups appear to be actively running illegal mines in Sonora, with the exception of El Bajío and (more recently) an illegal gold mine operating in La Ciénega where eight armed men were arrested.[108] However, this may be because the CJNG does not have a long-standing presence in Sonora.[109]

The relative lack of illegal mining operations may also be because of agreements between criminal groups and the large mining companies in Sonora, whereby criminal groups do not rob the companies or attack their workers in exchange for payoffs.[110] Given the power held by mining companies, this seems to be more a business decision rather than outright extortion. Mining companies also wield economic influence in the state and have strong political ties to the Sonora government, which may override the power of criminal groups. Furthermore, the corrupt relationships that exist between mining companies and public officials allow companies to break laws without consequences.

At a national level, the Mexican Mining Chamber estimates that companies lose between 10–20% of their revenue due to robberies.[111] In the past, mining companies were robbed, but this may have been due to a shift in territorial control among criminal groups rather than a general modus operandi. For instance, in 2020, the Sinaloa Cartel came to 'clean house' following the violation of the non-robbery pact after two robberies of La Herradura mine occurred that were attributed to the Caborca Cartel.[112]

In addition to these established criminal groups, mining companies regularly violate environmental laws, assisted by the nexus of large mining companies and government entities in Sonora. According to the head of Sonora's environment ministry (SEMARNAT) there are clear conflicts of interest.[113] For example, in 2023, SEMARNAT's national office accused Grupo México, one of the country's largest conglomerates, and former public officials of environmental crimes and corruption after toxic waste from the Buenavista del Cobre copper mine spilled into the Sonora River in 2014, comparing their actions to those of 'organized crime'.[114] (See Grupo México case study further below.)

Lastly, in Sonora, *gambusinos* or informal small-scale gold miners operate in a legal grey area, with many working without the necessary permits or licences, making their activities technically illegal. *Gambusinos* are opportunistic gold miners, usually with limited resources, who extract gold using artisanal methods that may include the use of mercury, causing environmental harms. Although data is scarce, it is estimated that about 5 000 *gambusinos* are currently active in the upper part of the Yaqui River,[115] with some reports suggesting that they are extorted by criminal groups.[116]

Actor	Motives/objectives	Use of violence	Mining involvement/ modus operandi	Relations with other actors
Large mining companies	Profit maximization; securing access to mineral resources; maintaining operational stability	■ May use hired criminal groups to intimidate or suppress opposition from local communities (although not widespread) ■ Environmental and structural violence through pollution and displacement	■ Conduct industrial-scale mining (legal concession-based extraction) with 36 metal ore mines producing almost a third of Mexico's output, more than any other state ■ Accused of environmental crimes and corrupt dealings with public officials	■ Corrupt relationships with some public officials ■ Possible financial pacts with criminal groups to prevent theft, attacks on their workers or illegal mining in their concessions
Criminal groups/ organized crime	Profit extraction through territorial control; diversification of income sources	Use of violence and intimidation to enforce extortion, protect illegal operations, or coerce compliance of communities on behalf of large mining companies	■ Limited but some direct involvement in illegal gold mining ■ Extortion of *gambusinos* (artisanal miners) and possible revenue from mining protection rackets	■ Occasionally hired by large mining companies to intimidate communities ■ May have non-aggression or financial agreements with mining companies ■ Sometimes violate pacts, leading to robberies at mining companies
Gambusinos (artisanal miners)	Livelihood mining; small-scale informal gold extraction	Typically non-violent, although vulnerable to coercion by criminal actors	■ Use rudimentary artisanal techniques (manual gold panning, small-scale extraction) ■ Operate informally, often without legal titles, with estimated 5 000 based at the Yaqui River, central Sonora, alone	■ Subject to extortion by criminal groups ■ Sometimes tolerated or ignored by companies and authorities
Public officials/ state actors	Governance, regulation or rent-seeking; maintaining political power	Indirect complicity through corruption or neglect of enforcement; not direct perpetrators of violence	■ Regulatory oversight (often weak or compromised) ■ Facilitate licences, contracts or protection for certain companies	■ Corrupt ties with mining firms ■ May turn a blind eye to criminal infiltration or environmental crimes

FIGURE 7 Actors related to mining in Sonora.

