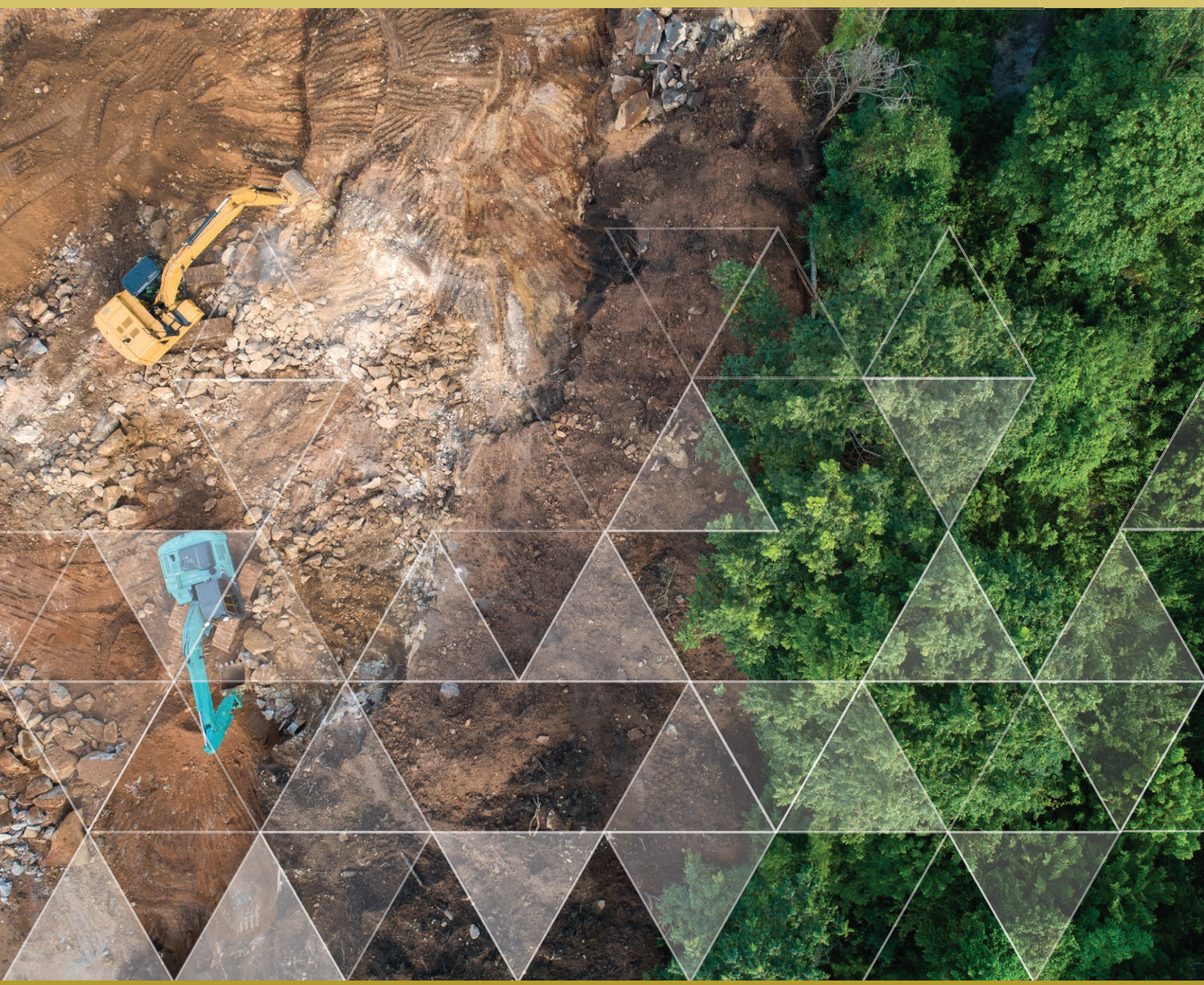
IMPACTS OF EXTRACTIVE INDUSTRY AND INFRASTRUCTURE ON FORESTS

GLOBAL AND SYNTHESIS REPORT



Anthony J. Bebbington, Denise Humphreys Bebbington,
and Laura Aileen Sauls

Assessment and Scoping of Extractive Industry and Infrastructure in Relation to Deforestation: Global and Synthesis Report

Report prepared by Anthony J. Bebbington,[1,2] Denise Humphreys Bebbington,[1] and Laura Aileen Sauls,[1] on the basis of work conducted and written up by: Sumali Agrawal,[3] Anthony J. Bebbington,[1] Denise Humphreys Bebbington,[1] Ali Filipovic,[1] César Gamboa,[10] Karen Hudlet Vázquez,[1] Aviva Imhof,[4] Kimberly Johnson,[1] Anam Khan,[1] Manuel Marti,[5] Marco Millones,[6] John Rogan,[1] Herman Rosa,[5] Antoinette Royo,[7] Laura Aileen Sauls,[1] Ricardo Verdum,[8] Luisa Young,[1] and Diego Zarate[9]

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The authors are solely responsible for its content.

[1] Clark University, USA
[2] University of Melbourne, Australia
[3] Yayasan Tambuhak Sinta, Kalimantan, Indonesia
[4] European Climate Foundation, UK
[5] PRISMA, El Salvador
[6] Mary Washington University, USA
[7] Samdhana Institute, Indonesia
[8] Museu Nacional - Universidade Federal do Rio de Janeiro, Brazil
[9] University of Costa Rica
[10] Derecho, Ambiente y Recursos, Peru

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Acronyms and Abbreviations

Acronym	
ASGM	Artisanal and Small-scale Gold Mining
BCIE	Banco Centroamericano de Integración Económica (Central American Bank for Economic Integration)
BNDES	Banco Nacional de Desenvolvimento Econômico e Social (Brazilian Development Bank)
COSIPLAN	Consejo Suramericano de Infraestructura y Planeamiento (South American Council of Infrastructure and Planning)
EII	Extractive Industry and Infrastructure
EITI	Extractive Industries Transparency Initiative
FPIC	Free, prior and informed consent
GIS	Geographic information system
GW	Gigawatt
HEP	hydroelectric power
IACHR	Inter-American Commission on Human Rights
ICMM	International Council on Mining and Metals
IFI	International Financial Institution
Mha	Million hectares
MP3EI	Masterplan for Acceleration and Expansion of Indonesia's Economic Development
OECD	Organisation for Economic Co-operation and Development
PPI	Public-Private Investment
RAAN	Región Autónoma del Atlántico Norte (North Atlantic Autonomous Region)
SEA	Strategic Environmental Assessment
WALHI	Indonesian Forum for Environment
WWF	World Wildlife Fund

Executive Summary

This executive summary provides an overview of key findings from five reports exploring the significance of extractive industry and infrastructure as drivers of deforestation and rights violations in forest communities globally and in three regions: Mexico and Central America, the Brazilian and Western Amazon, and Indonesia. The study was commissioned by the Climate and Land Use Alliance (CLUA) and carried out by Clark University from mid-2016 to early 2018 together with the organizations PRISMA (El Salvador), CASA (Brazil) and Samdhana Institute (Indonesia).

Context

Indonesia, the Amazonia, and Mesoamerica constitute distinct contexts for forest loss and forest resurgence. Indonesia is undergoing rapid forest loss, especially concentrated in certain parts of the archipelago. The Brazilian Amazon has been characterized until 2012 by a slowdown in deforestation and relative success of forested protected areas, though these trends are now increasingly in reversal. Mesoamerica's forest geography is more complex, with patchy but significant forest resurgence and well-organized networks of community-based forest management organizations, but also significant areas of forest loss and degradation. The political economies and political ecologies of the three regions are also distinct. Indonesia and Brazil are characterized by national development strategies that emphasize large-scale resource extraction and agroindustry coupled with significant and advanced industrialization. Mesoamerican economies, while more varied, are less industrialized, less dependent on large-scale resource extraction, more reliant on migrant remittances, and more dependent on transnational forces and organizations. Focusing on these three distinct regions highlights the need for differentiated approaches, but also reveals common trends in drivers and responses.

Findings

Increasing investment in extractive industry and infrastructure (EII) is promoted as a pillar of economic development. However, EII investment has also been accompanied by corruption, poor governance, inequality, environmental damage and climate change effects. The complex challenges of managing EII for sustainable and equitable development are reflected in the growing concern that EII is a driver of deforestation and rights violations in communities who live in and near forests. This concern is serious because many of the world's remaining areas of extensive humid and semi-arid forest are sites of important mineral, oil, coal and natural gas reserves. These forest areas are also set to receive significant investment in infrastructure designed to support extractive industry and large-scale agriculture. This suggests that threats to forest cover from EII are likely to increase. This analysis explores these issues in Mexico and Central America, the Brazilian and Western Amazon, and Indonesia, and finds evidence that this concern is warranted.

Infrastructure and extractive industry often come bundled together. Efforts to promote investment in the two sectors and the synergies between them drive legal and institutional

reforms that change how forests are governed. These reforms have led to reductions in protected area status, weakened protection of Indigenous territories, and relaxation of environmental assessment procedures, among others. Violence against environmental defenders has increased.

In aggregate terms, infrastructure seems a more important driver of forest loss than mining or hydrocarbon extraction, but in practice the two sectors are better understood as existing in a relation of synergy. While the direct footprints of extractive industry operations on deforestation are relatively limited in space, there is evidence that the forest degradation effect stretches much further than the mine site. Access infrastructure, on the other hand, facilitates expansion of the agricultural frontier by large agro-industrial and smallholder colonists alike, as well as in-migration of artisanal and small-scale miners. By opening roads and other means of access, energy transmission infrastructure and pipeline construction can have the same effect. Much new extractive industry investment, especially in more remote forest locations, requires access and energy infrastructure, and the prospect of resource extraction can make infrastructure investment more financially viable. In some sense, infrastructure is the "driver of drivers" of forest loss – it enables extractive industry, it drives expansion of the agro-industrial frontier, and it drives colonization.

If infrastructure has the greater footprint on forests, resource extraction has the larger adverse impact on bundles of rights[i] and (together with dams) has induced more mobilization and protest from local communities than have road, railway or waterway building projects. Beyond this distinction, the bundling of extractives and infrastructure has been associated with a general tendency towards conflict and constraints on civic space, and criminalization of community leaders and activists who are portrayed as "anti-development."

Trends

Some common drivers help explain EII's expansion into forests across Amazonia, Indonesia, and Mexico and Central America, including:

- A policy emphasis on national and regional infrastructure integration, including macro-regional integration of energy systems and increased national energy generation capacity. In each region, increased energy access and use together with higher quality infrastructure are considered key to economic development. This means responses to EII's impacts on forests need to promote "smarter" rather than "no" infrastructural investment and less carbonized, rather than less intensive, national energy strategies.
- Stable political settlements in which government and economic elites (who sometimes overlap) have a shared political commitment to these projects of integration and resource extraction across different elected regimes
- The weakening of regulations protecting forested lands, Indigenous and community territories, and restrictions on the rights and freedoms of environmental activists and organizations

- The use of illegality to access forest lands for large- and small-scale EII investment – through corruption or organized violence
- An increased presence of companies who are not International Council on Mining and Metals (ICMM) members or publicly traded in OECD countries, reflecting changes in patterns of investment and the rise of resource nationalism in some countries. To the extent that such investment is less subject to safeguards, this may increase environmental and social risk.
- Synergies between extractive industry and infrastructure investment in which each makes the other more financially viable, so the two types of investment become drivers of each other.

Infrastructure and its land cover impacts

Large-scale, expanded, inter-regional, and rural-urban infrastructure investment is at the core of development plans for each region. Planned infrastructure is designed to have synergistic relationships with increased carbon-based energy use, expansion of the agricultural frontier, and facilitation of new mining and hydrocarbon frontiers. Recurrent features of these plans are large-scale roads, interconnected electricity generation and transmission systems, and port improvement. In Indonesia, there is a particular commitment to thermal power plants and rail, in the Amazon to improved hidrovías (waterways), and in Mesoamerica to telecommunications.

Infrastructure is essential for development, but a large body of evidence shows that it has also been a historical driver of forest loss, especially by facilitating smallholder colonization and the expansion of the large-scale agricultural frontier. The fact that one of the primary lobbies for infrastructure investment in the Brazilian Amazon has been the agro-industrial lobby is testament to this synergy. In this sense, the greenhouse gas emissions deriving from large-scale agriculture are also a consequence of infrastructure investment. Similarly, emissions from extractive industry are also a consequence of the infrastructure investment that made the extraction possible.

Small-scale infrastructure – legal, illegal, and/or unplanned – also emerges as a cause of deforestation. The opening of tracks and roads by small-scale miners, loggers, ranch owners, and local authorities has been an initial catalyst to forest loss and degradation in all three regions, though it typically passes under the radar of planners and civil society monitoring efforts and research.

Given that accessibility and distance appear to be at least as effective in protecting forests as the designation of protected area status, there is good reason to be concerned about the expansion of infrastructure that increases access to remote areas through the combination of large-scale routes and smaller, sometimes illegal, feeder roads. This infrastructure also increases the financial viability of extractive industry investment in these remote forest areas. In fact, evidence shows that infrastructure is, directly and indirectly, the primary driver of tropical deforestation today.[ii]

Approaches for Reducing EII Impacts

Approaches for addressing the direct and indirect impacts of EII on forests and forest communities share several similarities across the regions studied. The most successful strategies recognize the following:

- The importance of grassroots capacity in strategies that combine resistance and negotiation as an effective mode of regulation, either in blocking projects or, more often, in renegotiating their design
- The importance of non-sectoral government agencies in gaining traction over large-scale investment, especially anti-corruption agencies, public ministries, and the offices of public prosecutors and human rights defenders
- The significance of legal action and litigation as a component of strategies to defend forests and forest users. As a result of litigation, Supreme and Constitutional courts have taken decisions that protect forest and native land cover, defend rights to consultation, and suspend national policies seeking to promote EII without adequate planning or consultation. Legal action has also involved collaboration between parliamentarians and civil society in drafting legislative proposals.
- The important role played by the development of spatially explicit analyses of investments and their effects, with innovative use of Geographic Information Systems and cartography. Though resources invested and the number of organizations involved in such efforts is limited, their visibility and effects are outsized, and there is growing traction to the idea that data on all natural resource based activities should be consolidated into single, publicly accessible data bases.
- The importance of understanding the regulation of extractives, infrastructure, oil palm, protected areas, and territories as a whole, and not issue by issue, or sector by sector. The same, or at least overlapping, interests participate across these sectors, and owners lobby for similar rule changes regarding land and forest governance, often without input from Indigenous territories and communities.

EII and its land cover impacts

To date, the direct land cover impacts of extractive industry have been limited. As one example, the Indonesian regions Sumatra, Kalimantan, Sulawesi, Moluccas, and Papua lost approximately 14.7 million hectares (Mha) of forests between 2000 and 2010. While 43 percent of this forest loss occurred in forestry, logging, fiber, oil palm and other non-mining related natural resource concessions, only 2 percent occurred in mining concessions.[iii] Analyses of Mexico and Central America and the Amazon suggest a similar pattern, though there is evidence of more extensive impacts of extractive industry on forest degradation beyond the sites of mines and oil and gas wells. But there are four caveats to this general observation.

First, digging deeper into the Indonesian data reveals that the percentage of concession area undergoing forest loss within coal mining concessions is comparable with the percentage of forest lost within concessions for oil palm, wood fiber, and tree plantations. The rates of forest loss within concessions are also far higher when different types of concession overlap. These results suggest that the rapid increase in coal mining concessions in Indonesia should be a cause for concern because when these overlap with other concessions, a probable effect will be to accelerate forest loss.[iv]

Second, localized land cover and biodiversity impacts of mining in particular types of environments can be substantial. In the case of large-scale mining, the iron-coking coal complex in Brazil stands out as a clear example, as does coal mining in forest environments in Kalimantan, Indonesia. The local impacts of artisanal and small-scale gold mining (ASGM) on forests are also significant and growing rapidly in many parts of Indonesia and the Amazon.[v] In the areas in which it operates, this mining clears all forest and renders soils sterile post-mining, placing alluvial forest as well as riverine biodiversity at particular risk.

Third, the forest loss effects of extraction are not limited to the concession area. Resource extraction can require the construction of access infrastructure to open mines and ship out resources (this is much more serious for mining than for oil and gas, for which there are also offshore-onshore options). This access infrastructure can expose far larger areas to forest loss due to the in-migration that it facilitates.[vi] In this regard, iron ore and coal are especially significant commodities, as their low unit value and volume requires the building of large railways, roads or waterways to extract and transport minerals for export. This is especially significant for Brazil (iron ore) and Indonesia (coal).

Finally, infrastructure and resource extraction can lead to the degradation of forests in areas that extend well beyond the areas of more localized forest clearance. Recognizing and assessing such degradation is important as recent work has begun to suggest the considerable significance of forest degradation for emissions.[vii] Degradation can result from the effects of small paths and access roads running through forests, increased forest use by communities springing up around roads and sites of extraction, and unplanned and unsustainable timber and fuelwood extraction, including to support mining activities, especially ASGM.

While impacts of extractive industry on forest loss and emissions have been modest to date, future impacts may be more significant:

- In Indonesia, strategic coal deposits are located deep within forest areas, particularly in Kalimantan. The direct and indirect impacts of these concessions on future emissions are threefold. First, the development of these concessions (which sometimes depends on infrastructure investment) would open up these forests to additional pressures from in-migration. Second, developing the deposits requires forest clearance. And third, the extraction and burning of the coal releases more greenhouse gases. The Government of Indonesia's commitment to important increases in thermal electricity generation makes it likely that such coal extraction will expand significantly.

- In the Amazon, there is a clear risk that pressures to extract oil and minerals will lead to further downsizing, degazetting, and/or downgrading of protected areas and Indigenous territories, and this is already occurring in some areas.[viii] Even without degazetting, there will be serious overlaps and conflicts with conservation areas and Indigenous territories. A second concern is that future development of mineral concessions combined with access infrastructure (waterways, rail) in the state of Amazonas, Brazil, might help "pull" development into areas of primary rainforest.
- In Mesoamerica, large-scale mining in Panama threatens substantial increase in emissions from forest loss, while the combined effect of hydrocarbon development and infrastructure places increased pressure on the community managed forest concessions of the Petén in Guatemala.

Rights impacts of EII

The granting of extractive industry and infrastructure concessions overlaps with land and resource rights held by Indigenous and traditional communities across all three regions. The granting of EII concessions does not automatically compromise or violate these tenure rights, but it accentuates risks to those rights. Concessions can also introduce powerful actors who have frequently used a combination of payments, incentives and intimidation to encourage forest residents and users to transfer rights to EII interests.[ix] Legislative efforts to weaken Indigenous territorial land rights (for instance, in Brazil at present) reflect efforts to facilitate rights transfer or displacement from communities to extractive industry. Indigenous and other rural movements across all three regions have expressed concern for territorial rights and tenure security in relation to EII investment.