The mining sector is set to grow in importance, as Sonora is believed to have Mexico's largest reserves of lithium, a key component in electric batteries. Lithium has been declared a 'strategic mineral' and has led to the nationalization of companies with lithium licences and the setting up of a parastatal company for future exploitation.[117] Furthermore, lithium mining will be required for the 'Sonora Plan', an ambitious energy, transport, industry and infrastructure nearshoring project that aims to supply electric vehicles to the US.[118] If lithium deposits prove economically viable, which is not guaranteed, they could provide additional extortion rents for criminal groups.[119] At the same time, environmental impacts may accelerate, as lithium mining is water intensive, and Sonora is already experiencing high water stress and desertification.[120]

Environmental impacts

The harmful environmental impacts of metal ore mining are well documented, from ecosystem disruption to water scarcity and contamination, soil erosion, air pollution, resource depletion and toxic waste generation. Moreover, the industry's carbon footprint is extensive. In 2021, the mining sector consumed the same amount of energy as a third of Mexico's population (42.2 million people), mostly due to electricity and diesel consumption.[121] The use of tailings dams to store waste material, often toxic substances and heavy metals, from mining operations adds further environmental concerns. Similarly, half of Sonora's mines are open pit, leading to landscape alteration, groundwater depletion, increased erosion, biodiversity loss and dust generation.

In Sonora, the criminality and environmental impact dynamic plays out mostly through large mining companies violating environmental laws, within the context of a sector characterized by a lack of transparency and poor regulatory oversight. In 2022, Mexico was suspended from the global multistakeholder group, the Extractive Industries Transparency Initiative, due to poor transparency regarding mining concessions and failures to provide environmental information and the identity of company owners.[122] Along with influence peddling and conflicts of interest with public officials, this context fosters a lack of accountability for environmental damage caused by mining companies in Sonora. Furthermore, according to the head of SEMARNAT in Sonora, the capacity to investigate environmental crimes needs improving at PROFEPA's local office.[123]

Mining also has a major impact on water stress. Sonora is the state with the highest volume (100 million cubic metres) of water concessioned to mining[124] and yet lacks access to water for local populations.[125] In February 2024, the Sonora government declared a state of water emergency, as 71 of 72 municipalities were suffering from drought, with 44 experiencing extreme drought.[126] Conflicts have erupted between communities and mining companies competing for water resources, most recently in Bacoachi, where residents accused Grupo México of extracting 63 000 cubic metres of water daily for use in its copper mine. They claim that the Bacoachi River and its aquifer has 4 million cubic metres available, but the company has been granted concessions for wells along the river for 14 million cubic metres, 10 million cubic metres more than what is officially available.[127] Socio-environmental conflicts have been reported at 11 other mining projects in Sonora.[128]

Corruption may contribute to the impact of large mining companies on water resources in Sonora. In 2018, Víctor Hugo Alcocer Yamanaka, former head of the technical sub-directorate of the National Water Commission (Comisión Nacional del Agua, CONAGUA) and now employed by Grupo México, was publicly accused by CONAGUA as being the official who granted the company a concession for 8 million cubic metres of water in an over-exploited aquifer before taking up employment with the

company.[129] Reporting on water use by mining companies is also a challenge, as companies are not required by law to disclose their water usage and employ different types of usage permits, often under different names, for example under subsidiaries of the parent company.[130]