Increased investment in EII also raises human rights concerns, especially in the context of trends observed in many tropical forest regions: the curtailment of civic space, the reduction of civil liberties, the criminalization and murder of activists, and the persecution of organizations supporting them. Four land and environment defenders are murdered every week globally, and Brazil, Colombia, Peru, Nicaragua, and Guatemala are among the most dangerous countries in this regard.[x]

The implications of ASGM for rights are also complex. While this activity is associated with increased livelihood opportunities, its potential links to organized crime, money laundering, land speculation, and the progressive un-governability by the state of wider forest areas are also significant. Some of these warning signs can be observed in regions such as Madre de Dios (Peru), parts of the Atlantic Coast of Mesoamerica, Serra Pelada (Brazil), Bolívar (Venezuela) and parts of Indonesia.

Recommendations

Addressing the indirect and direct impacts of extractive industry and large-scale infrastructure on forests and forest communities requires engagement with the elite politics linked to these investments and related economic activities, both legal and illicit. It also involves action in

remote geographical locations where the rule of law and civic oversight are weak, increasing the potential for human rights abuses and repression. This suggests that confronting the interests behind resource extraction and infrastructure head-on is not a wise approach. Civil society and some public sector actors, however, have developed strategies that have proven effective (see Box 2 above). These strategies operate at different levels (from local to national and international), have been pursued by organizations in different sectors (community based, NGO, government and even private commercial), and are targeted at different points along the value chain (resource extraction, distribution, financing and consumption). These strategies have often been combined in innovative ways.

In addition to these proven options, there are two areas in which there is need to do more strategic thinking and capacity development:

- **The development of viable economic and energy strategies that can provide alternatives to the ideas about "development" that are used to give legitimacy to large-scale investments.** Alternatives need to show how to combine the protection of forest cover and community rights with the provision of dignified livelihoods and systems of energy generation and distribution that can broaden energy access and increase energy provision. In this sense, proposals for viable large-scale decarbonization of energy systems and livelihood generation are integral to the success of strategies of forest protection.
- **Analysis of the growing diversification of investment in EII and its implications for forests, climate and community rights**. New investment is coming not only from China, India, Southeast Asian countries and elsewhere, but also from national elites and sources of finance capital that are interested in investing in public-private partnerships for infrastructure projects. Civil society, public bodies and the research community need enhanced capabilities to understand and monitor these new financial flows, to guarantee the implementation of social and environmental safeguards, and to hold these sources of investment accountable.

In short, there are good reasons to be concerned about the impacts of EII on deforestation and community rights. In many cases, these reasons have less to do with what has gone before and much more to do with what might be coming in terms of future investment. Researchers who explored these issues in the early 2000s produced reports that have turned out to be prophetic. For whatever reason, a decade ago many pushed the issue of EII and forests to one side, perhaps because they felt the evidence seemed too limited or the issues too sensitive. The question is whether this time around, with more data at hand and clearer evidence on future planned investments, the same will happen again.

1. Introduction

Infrastructure, extractive industry and forests: is there a problem?

This study answers one overarching question: how significant are extractive industry and infrastructure (EII) as drivers of deforestation and rights violations in communities living in and near forests? We explored the current and projected landscape of EII investments in three regions that are of special significance for global forest loss: Amazonia,[xi] Indonesia, and Mesoamerica.[xii]

- Amazonia remains home to Earth's most expansive standing tropical rainforest.
- Indonesia, with extensive forest spread across its archipelago, has the highest rate of deforestation in the world, estimated at an average of 1.3 million hectares of forest loss a year between 2000–2014, of which 39 percent is from primary forest areas (4, 5).
- While Mesoamerica is not characterized by extensive remaining tropical forest (though some of this forest is indeed globally important, for instance the Darién peninsula linking to South America), it is a source of many internationally recognized experiments in community forest management that seek to protect what remains of the region's forest cover.

There are many forms of rural land use that extract rents and natural capital without investing in significant ecosystem restoration or redistribution of surplus – in some sense, these could all be referred to as forms of natural resource extraction. However, in this report we take extractive industry to refer only to the mining of minerals and coal and the withdrawal of oil and natural gas. We consider a range of scales for organizing extraction and infrastructure development – from the artisanal work-gang to the transnational corporation – although regardless of scale, the unit of "production" exists within wider networks of relations that constitute part of the organization of resource extraction in a given territory. The extraction can be legal, illegal, or extra-legal. Infrastructure can range from that which is imagined on a national or multinational scale (as in the interconnection of electricity systems between Mesoamerica and Colombia) to the local motorcycle tracks used by artisanal miners to access gold deposits in the forests of Kalimantan. We also pay special attention to large-scale infrastructure, in particular to access infrastructure and energy infrastructure such as roads, dams, electricity generating power plants, electrical transmission lines, *hidrovías* (modified river courses, or waterways), ports, and pipelines.

We take as a given that deforestation rates have not slowed since 2010 and that the primary proximate drivers of forest loss continue to be the expansion of commercial agriculture and logging (6). This generates a second question about prioritization: should those organizations addressing the climate change, human rights, and biodiversity consequences of forest loss pay attention to extractive industry and infrastructure, or would this simply divert attention from the "more important" task of tackling the dynamics of large-scale agricultural commodity expansion?

There *are* good reasons to be concerned about the impacts of extractive industry and infrastructure on deforestation and community rights. These reasons have less to do with what has gone before and much more to do with what might be coming in terms of future investment. A Chatham House survey of mining and forests concludes not only that "While agriculture is the major driver of deforestation, mining and infrastructure are next on the list," but also that "A static picture alone could miss important trends – it's not just mining today but mining tomorrow…" (7). These investment trends will drive further increases in greenhouse gas emissions and most probably undermine the prior efforts of organizations that have sought to reduce forest loss and rights abuses through legal advocacy, institutional change and grassroots capacity building. As a recent PRISMA report for Mesoamerica suggests, this risk is real (8).

Purpose and methodology

In 2017, the Climate and Land Use Alliance (CLUA) commissioned Clark University to conduct a study exploring the significance of extractive industry and infrastructure as drivers of deforestation and rights violations in forest communities globally and in three regions: Amazonia (the Brazilian and Western Amazon), Mesoamerica (Mexico and Central America), and Indonesia. Clark University implemented the study in collaboration with the organizations PRISMA (El Salvador), CASA (Brazil) and Samdhana Institute (Indonesia). This document presents the global report and a synthesis of the regional reports, which are provided separately.

Our research methodology included a review of academic, policy, and journalistic literature; selected interviews with key informants in each region; analysis of policy reforms since 2010; information on committed and projected financial flows to extractives and infrastructure; and geospatial data and geographic information system (GIS) analysis of forest loss and natural resource concessions. Preliminary results were discussed in six regional workshops and one international workshop.

Structure of report

Following this introduction, in Section 2 of the report, we discuss key dimensions of current and potential geographies of extractive industry and infrastructure in the three regions. In Section 3, we discuss the drivers of investment in extractive industry and infrastructure. We note that these drivers show remarkable convergence across the three regions and also that there is some reason to think that at least some of these drivers may be intensifying. In Section 4, we assess the impacts that extractive industry and infrastructure have had (and are likely to have) on forest cover, forest governance, and the rights and livelihoods of community members living in, near, or from these forests. We also discuss potential future trends in these effects and draw attention to signals suggesting the risk that future impacts may be greater than past impacts. Section 5 discusses the regulators (policies, laws, institutions) that seek to limit potential adverse environmental, social and economic consequence of EII investments. Key challenges in addressing the EII-forest relationship are discussed in Section 6. The final section 7 presents

our conclusions. Further detail on each of the regions can be found in accompanying reports on Amazonia, Central America, Indonesia and Mexico.

2. Landscapes of EII: current and projected

Amazonian Landscapes of EII: current and projected

The association among extractive industry, infrastructure, and forest loss and degradation in the Amazon is well established. “Historically 80 percent of deforestation in the Brazilian Legal Amazon has taken place within 20 km of a road,” according to Barros (9), while Laurance argues that “In the Amazon, 95 percent of all forest destruction occurs within five kilometers of a road” (10, 11). Forest loss and degradation in Eastern and Northeastern Ecuador has been at least as associated with oil extraction and associated roads as with colonization from the highlands (much of which followed roads related to the oil frontier).

Looking forward, the deforestation anticipated by Killeen (12) which is likely to result from the basket of projects grouped under the Initiative for the Integration of the Regional Infrastructure of South America (IIRSA) – now the South American Council of Infrastructure and Planning (COSIPLAN) – is likely to be accompanied by a further “Andean” arc of deforestation running along the Western Amazon. This second arc is stitched together by the expansion of mining, hydrocarbons, and hydroelectric and road infrastructure planned and/or already under construction in Peru, Bolivia, Ecuador and Colombia – investments which will threaten what Song et al. (13) characterize as among “the most bio-diverse, most carbon-rich, yet mostly unprotected rainforests in Northern Bolivia and Southern Peru.”

In 20127, the Amazonian Network of Geo-Referenced Socio-Environmental Information (RAISG) identified 327 oil or gas blocks up for bidding or being explored (covering some 1.08 million square kilometers), with mining concessions covering a further 1.6 million square kilometers – approximately 21 percent of the total Amazon Basin area (14). Fearnside (15–18) has produced a series of papers in recent years documenting the extent of hydroelectric power (HEP)-related dam building across the Amazon basin, with 246 dams currently planned or under construction (in comparison with the 191 currently existing), many of which exist in synergistic relationship with expansion of the mining industry in the Basin. While Brazil’s 2018 announcement of a moratorium on new HEP construction suggests that these figures may now be overstated, it is too early to assess how firm this new commitment will be.

In addition, the Lava Jato scandal[xiii] in which civil engineering company Odebrecht was deeply implicated will affect future infrastructure investment in the Pan-Amazon, though it is not yet clear how. While many of the region’s largest civil engineering companies will be severely weakened, Chinese and other investors seem interested in acquiring some of these companies and supporting the development of associated infrastructure – particularly in infrastructure supporting the expansion of soybean production and energy infrastructure and links to expanding EI activity.

These EII investments and the property rights in the subsoil granted to extractive industry companies show substantial overlaps with protected areas and Indigenous territories. RAISG's maps reveal that nearly all protected areas and Indigenous territories across the Amazon Basin are threatened by some form of hydro-power/waterway development, mining, oil and gas, and road investments. Governments of the region seem inclined to indulge such overlaps by rolling back social and environmental safeguards that had been won in prior decades. Proposed legislative or normative changes will, for instance, facilitate extractive industry operation in Indigenous territories in Brazil, allow hydrocarbon exploration in protected areas in Bolivia, and in Ecuador and Peru allow extraction in areas of Indigenous Peoples living in voluntary isolation (as in Camisea and Yasuní). In Brazil, several legislative proposals currently seek to use paragraph 6 of Article 231 of the Federal Constitution of 1988, which deals with "the Union's relevant interest", to establish limits on the ethnic and territorial rights of Indigenous Peoples, as well as other traditional communities in the Amazon and elsewhere. While weakening safeguards in order to promote investment, the government of Brazil has encouraged new Private-Public Partnerships or Associations to enhance their role in financing projects.

While the spatial extent of mining and hydrocarbon concessions overstates the actual footprint and environmental impact of extractive industry, the impacts that mining and hydrocarbons have on forests are more extensive than the specific mine or well site because of associated infrastructure development (19). The geography of concessions may, however, be a more accurate indicator of the extent of social disruption and conflict caused by the anticipation of resource extraction and large-scale infrastructure. Coupled with recent policy reforms, political transitions (Brazil, Peru), the rise of extractive industry investment in Venezuela, and the possible investment dividends from the Colombian peace process, data and projections suggest that threats to forest cover are real.

Indonesian Landscapes of EII: current and projected

While no longer the official policy of the current Government of Indonesia, the *Masterplan: Acceleration and Expansion of Indonesia Economic Development, 2011-2025* (20), or MP3EI, of the preceding Yudhoyono (SBY) government remains an important indicator of potential future geographies of EII investment. Much in the same vein as IIRSA/COSIPLAN for South America, which identifies nine "axes" for integrated infrastructure and natural resource investment, the MP3EI identified six "economic corridors" around which growth and investment strategies would be focused. The plan also committed to focus budget allocations on infrastructure and made enhanced domestic connectivity a priority. Strategies in the six corridors would hinge around natural resources and infrastructure, with the primary components noted below:

1. Sumatra: Palm oil, rubber, coal, steel, Sunda Strait Bridge (JSS)
2. Java: Food and beverage, textile, machinery, transport, shipbuilding defense, telecommunications and informatics Greater Jakarta metropolitan
3. Kalimantan: Palm oil, coal, alumina/bauxite, oil and gas, timber, steel
4. Sulawesi: Food crop, cacao, fisheries, nickel, oil and gas
5. Bali Nusatenggara: Tourism, animal husbandry, fisheries
6. Papua-Maluku Islands: Food estate, copper, animal husbandry, fisheries, oil and gas and nickel.

These six corridors suggest an agro-industrial, extractive industry, and infrastructure plan for national development (with the exception of Java, where the plan hinged around industry). In the Kalimantan, Sumatra, and Papua-Maluku Islands corridors (i.e., those with the most significant remaining forest cover), the only non-primary industry, non-infrastructure sector anticipated for accelerated investment was the steel industry– and this would be fed by coking coal from Sumatra and Kalimantan.

Stakeholder input into the MP3EI masterplan came primarily from business interests, as acknowledged in the planning document itself (20). The plan remains a valuable indicator of likely futures because it captures the desires of business interests. That said, the current administration of President Joko Widodo ('Jokowi') has scrapped some elements of the strategy, including the bridge between Java and Sumatra. A major railway for coal transportation in Kalimantan is delayed, though some observers believe it will still be built, possibly with Russian investment (21, 22). Jokowi's Economic Stimulus Package I – XIII places special focus on connectivity, pushing for 24 new seaports, 15 new airports, and 65 dams, as well as large-scale road projects on the larger islands. Most of the current ports in the country cannot host shipping containers, so new port construction will likely have a broad footprint and expand related infrastructure as well (23). In short, infrastructure investment is at the core of Indonesia's national aspiration – infrastructure oriented in large measure to facilitating the movement (internally and for export) of natural resources.

Under the Jokowi government, MP3EI's corridor-based approach has been replaced by an area-based approach to development, with investments focusing on special economic areas (*Kawasan Ekonomi Khusus/KEK*) and strategic development areas (*Wilayah Pembangunan Strategis/WPS*). Reflecting the centrality of infrastructure to these approaches, Jokowi has also created a Committee for the Acceleration of Provision of Infrastructure Priorities (*Komite Percepatan Penyediaan Infrastruktur Prioritas/KPPIP*), chaired by the Minister of Economy. To a considerable extent, Jokowi's policy operationalizes the principles of MP3EI, with infrastructure, public-private investments, and natural resources still central. To meet energy demands (many of them implied by MP3EI), Jokowi's government announced in 2014 a plan to add 35 gigawatts (GW) of new electricity generating capacity to the national grid by 2019. Sixty percent of this capacity, or 20 GW, would be produced by new coal plants. In addition, the Indonesian electricity utility PLN has plans to add at least another 15 GW of new coal-fired electricity generation between 2019 and 2025. As a result, the domestic demand for coal is rising and is expected to continue to rise over the next 20 years, overtaking export volumes by 2019. Beyond energy demand and broadened access, this energy plan would also provide both public subsidies and access to new domestic markets to national coal producers, some of whom have high and uncompetitive operating costs and will progressively lose export markets in a post-Paris Agreement world.

The total amount of forest land currently affected by coal mining in production is 1.74 million hectares, with over 1.1 million hectares of what Indonesia classifies as "conservation" and "protection" forest currently located in coal mining concessions and 70 percent of East Kalimantan's total land area allocated for mining, mostly coal.[xiv] Around 8.6 million hectares of forest is threatened by future coal mining permits—about 9 percent of Indonesia's remaining

total forest cover (24). Future expansion will be mostly in East Kalimantan and South Sumatra, reflecting the geography of known coal reserves.

While coal mining is supported by government commitments to expand the domestic market, how quickly this can happen is unclear, because of the vast investments required from both the private and public sector. In addition, while global coal prices have increased in recent years, the scope for export-led expansion is constrained. In this context, mines with the highest operating costs may be vulnerable – making them potential targets of advocacy interventions that may increase their costs further. Indonesia's value-added mining policy (the 2009 Mining Law, which placed an export ban on all low-grade mineral ore), together with a new regulation requiring 51 percent divestment of foreign ownership after 10 years, creates further challenges for the mining sector. Indeed, mineral exploration has come to a halt (25), although artisanal and small-scale gold mining (ASGM) continues to be important and has indeed spread across the archipelago. The situation in the coal sector is somewhat different, as the foreign companies that pioneered development of the Indonesian coal industry have now largely been replaced by domestic competitors. The summary implication is that while natural resources are central to both the current and prior government's policy commitments, there are also obstacles to a rapid increase in extraction.

Mesoamerican Landscapes of EII: current and projected

Mesoamerica hosts much less expansive areas of intact forest than do Indonesia and the Amazon, though there are significant blocks of intact forest in, for instance, the Petén (Guatemala), south and southeastern Mexico, Moskitia (Honduras and Nicaragua), and Darién Peninsula (Panama).

Like the other two regions, Mesoamerica has pursued visions of regional infrastructural integration between and within countries, coupled with an economic model dependent on natural resource extraction, some agroindustry (oil palm, sugar), and limited and geographically concentrated industrialization, much of it based on the low value *maquila* model[xv] (though Mexico is far more industrialized). The framework for infrastructural integration in the region was the Plan Puebla-Panama from 2001 to 2008 and is now the Mesoamerican Integration and Development Project (Proyecto Mesoamérica) launched in 2008 and focused on transport (roads and ports) and electrical energy interconnection.

Road expansion facilitates colonist access and correlates directly to forest clearing. For instance, Landsat images from April 1986 and 1990 showed that over 90 percent of new forest clearings in the Petén region of Guatemala were within 3 km of a road or river (26). Roads linked to extractive enterprise have had similar effects: in Guatemala's Laguna del Tigre National Park (27), forest clearing rates were low from 1986 to 1993 but increased significantly from 1995-97, after the construction of a road entering the park from the south to access the Xan Perenco oil field inside the park. The Sierra del Lacandón National Park also experienced a large reduction of its intact forest landscapes. The Petén, while still moderately intact in its inner areas, is threatened by dense road networks and hydrocarbon concessions on the Mexican side

of the border (28). In general, remaining forest areas are threatened by the current round of integration, with governments and national elites apparently pursuing new agricultural frontiers for oil palm and other products, and narco-elites viewing forests both as areas for drug production and vehicles (through forest clearing) for the laundering of narco-profits.