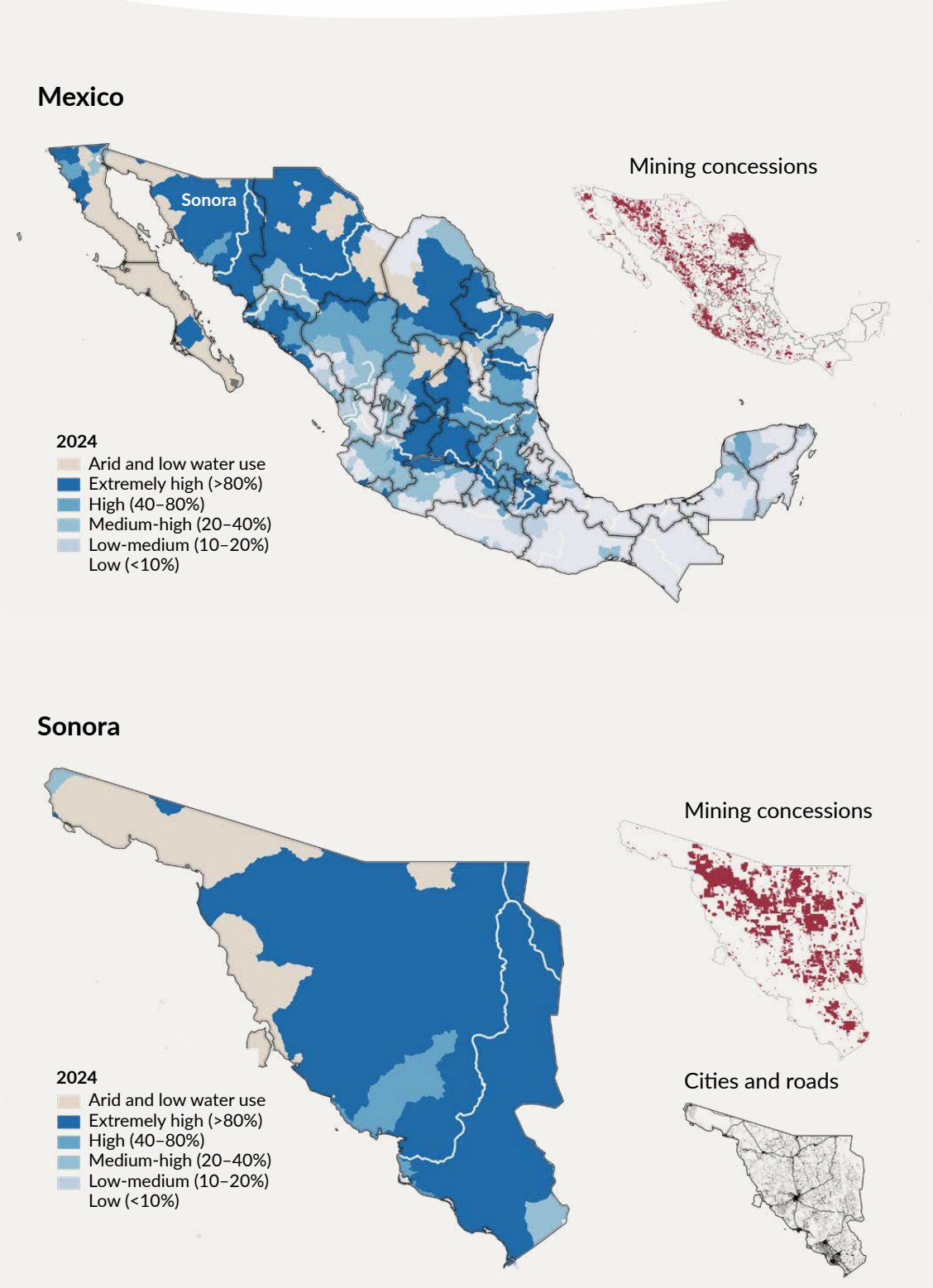

FIGURE 8 Water stress in Mexico and in Sonora.