National policies for extractive industry vary across the region. Most countries reformed their natural resources policies in the 1990s to encourage investment in EII, and reforms like Mexico's 1992 Mining Law led to a strong increase in the number of concessioned areas and mineral production. As of 2013, 29 Mha, or 15 percent of the country was under mineral concessions (29), and 22.5 percent of mining concessions in Mexico overlap with forested lands (30). Mineral mining brought in $15.7 billion in 2016 and is on pace to grow more than 3 percent annually (31). Guatemala has a de facto moratorium on new mining concessions, and El Salvador passed legislation in 2017 banning all mining (though regulations for the law are still pending, and the law also gives a two-year transition window for ASGM miners). Conversely, Honduras has passed legislation highly favorable to the mining sector, and Panama has promoted copper mining, often in forested areas. The United States Geological Survey projects that mining's contribution to Panama's GDP will have increased from 1 percent in 2013 to about 10 percent in 2018 (32). Some of these projects are very large: the Cobre Panama project will have impacts all the way to the global level (33), including an 8 percent increase in national greenhouse gas emissions and the clearing of 5,500 hectares of tropical forest.

In Mexico, a series of reforms (especially energy sector and hydrocarbons reforms since 2013) have created a favorable environment for private sector investment in oil and gas. Aspects of these reforms (e.g., articles of the hydrocarbons law covering easements and temporary occupation, the law's declaration that fossil fuel resources are matters of "social interest and public order") also appear to reduce protections of Indigenous and collectively owned lands and of rights to organize and protest. As in Indonesia, Mexican energy reforms are predicated on the need to increase energy production to meet growing demand. As the only federal state within this region, Mexico has subnational jurisdictions with varying levels of favorability for extractive industry – with states such as Guerrero being especially favorable (and equally tolerant of serious community rights abuses) and others such as Oaxaca and Chiapas more constrained because of, among other things, the relative strength of Indigenous, Zapatista, and Zapatista-like organizations. That said, among southern and eastern states, Chiapas, Sierra Norte de Puebla, and Oaxaca have high rates of overlap of mining concessions with designated areas for water resource protection, and in Oaxaca and Guerrero, mining concessions overlap heavily with forests.

The geography of future mining expansion might be expected to follow elements of the current distribution of exploration and reconnaissance concessions. Across all countries in the region, mining concessions are concentrated in highland areas – typically with less dense forest cover, a higher proportion of pine or grassland-forest complexes, and a higher proportion of small-scale farming and Indigenous communities. Mining concessions are less likely to be found in humid forest areas (though there are clear exceptions in Panama and Mexico). Conversely, hydrocarbon concessions have somewhat more presence in humid forests, and more so along coastal fringes.

Loan-based financial flows in the region are more oriented towards infrastructure than extractive industry – and in particular infrastructure linked to energy and energy integration, port expansion, and road building.[xvi] These roads are generally part of urban infrastructure and not inter-regional roads, with some exceptions like the road planned along the Pacific coast of El Salvador. Though beyond the scope of this report, a growing area of investment (in Mexico especially) appears to be renewable energy which, because of its space needs, will generate growing community-level conflicts (34).

Global Landscapes of EII: current and projected

Patterns of extractive industry and infrastructure investment across these three regions reflect broader global processes. At its 2014 meetings, the G20 made significant commitments to mobilizing global infrastructure investment (35, 36), while initiatives such as the Asian Infrastructure Investment Bank and China's Belt and Road Initiative reflect China-led commitments to increased investment in the sector to connect countries with Chinese markets and finance. Indian and Chinese demand for coal also has the potential to drive expansion of the coal frontier in Indonesia. Meanwhile, maps of planned infrastructure development in Sub-Saharan Africa look strikingly similar to the maps of COSIPLAN for South America, showing that the combination of infrastructure and extractives drives threats to Central African forests and forest communities that resemble those in the Amazon (37–39). Laurance et al. (40) also demonstrate quite similar patterns, This growth of investment is facilitated by increasing use of public-private investment (PPI) initiatives as well as by resources from the new investment banks, meaning that the range of financing agencies associated with investment is widening considerably. Dynamics in South-East Asian forest areas also show growing investment in infrastructure and resource extraction, and resulting threats to both forest cover and community rights (41–43). The expansion and impact of combined investment in infrastructure, commodities, and resource extraction thus stretches well beyond the three regions studied here. This suggests that the threats and drivers encountered in Mexico and Central America, the Amazon, and Indonesia reflect not only regional development commitments but also global accords and processes.

3. Drivers of EII expansion in forested areas

The expansion of investment in EII affecting forested areas is driven by a combination of economic and political incentives, a range of public sector subsidies, economic and political visions of the future ("development models"), pacts or "settlements" among elites, and planning practices that encourage or allow such expansion. Taken as a bundle of factors these would be referred to as political economy and state capacity factors (Kaimowitz, forthcoming), but it is helpful to unpack them in order to identify potential points of leverage as well as to recognize that the mix of factors varies according to the type of infrastructure and extraction.

Visions of development, incentives, and political settlements

It is too trite to characterize whole governments or national elites as having a particular vision of development, not least because visions in countries as large and complex as Brazil, Indonesia, or Mexico are too varied to boil down to simple characterizations. Aspirations underlying these visions involve a combination of urbanization and urban upgrading, industrialization, graduation into becoming a stable global power, and natural resource development and extraction (including as a way to finance elements of the broader vision; for one example of such a vision see the masterplan for economic development in Indonesia (20). These have also been visions that combine a willingness to accept or indulge elite capture of surplus together with commitments to poverty reduction, "managed" democracy, and occasional bouts of resource nationalism. Within this diversity, it is at least clear across Amazonia, Indonesia, and Mesoamerica that expanded investment in natural resource extraction and mega-infrastructure projects is part of the development model and has become visibly more so in the last fifteen years (10, 12, 20, 45, 46).

More helpful than to caricature visions is to view development commitments as reflecting a balance among the expectations of different elite groups, the level of pressure exerted by civil society, and the relative legitimacy of different ideas in society about what development should look like (47). Within these so-called "political settlements," elites have an incentive to find an agreement with other elites over how opportunities to capture value and political power should be distributed. The more that prices, domestic institutions, and national debates converge to allow for and legitimize super-profits from natural resource extraction, the more likely it is that elites will settle on models that include an important and expanding role for extractivism in the form of mining, hydrocarbons, and forest clearance. How far they are able to promote such models depends, however, on the extent to which civil society actors (including religious and media actors) with alternative views are also powerful enough to be party to the political settlement, or at least to exercise significant legitimate pressure on that settlement.

The implication is that an important driver of forest loss due to extraction and infrastructure is the nature of the overall national political settlement and relationships of power, and that therefore to address this source of emissions requires addressing the terms of the settlement: in particular, the weight of societal ideas about legitimate uses of nature, the incentives to extracting nature, and the political and economic incentives to pursuing forms of accumulation that do not require such extraction. This makes the elaboration of credible alternatives – alternative ideas and alternative economic opportunities on national and subnational scales – critical to any intervention.[xvii]

Across Amazonia, Indonesia, Mexico and Central America, these underlying settlements seem relatively stable. The crisis in Brazil seems only to have allowed a deepening commitment to development based upon resource extraction, and the transition to the Jokowi administration in Indonesia did not change the fundamental commitment to large-scale resource extraction from the country's forested areas. In Mexico, the government is actively pursuing a natural resource extraction model, albeit much later than other countries. Perhaps only in Central America, where, among other things vulnerability to climate change is more acute and tangible, is there

greater instability in the settlement around core ideas about natural resources and development. This instability is reflected, for instance, in the declaration of mining moratoria in several countries over the last decade and in particular the recent national legislation banning mining in El Salvador.

Plans and planning systems

Development visions are ultimately expressed in national plans and planning systems. This is clear in all three regions. In Indonesia, the MP3EI and its successor frameworks under the Jokowi government express a clear commitment to growth based on large-scale infrastructure investment to facilitate, above all, extractive industry, energy provision, and inter-urban connection. Plans for inter-regional energy connectivity from Mexico to Colombia serve as a backbone around which specific investments in energy generation hang (e.g., hydroelectric power expansion in Honduras, high-tension lines through or around the Darién peninsula in Panama). In the Brazilian Amazon, the 2012 Integrated Logistics Plan (PIL) focused on encouraging private investment, emphasizing highway concessions, railroads, ports, and airports, with the goal of speeding-up the integration of transport infrastructure in order to increase the competitiveness of the Brazilian economy, increasing the efficiency in the flow of agricultural commodities, and reducing industry's logistical costs and increasing exports. Since 2016, though not a formal plan, the package of expressed commitments in the Temer government have reflected a clear plan for large-scale investment in infrastructure to enable expanded commercial agriculture and mining. These visions (and indeed those of the previous Rousseff government) sit within the continent-wide COSIPLAN.