SOURCES: Global Forest Watch; World Resources Institute; OpenStreetMap

Mining also causes vegetation loss because of changes in land use. In Álamos, in southern Sonora, studies suggest mining has caused a significant loss of vegetation, harming local biodiversity.[131] The *ejido* El Bajío open pit gold mine at Penmont has reportedly also caused soil degradation and polluted the already scarce water, threatening the community's livelihood.[132] Mining also causes air pollution in Sonora. In 2022, Buenavista del Cobre's mining activities in Cananea emitted over 150 000 kilograms of nitrous oxide, a potent greenhouse gas, and Penmont emitted 2.7 million kilograms of carbon emissions.[133] In addition, as mentioned earlier, informal artisanal mining activities by *gambusinos*, although not quantified, harm the environment, in particularly polluting waterways through the unregulated use of mercury.

Mexico's new mining bill goes some way to addressing concerns around the environmental impact of mining by banning open pit mines and new mining concessions in conservation areas and in regions of water scarcity.[134] However, several mining companies, including Grupo México, and a coalition of opposition parties are challenging the law in court, and it remains to be seen what changes will be adopted.[135]

Mexico's mining reform

On 24 March 2023, then president Andrés Manuel López Obrador introduced a bill, which was enacted on 9 May 2023, that represents a major reform of the country's extractive framework. The legislation amends the Mining Law, the National Water Law, the General Law for Ecological Balance and Environmental Protection, and the General Law for the Prevention and Integral Management of Waste, with the aim of aligning mining activity with environmental, social and public interests.[136] Concessions are limited in duration, have stricter renewal rules and could be revoked for social or environmental violations.[137] Mining is now prohibited in protected areas and water-scarce regions, while concession holders must implement mine closure and restoration plans. Importantly, the law strengthens indigenous and Afro-Mexican rights, requiring free, prior and informed consent and mandating a 5% profit-sharing with affected communities.[138] ■

Mining case studies

Minera Penmont and *ejido* El Bajío

The *ejido* El Bajío case is emblematic of environmental crimes carried out by large mining companies in Sonora and the level of impunity for their actions. It also reveals the role of criminal groups, some with political connections, who act opportunistically to mine gold illegally and employ violence to suppress dissent, a method of social control that some attribute to collusion with the company's interests. However, the active involvement of criminal groups appears to be particular to this case rather than representative of Sonora as a whole.

The conflict between the *ejido* El Bajío and the mining company Penmont took place in Caborca, a municipality that provides more than a third of Sonora's gold production, and where the company operated

the Soledad-Dipolos mine on part of the *ejido* land between 2009 and 2013.[139] Members of the *ejido*, which covers 21 000 hectares of desert rich in biodiversity, accused Penmont of illegally extracting gold without their approval.[140] In 2014, a court confirmed this illegal activity and ordered the company to stop its operations, rehabilitate the damaged environment and compensate the inhabitants with the value of the gold that had been extracted.[141] Penmont is a subsidiary of London Stock Exchange-listed Fresnillo plc and owned by the Baillères family (one of the richest in Mexico), while Fresnillo is Mexico's largest gold producer. According to the *ejido* El Bajío, the company removed almost 11 million tonnes of earth from their land, extracting 236 000 ounces of gold and making profits of around US$436 million.[142] Although the company complied with the order to stop extracting gold, to date it has not restored the environmental harms caused or compensated the *ejido's* inhabitants.

The Soledad-Dipolos mine in *ejido* El Bajío was found to have illegally extracted gold without community consent, leaving behind significant environmental damage to the surrounding ecosystem. *Photo supplied*

Caborca is also the home of the Caborca Cartel, which is accused, together with other individuals and criminal groups, of illegally extracting gold since 2014 from the abandoned mine site and of using threats and violence against members of the *ejido* who opposed the illegal mining. Rafael Pavlovich, the uncle of Claudia Pavlovich, who was governor of Sonora from 2015 to 2021, was allegedly the first to employ armed men to carry out these mining activities.[143] In 2016, Rafael Pavlovich entered into an agreement with the Cruz family, members of the *ejido* who claimed to have ownership rights over the area of the mine, that allowed him access to the site using his 'capacity and human resources' and splitting the proceeds 50/50.[144]

According to other *ejido* members, Pavlovich began to act as owner of the land, which was demarcated as 'common use' and so belonged to the whole *ejido* (even though the Cruz family retained usufruct rights), allegedly using forged signatures to obtain a legal document backing his claim.[145] In April 2016, just two weeks after Pavlovich requested the arrest of *ejido* members for 'plunder', over 100 state and municipal police officers entered El Bajío and beat and threatened *ejido* members.[146] Five were taken to the police station in Caborca and imprisoned for more than a year before being absolved of all charges.[147] Experts and community members highlight this episode as an example of Pavlovich exploiting his familial ties with the Sonora governor, using his 'capacity and human resources' to violently repress the *ejido* El Bajío.[148]

After the police incursion, armed men appeared at the site and installed a clandestine gold-mining operation. According to *ejido* members, the men worked for Rafael Pavlovich and belonged to the Caborca Cartel, a criminal group set up by veteran trafficker Rafael Caro Quintero and run by family members after Quintero's second arrest in 2022.[149] These gunmen employed violence to suppress the *ejido* members who opposed their actions and who fought the legal battle against the Penmont mining

company. For example, hooded men kidnapped Erasmo Santiago, one of the members imprisoned on trumped-up charges, shortly after his release, along with his wife Margarita, saying that 'their boss wants this land'.[150] Margarita took this to mean Rafael Pavlovich and alleges that one of the Cruz family members, who had made the agreement with Pavlovich, was in the car used for the kidnapping.[151] The gunmen took the couple to try and find another *ejido* member, Raúl Ibarra, who had been a key opponent of the mining company. When they were unable to find him, they left Erasmo and Margarita on the side of the road. Weeks later, in February 2018, Raúl Ibarra was killed and his wife disappeared following the arrival of more armed men at the mine site, who allegedly said, 'we have come here because you are causing a lot of trouble'.[152] A month later, hooded gunmen stopped a documentary film crew from entering the area and were recorded saying 'we are looking after the interests of Rafael Pavlovich'.[153]

According to *ejido* members, the next actor to seek to exploit the *ejido* El Bajío's gold reserves was Rodrigo Omar Páez Rodriguez, the son of Caborca Cartel head Rodrigo Omar Páez Quintero, who was arrested in 2023 on drug trafficking charges and extradited to the US.[154] In December 2018, Páez Rodriguez signed an agreement with the Cruz family (again) whereby he and a business partner committed to mine the site for gold and share the profits with the Cruz family.[155] The agreement also left an opening for the Penmont mining company to return. According to *ejido* members, armed men working for Páez Rodriguez then illegally mined the site until March 2020, when the community, with the support of security forces from the National Guard, managed to evict them.[156] At the time of the eviction, Penmont was allegedly building a road to the mine site, on the other side of the fence from where the criminal group was actively extracting gold.[157]

Despite the expulsion of illegal gold miners, the violence continued. In April 2021, José de Jesús Robledo Cruz and his wife were killed and their bodies found with a placard listing the names of 13 other anti-mining activists, also members of the *ejido* El Bajío.[158] Years earlier, Robledo Cruz had been kidnapped by armed men and had reportedly received threats for his opposition to Penmont.[159] Penmont has continuously denied any links to criminal groups or violence against community members.