These plans include both spatial visions and the identification of public sector policy reforms to help meet these spatial visions. The Temer government's plans to "flexibilize" rules to facilitate mining investment in Indigenous lands provide one example. Also in Brazil, a draft bill (Senate Bill [PLS] 654/2015) seeks a special environmental licensing procedure for projects considered to be of strategic and national interest. This would allow a single environmental license to be granted in around eight months, without public hearings. Reform to mining laws in Honduras in the early 2010s are another example, and a particularly significant example is the Mexican 2014 hydrocarbon legislation allowing private sector investment in the sector for the first time in nearly a century (49, 50).

Planning system characteristics also matter and can make particular plans more or less likely to impact forests. Systems in which plans in ministries of energy and mines do not 'talk' to existing plans for forest management (or even worse, seek to overturn prior plans) aggravate pressures on forests. In Indonesia, for example, coal mining, oil palm, forest, timber, and other concessions frequently overlap, and rates of deforestation are systematically higher in areas of such overlap (51). In Brazil, 39 percent of mining petitions lodged at the National Department of Mineral Production were allocated, totally or partially, inside Indigenous territories and Conservation Units (CUs) in the Amazon (52). In Mexico, planned hydrocarbon expansion from 2015-19 could overlap with 3.5 Mha of collectively owned land, and mining concessions already overlap with 50 percent of such land, as well as 2.7 Mha of protected conservation areas (53).

In Peru, small-scale mining and forest concessions overlap, and ASGM miners pay farmers off in order to completely (rather than selectively) fell forest (54). Planning systems that are not "joined up" (as in all these cases) deepen the pressure that particular development visions place on forests. Initiatives such as OneMap in Indonesia reflect an effort by parts of the state to do such joining up, as do civil society mapping initiatives by groups such as RAISG in the Amazon (https://raisg.socioambiental.org/), CartoCrítica in Mexico (http://www.cartocritica.org.mx/) and Auriga in Indonesia (http://auriga.or.id/en/).

Finally, efforts to weaken the power of Indigenous/collective tenure in favor of resource extraction and other land users – a recurring element of reform efforts, especially in the Americas – threaten forests insofar as such territories repeatedly show lower rates of forest loss. As one example, Crisostomo et al. (55) show that the loss of forest within Indigenous territories was less than 2 percent from 2000 to 2014, while the average deforested area in the Amazon was 19 percent. The community forest concessions in northern Guatemala reflect similar patterns (56).

Fiscal drivers

Anticipated government revenue from resource extraction and the growth effects of infrastructural investment is undoubtedly a driver of policies that facilitate such investments, and perhaps more importantly a driver of the legitimation of those policies. A senior Natural Resource Governance Institute (NRGI) official commented in an interview that efforts to reduce hydrocarbon investment in the Amazon will not succeed if they do not explain how alternatives will generate as much tax revenue as oil and gas (the demise of the initiative for keeping oil under the ground in the Yasuní protected area in Ecuador is a case in point). However, it is also the case that a number of EII sectors receive substantial fiscal benefits, offsetting their net contribution to the public budget. In Indonesia, for instance, the bulk of coal extraction is conducted by companies that enjoy Coal Contracts of Work, protecting them from changes in taxation, royalties, or other conditions of production. Furthermore, the planned move to increase coal-based electricity generation involves a range of subsidies to coal producers – indeed, a number of these producers operating with high costs continue largely because of subsidies.[xviii] Often, tax rates are modest. In Mexico, royalties on mining amounted to just 0.7 percent of the value of production in 2013, and following a tax reform in 2013, mining companies pay 7.5 percent tax on profit and a 0.5 percent royalty on sales; in 2014, the new hydrocarbons law created favorable tax conditions for private companies entering the previously state controlled sector.

Fiscal considerations also affect the two sectors through concerns for government fiscal capacity. Thus, as Brazil continues to experience recession and reduced government budget, there is likely to be more use of public-private investment (PPI) partnerships as a mode of financing infrastructure. For instance, the Investment Partnership Program, involving the Ministries of Transport, Mines and Energy, and Cities and two state banks (BNDES and Caixa), was provisionally launched by the federal government in May 2016 and converted into Law No. 13,334 in September 2016. To attract private investment, the law aims to streamline processes

for granting concessions, public-private partnerships, and privatizations, in addition to providing a "conducive environment for infrastructure expansion." The program has at its core the "flexibilization" of current rules for the licensing of enterprises and for the installation of enterprises and the exploitation of natural resources (land for cultivation, forest resources, water courses, minerals, etc.) in Indigenous lands and some types of conservation area. In Mexico, the 2014 hydrocarbon law promoting private investment is also grounded in arguments regarding the state's need to supplement its investment in the sector. More generally, arguments about constraints on public sector fiscal capacity can be expected to be used for further encouragement of private and public-private investment, especially for large-scale infrastructure projects.[xix] The MP3EI in Indonesia, for instance, noted that the bulk of investment in planned projects would come from PPI or the private sector alone, and the Jokowi government has continued this commitment to PPI financing of infrastructure and other sectors in strategic development areas.

Finally, moves to cut public budgets as part of government efforts to reduce fiscal deficits weaken investment in forest protection. This concern is perhaps most acute in Brazil downstream of the Odebrecht and Petrobras scandals,[xx] in a context where such spending was already being reduced (57). Spending for FUNAI (the National Indian Foundation, responsible for protecting Indigenous Peoples and lands) has been declining, and a comparison of federal budgets for the periods 2007-10 and 2011-2014 shows a roughly 72 percent decrease in spending on actions to prevent and combat deforestation in the Amazon (58, 59). This likely helps explain the uptick in deforestation rates and forest fires in 2015 and 2016, with the National Institute of Space Research (INPE) reporting for 2015-16 a year-on-year 29 percent increase in area deforested, the second consecutive annual increase (though rates remain well below historical rates) (60).

Corruption and extra-legal action

While corruption is a culturally loaded term that can be deployed to criticize survival strategies and modes of exchange of which the observer disapproves, here we use it to refer to the exchange of payment in return for some sort of public subsidy that by law either should not be given at all, or should be given through a process that by law ought to be subject to public oversight and open to multiple players. Understood this way, corruption is an accelerator of EII expansion and also at times a direct driver. Payments are used to secure concessions, environmental approvals, exoneration from environmental review, tax exoneration, police and military security services, and other favors that all constitute reductions in what should otherwise be the real costs of projects within the procedures defined by law.

It could be argued that corruption is an *impact* of the EII economy, induced (and made fundable) by the existence of potentially large rents relative to capital invested. However, to the extent that corruption facilitates the final roll out and then the continued viability of EII investments, we treat it as a driver. Indeed, corruption emerges as a driver across all geographies and scales. Scandals and criminal cases surrounding Odebrecht throughout Latin America make clear the role of corruption in facilitating large-scale road, dam and other infrastructure projects as well as

in diverting (i.e., stealing) very large sums of public monies that could otherwise have been invested in social and environmental programs (61).[xxi] At the other extreme, when district heads approved mining concessions in their districts in return for payments to them or their political campaigns, this reflects subnational workings of corruption that has facilitated the expansion of mining in forested areas of Indonesia. The use of side payments by ASGM miners to local officials is another example.

Violence, like corruption, could be viewed as much as an effect of EII as a driver, but again we treat it as a driver here because its role is ultimately to facilitate investment. Such violence is recurrent across the Amazon, Indonesia, and Mesoamerica, and is used as a strategy to remove people from land, force land sales, and persecute and kill critics of EII investments (62, 63). Mexico is perhaps the most severe case in which violence is used in the service of facilitating EII access to forested lands (64, 65). Drug cartels are often involved in these processes (66).

Drivers of small-scale mining and infrastructure

Artisanal and small-scale mining is an important driver of forest loss and degradation in Indonesia and the Amazon. It is somewhat less significant in Mesoamerica, though is of rapidly growing significance in Nicaragua. This mining is primarily of gold, with estimates that ASGM produces up to 40 percent of Indonesia's gold; similar figures circulate for Peru. However, small-scale and illegal mining also accounts for a significant part of Indonesia's coal exports.

ASGM prospers because of price incentives, the ability to avoid paying taxes and royalties, and underemployment and low wages in the urban economy and small-scale agriculture. In this sense, ASGM is analytically similar to the labor-intensive production of narcotics which also affects forested areas (62, 63). Like narcotics production, ASGM is sometimes favored by support from both illicit and formal sector sources. In Indonesia, interviewees note that mercury for use in ASGM is flown from the Moluccas, and there are accounts of security forces involvement in gold marketing and the protection of mines. Corruption of local officials is reported at a district level in Indonesia, and ethnographically by Delmotte (54) in Madre de Dios, Peru. Finally, like narcotics, ASGM is a substantial part of subnational and even national economies.

Ultimately, the drivers of ASGM are economic (price, profit, and livelihood), while the sustainers of ASGM are ones of governance (corruption, criminality). These sustainers are the principal risks related to ASGM because the expansion of such mining can help render large tracts of forest increasingly difficult and dangerous to govern.

Small-scale mining and infrastructure investment in forest areas have also been encouraged by the decentralization of government authorities. This has been most clearly the case in Indonesia, where the delegation of mining approvals to the district (*kabupaten*) level is directly associated with a rapid rise in granting of coal and other mining concessions (in return, it is presumed, for paybacks either as corruption or contributions to political campaigns). In Madre

de Dios, Peru, the control of local government by interests from the ASGM sector further protects miners from regulation.