The most recent actors in the struggle for the *ejido's* gold reserves are consulting company Asesora QL-Peon and José Hemel Quintero Ley, the Cruz family's legal representative.[160] With the support of a state senator, their aim is to recoup the compensation owed by Penmont for themselves and the Cruz family, while suing the *ejido* El Bajío for creating a protected natural area on the land.[161] In 2024, at least two further attempts were made to access the mine site, one by a group claiming to be lawyers and public officials and one led by Carmen Cruz Pérez, the family's patriarch.[162]

While some suspicions have been raised about alleged collusion between Penmont and the various criminal groups who have exploited the *ejido* El Bajio's gold and used violence against its members, the evidence in support of this is unclear. Penmont could however benefit indirectly from these criminal groups intimidating the *ejido* members, in that it can return to the mine site and restart gold exploitation, potentially through an agreement with the Cruz family. Another possible benefit flowing from the intimidation of the community is the outstanding court order that requires the company to restore the environment damage caused and provide compensation for the gold extracted. In both cases, the interests of the company and criminal groups align in terms of a desire to silence *ejido* members who oppose gold mining on their land.

Although evidence of collusion is unclear, there have been reports of attempted bribery by alleged representatives of the company of *ejido* members to stop their legal battle against the mine,[163] and in April 2022, someone claiming to be a Penmont representative allegedly phoned the father of Miguel

Fernandez de Castro, an artist who had an exhibition at the time about the El Bajío case, warning him to tell his son to 'quieten down'.[164]

What is clear is the environmental damage left by the mining company. The area's topography has been severely affected by two vast, abandoned open pit sites, which have levelled part of a mountain, and several uncovered tailing ponds still containing wastewater. According to local residents, the mine's water use has caused wells to run dry, while the loss of habitat has led to the decline of local flora and fauna, such as the pronghorn.

Grupo México and the Sonora River

The complicity between large mining companies and state authorities in Sonora is reflected in the lack of remediation for environmental harms caused by Grupo México, the country's largest mining company. Grupo México is one of the world's largest copper producers[165] and has the highest number of socio-environmental conflicts of any mining company in Mexico.[166] The company, together with ex-public officials, stands accused of environmental crimes and corruption related to the worst environmental disaster in the history of mining in Mexico that occurred in Cananea, northern Sonora.[167] On 6 August 2014, 10 million gallons of acidified copper sulphate spilt into the Sonora and Bacanuchi rivers from the company's Buenavista del Cobre's copper mine.[168] An estimated 22 000 people in at least eight municipalities have suffered impacts to their health, environment and livelihoods.[169]

Grupo México initially blamed the spill on high rainfall and was backed by the pliant Sonoran state government. However, in a 2023 report, the Environment Ministry confirmed that Grupo México was responsible for the disaster, which resulted from negligence due to the deficient design of their dam leachate system.[170] Almost a decade after the disaster, 'alarming' amounts of heavy metals were found to be contaminating the water, land and air across almost 260 square kilometres of the spill's path.[171] Over half of the drinking wells in the region were found to be unsafe, and every soil sample showed the presence of mercury, which does not occur naturally in the area and is an indicator of mining pollution. The report concluded that the company had not adequately addressed the environmental and economic consequences of the spill on the affected communities. Research by the Mexican NGO Poder has found that community members carry significant levels of heavy metals, such as lead and arsenic, in their blood,[172] and there is anecdotal evidence of high levels of cancer among the population.[173]

Farmers and residents gather in Baviácora, Sonora, seeking compensation after a copper sulphate spill from Grupo México's Buenavista del Cobre mine contaminated the Sonora River, harming crops, livestock and public health. *Susana González/Bloomberg via Getty Images*

In September 2014, Grupo México agreed to donate MX$2 billion (US$994 million) to a trust that was created to remediate the impacts of the toxic spill,[174] but the trust was not transparent and was seemingly open to corruption.[175] This was demonstrated in February 2017, when officials endorsed the closing of the trust despite the distribution of only half the funds and multiple irregularities in the implementation of projects, including water treatment plants that stopped operating soon after their construction.[176] The unspent funds were returned to Grupo México, and the long-term commitments remained unfulfilled.[177]