ASGM is linked to the expansion of small-scale roads cutting into forests – where local authorities play a role either by facilitating construction or by ignoring illegal local road building. Such small-scale roads pass under the radar of most advocacy organizations and research centers, yet they emerge as a particularly important infrastructural driver of forest loss in some regions, as the roads built for ASGM create opportunities for others to enter forest areas also in search of land or timber (11). The expansion of local road networks into new frontiers can also be driven by local dynamism in the agrarian economy. This pattern is evident in Central America and is arguably a more important driver of forest loss than are large roads. The Central American case points to instances where a growing small- and medium-scale dairy economy (enabled by electrification projects) encourages road building which in turn facilitates further expansion of the agro-livestock frontier into forest margins, such as in the North Caribbean Autonomous Region of Nicaragua.

Reflecting the extra-formal nature of the activity, data relating to ASGM and its drivers, as well as to the conditions under which it might be brought into formal and accountable modes of forest governance, is often scarce. That said, this lack of data is less serious than it was just five years ago, reflecting innovative use of remote sensing to monitor the forest impacts of ASGM (67–69) and the conduct of ethnographic field research and journalism among miners, especially in the Amazon (54, 70, 71), though also in Indonesia (72).

Infrastructure and extractives as drivers of each other

In addition to these specific drivers of expanded investment in infrastructure and extractive industry, it is also the case that these two phenomena drive each other with consequent implications for forest loss and related emissions. This pattern is recurrent across the regions. In Madre de Dios, Peru, an Amazonian center of ASGM gold expansion which has had severe implications for forest cover (67, 68), census figures show that 42 percent of the population moved in along newly improved roads from highland Cusco, mostly to work in mining in forest areas (54). As an example of where the causal arrow points in the other direction, as ASGM in parts of central Kalimantan, Indonesia has expanded, the increasing use by miners of motorcycle tracks led to their widening and ultimate asphalting, which in turn encouraged the rise of medium-scale mining, further in-migration, and complete forest loss (73). The regional studies, background literature, and interviews provide other similar examples: iron deposits in Brazil and coal deposits in Indonesia that require railways, roads and/or river widening to allow access; or the synergy between the expansion of coal production and massive investment in thermal power plants and transmission cables in Indonesia. Extractives and infrastructure are, then, often part of a complex and should be considered together rather than separately.

Convergences across global and regional drivers

The convergences among drivers of EII's impacts on forest loss and community rights across Amazonia, Indonesia and Mesoamerica are striking. The following stand out:

- The effect of macro-regional energy integration and national energy access projects
- The effect of regional access infrastructure projects – imagined on a massive and integrated scale
- Stable political settlements in which government and economic elites (who sometimes overlap) share commitments to these projects of integration and resource extraction across different elected regimes
- The systematic weakening of regulations protecting forested lands, Indigenous, and community territories (though perhaps most dramatically in Brazil at present)
- The use of illegality to access forest lands for large- and small-scale EII investment – through corruption or organized violence.

4. Impacts of EII on forests and rights

In this section, we discuss the impacts of investment in infrastructure and extractives on forest cover, land use emissions, livelihoods and rights, overall development performance, and institutions for governing forested areas. While our primary focus is on impacts to date, as this is where there is more data, we also discuss potential future impacts drawing on material in the previous section regarding future drivers of investment in extractives and infrastructure. The distinction is important, because it is quite possible that future impacts will exceed impacts so far.

Impacts to date

Land cover change and degradation impacts

The direct land cover impacts of extractive industry are limited. For instance, Abood et al. (74) calculate that in Indonesia, between 2000 and 2010, Sumatra, Kalimantan, Sulawesi, Moluccas, and Papua lost approximately 14.7 Mha of forests in total. While 42.9 percent of this forest loss occurred in forestry, logging, fiber, oil palm and other non-mining related natural resource concessions, only 2.1 percent of forest loss occurred in mining concessions. A similar pattern is suggested by analyses of the relationships between mining and the geographies of forest loss for the first 15 years of the 21st century in the three regions on which we focus (75). The maps presented in Appendix 1 for a subset of countries or regions (Brazil, Guatemala, Honduras, Panama, Peru, Sumatra, and West Papua) show that:

- There is no evident relationship between the geography of mining concessions and the geographies of forest loss – suggesting at a minimum that mining concessions are no more significant a factor in forest loss than are other drivers.
- The immediate footprint of mining operations on forest loss is, in most instances, limited, and this is the case whether concessions cover a very substantial part of the nation's territory (e.g., Guatemala) or a small proportion of the territory (e.g., Brazil, Honduras). Clear exceptions to this pattern are the substantial deforestation effects of industrial mining in eastern Brazil and Panama.
- The success of protected areas in hindering forest loss varies across countries. Protected areas seem most effective in Brazil (even if in 2013, the Audit Courts of the Union [TCU] and the States [TCE] found that only 4 percent of these had a high degree of implementation), partially effective in Peru, and completely ineffective in Central America where those few cases in which protected area status is correlated with less than average forest loss seem to be because of distance and physical inaccessibility (or active community-based forest management in the case of the Petén), rather than protected area status.

These general conclusions merit four elaborations. First, digging deeper into the Sumatra data[xxii] reveals that:

- If the relationship between natural resource concessions and forest loss is calculated in terms of absolute area of forest loss (in hectares), then forest loss within coal mining concessions is insignificant, and most significant within protected areas and concessions for tree plantations.
- If, however, the relationship between concessions and forest loss is calculated in terms of the percentage of an area under some form of concession that experiences forest loss, then the percentage of concession area undergoing forest loss within coal mining concessions is comparable with the percentage of concession area lost within concessions for oil palm, wood fiber, and tree plantations.
- Rates of forest loss within concessions are far higher when different types of concession overlap. Thus, the percent area of a coal mining concession losing forest from 2000-2014 increases from 22 to 40 percent if the concession overlaps with another type of resource concession.

These results suggest that the rapid increase in coal mining concessions should be a cause for concern because when these overlap with other concessions, a probable effect will be to accelerate forest loss.

Second, localized land cover and biodiversity impacts of mining in particular types of environments can be substantial. The most significant example of this is the effect of ASGM. This type of mining is typically concentrated in areas of alluvial deposits where gold has been borne downstream from montane mineralizations. These deposits occur across many sites in Indonesia, and along most of the eastern flank of the Andes (typically a privileged zone for

protected area initiatives because of the concentration of biodiversity hotspots). Rapid growth in such mining has been evident in Peru (67, 68), Colombia (78), Venezuela (where estimates are that 90 percent of gold mining is illegal and small-medium scale (79)), Brazil (80, 81) and Indonesia (72). In the areas at which it operates, this mining clears all forest and renders soils sterile post-mining, placing alluvial forest as well as riverine biodiversity at particular risk.

Third, the observation regarding the limited effects of protected areas on forest loss in contrast with the significant effects of accessibility and distance, suggests that there is good reason to be concerned about the expansion of infrastructure that increases access to remote areas through the combination of large-scale routes and smaller, sometimes illegal, feeder roads. Thus, for instance, the construction of the Patuca dams in Honduras on the border with areas currently showing low rates of forest loss constitutes a significant threat to forest cover. The broader body of work by Laurance and associates confirms this concern, suggesting that infrastructure is the primary driver of tropical deforestation today (10, 40, 82–84).

Fourth, and related to the third point, the forest loss effects of extraction may not be limited to the concession area. Resource extraction can require the construction of access infrastructure to open mines and withdraw resources (this is much more serious for mining than for oil and gas, for which there also exist offshore-onshore options). This access infrastructure can expose far larger areas to forest loss due to collateral in-migration (19, 85). In this regard, iron ore and coal are especially significant commodities as their low unit value and volume requires the building of large railways and roads (or hidrovías) to extract and transport minerals for export. This is especially significant for Brazil (iron ore) and Indonesia (coal) (51, 86, 87).

Finally, it is important to note that infrastructure and resource extraction can lead to the degradation of forests rather than only their clearance. Recognizing and assessing such degradation is important as recent work has begun to suggest just how significant the emissions consequences of this could be (88). Degradation can result from the effects of small paths and access roads running through forests, increased forest use by communities springing up around roads and sites of extraction, and unplanned/unsustainable timber and fuelwood extraction, including to support mining activities, especially ASGM. Margono et al. (89) document the significance of such degradation for Sumatra and demonstrate techniques for assessing forest degradation, but understanding the link between different types of land uses, degradation, and emissions remains limited.

Emissions impacts

Efforts to calculate the joint impacts of extractive industry and infrastructure on emissions are limited. Abood et al. (74) undertook one of the most serious efforts to begin such analysis for Indonesia. They conclude that from 2000 to 2010, gross carbon emissions from forest loss within all industrial concessions for Kalimantan, Sumatra, Papua, Sulawesi, and Moluccas were 42-45 percent of emissions from total forest loss, with patterns varying regionally. The maximum impact from mining was found in Kalimantan, with 6 percent of emissions from industrial concessions coming from that sector. Oil palm and fiber plantations dominated emissions in Kalimantan and Sumatra, while logging contributed the majority in Papua, Sulawesi, and

Moluccas. However, the authors acknowledge that data constraints around mining in the latter three regions limited their ability to fully incorporate those regions into their analysis. They also did not account for downstream emissions from the burning of coal removed from these forests. A more complete analysis would combine emissions from burning the coal, oil and gas removed from areas that were previously beneath forest – or put the other way around, a calculation of the benefits of protecting forest from hydrocarbon or coal extraction should also include the emissions avoided by not burning these subsoil deposits.[xxiii]

More complex analytical challenges relate to calculating the land cover change-related emissions effects of infrastructure. The bulk of these effects are indirect, expressed through forest loss due to the agricultural expansion facilitated by infrastructure. This presents two analytical tasks: first, to calculate those emissions from agricultural expansion, and then to model the proportion of those emissions that occurred only because infrastructure investment allowed the expansion of the agricultural frontier. The more general lesson is that, as with the case for coal mining and oil and gas drilling, so for infrastructure: namely, the direct impact of the investment on land cover change and forest-loss based emissions is much less significant than its indirect and downstream impacts.