SEMARNAT has filed a criminal lawsuit against Grupo México and ex-public officials, claiming that the promised remediation by the company did not happen due to the inaction of former officials at CONAGUA, PROFEPA and SEMARNAT.[178] These government entities were accused of failing to assert their powers, accepting the company's reports as true and not verifying that the remediation had been carried out.[179] The complaint reportedly compares the actions of those accused to that of 'organized crime'.[180]

The remediation trust also reflected conflicts of interest and indicators of corruption. The head of the trust and a senior Sonora government official, Rodolfo Lacy Tamayo, had an apparent conflict of interest, as owner of Mexico's college of environmental engineers (Colegio de Ingenieros Ambientales de México). Formed just after the spill occurred, the company secured a contract to supply water storage tanks to the affected community and inflated the price of the tanks by three times their value.[181] Another beneficiary of the trust, the company Rotoplas, was co-owned by the cousin of Grupo México's owner.[182] Moreover, a network of ex-public officials who favoured the company are now working for Grupo México.[183] For example, at the time of the spill, current Grupo México employee Víctor Hugo Alcocer Yamanaka was working for CONAGUA and headed a sub-directorate of the agency that reportedly issued a document supporting the 'improving quality' of the water in the contaminated region.[184] To this day, CONAGUA continues to deny access to official documents.[185]

In addition, activists demanding just reparations for the toxic spill have been targeted, with claims of attempted bribery by a government official to desist their campaign and a death threat from an official who said it had been delivered on behalf of the company.[186]

In 2022, the government estimated that the Buenavista del Cobre spill caused environmental damages of MX$20 billion (US$9.9 billion), 16 times the amount Grupo México originally put aside.[187] Although the trust was reopened in 2020, Grupo México continues to refuse to make additional funds available, according to representatives of affected communities.[188]

RECOMMENDATIONS

Environmental crime in northern Mexico, through large-scale illegal logging in Chihuahua and collusive mining practices in Sonora, is a multifaceted threat that extends far beyond ecological degradation. Criminal organizations have professionalized the exploitation of resources by leveraging sophisticated networks of violence, document fraud and political corruption, often in concert with private-sector actors. The convergence of illicit and semi-licit practices presents acute risks and has produced profound social harms, from forced displacement of indigenous communities to targeted violence against environmental defenders, water insecurity and biodiversity loss.

State capacity to detect, investigate and prosecute environmental crimes in northern Mexico remains woefully inadequate, while these crimes generate significant reputational, legal and operational risks for foreign actors and states. As Mexico moves to nationalize strategic minerals, such as lithium, the potential for criminal rent-seeking and for foreign firms to be drawn into corrupt arrangements will only intensify unless corrective action is taken.

Mexican authorities, private-sector actors, civil society and international partners must seek to disrupt the nexus of organized crime and corporate corruption that undermines environmental governance in northern Mexico.

Mexican authorities:

- Must expand and professionalize inspection regimes and judicial resources in Chihuahua and Sonora, to strengthen capacity to detect, investigate and prosecute environmental crimes. The number and geographical coverage of forestry checkpoints and sawmill audits should be increased, with teams properly trained, equipped and rotated regularly to minimize opportunities for collusion.
- Should ensure that all logging and mining concessions, environmental-impact assessments and water-use rights are published in accessible, centralized online registries. These platforms must include clear grievance mechanisms, so that civil society organizations, community groups and journalists can flag irregularities. To curtail revolving-door practices, former regulators should have mandated cooling-off periods before they can accept private-sector positions in the industries they once supervised.
- Should introduce binding human-rights and environmental due-diligence legislation at the corporate-governance level. Such laws should compel all companies operating in high-risk sectors, from multinational mining conglomerates to timber traders, to conduct comprehensive risk assessments, publish remedial action plans and demonstrate full supply-chain traceability through independent third-party audits.

- Must properly resource protection programmes, such as the Mexican Protection Mechanism for Human Rights Defenders and Journalists,[189] to guarantee the safety of indigenous forest defenders and *ejido* members whose testimonies are crucial for combating illegal mining.

Private sector:

- Downstream companies should conform fully with the OECD conflict minerals due diligence guidance.[190] This means that all companies that source minerals from Mexico should identify and disclose the origin of the minerals, map their supply chain, identify potential harms and publicly disengage from problematic refiners or suppliers.
- Downstream companies should incorporate stronger environmental and indigenous rights requirements. This means including environmental risks and risks related to indigenous peoples' rights in their due diligence processes, pushing industry initiatives to make ESG requirements mandatory and supporting the Initiative for Responsible Mining Assurance audit standard.
- Financial institutions must condition lending on demonstrable compliance with anti-corruption and environmental standards.

Civil society organizations:

Should help strengthen communal land rights by providing the technical support and funding necessary for community-led forest and water monitoring initiatives by local communities. These on-the-ground networks should detect illegal activity in real time, feeding data to NGOs and enforcement bodies such as PROFEPA.

International partners:

- Must integrate environmental-crime risk mitigation into their corporate-governance and foreign-policy frameworks. Illegal logging and mining corruption must be elevated to agenda items in trade-agreement negotiations, with market access or financial support tied to measurable anti-crime benchmarks. Where evidence of corporate or official complicity in environmental crime emerges, diplomatic pressure should signal that impunity carries international consequences.
- Should provide support through technical assistance to Mexican regulatory bodies to bolster capabilities in financial forensics, satellite monitoring and supply chain tracking.

By harmonizing enforcement, transparency, corporate accountability, community empowerment and international cooperation, Mexico and its global partners can begin to sever the deadly nexus of organized crime and corporate corruption that threatens northern Mexico's forests, waterways and frontier communities.

NOTES

1 Daniel Shailer, 'They're waiting till we die of cancer': 10 years on, Mexico's worst mining disaster still poisons lives, *The Guardian*, 24 July 2024, https://www.theguardian.com/global-development/article/2024/jul/24/theyre-waiting-till-we-die-of-cancer-10-years-on-mexicos-worst-mining-disaster-still-poisons-lives.

2 *Ejidos* are communal land holdings established under the 1917 Mexican constitution, primarily for the benefit of rural communities. Elected *ejido* members manage the land use and resources.

3 In 2021, the year with the latest available data, Chihuahua produced MX$3.32 billion of wood, while Mexico's total was MX$10.16 billion. See Sistema Nacional de Información Forestal, *Estadísticas por estados de producción forestal maderable y no maderable*, https://snif.cnf.gob.mx/estadisticas-por-estados-de-produccion-forestal-maderable-y-no-maderable/.

4 3 271 species of plants, 470 birds, 475 invertebrates, 206 mammals and 150 reptiles have been registered in the Sierra Tarahumara. United Nations Environment Programme, Protecting the Sierra Tarahumara, a biodiversity hot spot, 28 June 2019, https://www.unep.org/news-and-stories/story/protecting-sierra-tarahumara-biodiversity-hot-spot; Comisión Nacional de Áreas Naturales Protegidas, *Convocatoria: Proyecto GEF Tarahumara Sustentable*, 7 September 2016, https://www.gob.mx/conanp/documentos/convocatoria-proyecto-gef-tarahumara-sustentable.

5 Ibid.

6 Livia Wagner, Diana Siller and Rosalva Landa, People and forests at risk: Organized crime, trafficking in persons and deforestation in Chihuahua, Mexico, GI-TOC, April 2020, https://globalinitiative.net/analysis/oc-trafficking-deforestation-mexico/.

7 Global Forest Watch, Mexico country dashboard, https://www.globalforestwatch.org/dashboards/country/MEX/6/?location=WyJjb3VudHJ5IiwiTUVYIiwiNiJd&map=eyJjYW5Cb3VuZCI6dHJ1ZX0%3D.

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