Livelihoods and rights impacts

The implications of infrastructure and resource extraction for livelihoods and rights are also ambiguous. We note impacts in the areas of: land tenure rights; livelihoods, employment and compensation; and human rights and physical safety.

The granting of extractive industry and infrastructure concessions typically overlaps with land and resource rights held by communities, both Indigenous and others. This pattern is widespread across all three regions. The granting of EII concessions does not automatically compromise or violate these tenure rights, but it accentuates risks to those rights. It introduces powerful actors who have frequently used a combination of payments, incentives and intimidation to encourage forest residents and users to transfer rights to EII interests (62, 63, 90). The Munden Project reported that about 30 percent of industrial concessions (including some extractives) overlap with Indigenous Peoples' territories, in many cases in forest areas (91, 92). The maps produced by RAISG demonstrate similar overlaps for Amazonia, while Auriga's (auriga.or.id/) and Fern's maps for Indonesia do likewise. Legislative efforts to weaken Indigenous territorial land rights (for instance, in Brazil at present) reflect efforts to facilitate rights transfer or displacement from communities to extractive industry. Concern for territorial rights and tenure security in relation to EII investment is present in platforms and concerns of Indigenous movements across these three regions (see, for instance, platforms of AMAN in Indonesia, COICA and affiliates in the Amazon, and the Ngöbe in Panama).

ASGM provides for many livelihoods. In Indonesia, the German Society for International Cooperation (GIZ) estimates that 250,000 ASM gold miners operate at approximately 1,000 locations in the country, while the Blacksmith Institute put the figure at 300,000 (93). The GOMIAM project estimates that 20,000 ASM gold miners are working in just the Tapajós River basin of Brazil (70). In Indonesia, rather than resist coal mines, some communities have sought

to have their lands placed within concessions so that they can claim compensation. In other cases, communities, Indigenous and others, have had lands invaded by colonists following roads and by larger scale extraction as well as by ASGM miners. There is no simple story regarding the community-level livelihoods and rights impacts of these processes, except to say that they are unequal and that this inequality can and has sometimes been fanned into overt conflicts that different actors calculate to be in their interest: either to resist investments or to undermine resistance to investment.

The civil society organizations Civicus and Publish What You Pay (PWYP) (94) document numerous instances of the closure of civic space, the reduction of civil liberties, the criminalization and murder of activists, and the persecution of organizations supporting them. Here are just a few examples:

- In Indonesia, "[i]n January 2016, nine armed men raided the offices of JATAM, Indonesia's Mining Advocacy Network…. The network's campaign to prevent children from drowning in former mining pits in [previously forested areas in] East Kalimantan had contributed to 11 mining companies being sanctioned by the provincial government. The attack was suspected to be by local contractors of the mining companies, reacting to the sanctions" (94).
- In Honduras in 2016, three Indigenous leaders of the National Council for Popular and Indigenous Organizations of Honduras (COPINH) were murdered for their involvement in protests related to dams, mining and land acquisition: Berta Caceres, Nelson Garcia and Lesbia Yaneth (95). Indeed, the international NGO Global Witness (62, 63) reports that Honduras, together with Nicaragua, have the world's two highest per capita murder rates of natural resource activists.
- In Brazil in July 2016, the body of Nilce de Souza Magalhães, a vocal opponent of the Jirau dam, was found tied to a rock and washed up on the shore of the Madeira River. A fisherwoman, Nilce had criticized the Jirau dam as it devastated fish stocks in a river the community has fished for generations. She became a leading activist and part of the Movement of People Affected by Dams (MAB) in the state of Rondônia (63). Brazil consistently registers the most killings of environmental defenders worldwide in reports by Global Witness.

While Global Witness named 2015 the "worst year on record for killings of land and environmental defenders", the 200 murders they reported for 2016 surpassed even that. Of the countries in the regions we consider in this report, Brazil, Colombia, Peru, Nicaragua, and Guatemala all made the top of the list of most dangerous countries to be an environmental defender in 2015, while in 2016 Brazil, Colombia, Honduras, Nicaragua and Guatemala were among the nine countries with the most killings. These numbers may not be exhaustive, however, as local observatories in Brazil claim that up to 137 Indigenous Peoples were murdered in 2015.

In addition to violence, governments are closing civic space and criminalizing various forms of protest. Civicus/PWYP (94) note that:

> [a]n 'anti-blockades' law was also passed in Guatemala in 2014, with the stated aim of guaranteeing traffic circulation, but the suspected intention was restricting social protest. There is also a trend towards the inclusion of vaguely defined notions of 'terrorism' in the criminal codes of various countries, including Brazil – an approach civil society suspects will be used as a tool to criminalize activists and demonstrators.

This said, in March 2018, representatives of 24 Latin American countries "adopted the first binding regional agreement to protect the rights of access to information, public participation and access to justice in environmental matters…. which also enshrines the protection of human rights defenders in environmental matters" (96). This offers a vehicle to push back against the widespread killings documented by Global Witness.

Finally, it is important to note that impacts on livelihood and rights are always gendered, though often in ways that are not easy to perceive without in-depth understanding. The impacts of EII investment on labor markets and resource and land tenure are not equal between women and men (or across generations), and the ways in which violence is exercised, and the impacts it has, is also gendered. Many of the environmental defenders who have been killed have been women (reflecting their important leadership roles in much activism around forests and livelihoods), while presumably much of the killing is done by men (though we do not know this). Overall, gendering of the relationships between EII, forests and rights receives little attention from both civil society and public sector bodies, running the risk that interventions and responses are also blind to their own implications for gender relations.

National development performance impacts

While resource extraction and infrastructure have been associated with growth, they have also been implicated in adverse development performance (97–99). Among the countries in the three regions considered in this study, Brazil is the clearest example. During the late 1990s and 2000s, Brazil's growth soared on the back of a commodity boom, but its rapid unravelling since 2016 (in the context of the Odebrecht and Petrobras scandals) has led to substantial cooling of the national economy – the great irony being that the government is attempting to expand natural resource extraction as a means of rebooting the economy. As these schemes have unraveled, Brazil's economy and democracy have been thrown into crisis and recession from which recovery will be slow. Furthermore, the crisis seems to be creating conditions for an acceleration of deforestation through the loosening of land laws and the encouragement of mining and commercial agriculture. In Indonesia, the World Bank estimates that massive forest and peat fires in 2015 cost Indonesia at least $16.1 billion, equivalent to 1.9 percent of 2015 GDP. While these fires are mostly associated with commercial agriculture, to the extent that such agricultural expansion is enabled by infrastructural development (especially roads), then infrastructure is partially implicated in this cost to the economy.

The implication is that while infrastructure and extractive industry have clearly been drivers of macro-economic growth, and, during certain periods, a reduction in national poverty rates, there have also been environmental, institutional, and economic costs that are significant at a national level and whose carryover effects can be long-lasting. That these costs are often not sufficiently integrated into conventional measures of growth means that the case for the positive effects of these industries on growth may be overstated, and the costs underestimated (100, 101). The traditional aggregate accounting of the positive effects of these industries may not account for the spatially and socially uneven distribution of costs and benefits.

Institutional and policy impacts

While the previous section discussed policies and plans as *drivers* of expanded investment in extractives and infrastructure, it is also the case that changes in institutions, laws, and policy are themselves consequences of expanded investment in these two sectors. When the sectors become sufficiently powerful within the national political economy they can demand policies and plans that support their further growth.

Brazil offers an example of how this process works (102). The military government of the 1970s sought to foster agricultural and regional development in the Brazilian Cerrado using, among other instruments, significant investment in infrastructure to support agribusiness (roads, electrification, etc.). The government also displaced peasants, making their land available to companies committed to producing export commodities. One company that grew out of this process was the Amaggi Group, now one of the world's largest soy bean producers. The owners of this group, the Maggi family, entered municipal politics and in 2002, Blairo Maggi was elected governor of Mato Grosso State at a time when soy was booming in response to Chinese demand. As governor he emphasized investment in large-scale infrastructure, especially roads, and deforestation accelerated. As the soybean sector grew, so did the wealth and power of soybean farmers. The reelection of Maggi as governor saw continued state investment in large-scale infrastructure in Mato Grosso and the Amazon, and the Amaggi Group also diversified, investing in infrastructure as well as grains trading. A political bloc, the Bancada Ruralista, steadily consolidated power in Brazil's senate, and Maggi became a senator and now serves as Minister of Agriculture. The Bancada Ruralista and the Ministry consistently push within parliament for further investment in infrastructure in forest areas (roads, waterways, and rail lines), curtailment of legislation for the demarcation of Indigenous Peoples' territories, and promotion of legislation favoring further large-scale agribusiness investment. This case demonstrates how infrastructure and large-scale agribusiness emerge as part of a single process and then, as the sectors become stronger, become sufficiently powerful to create policy environments that facilitate their further expansion, placing additional pressures on forest cover and forest communities.

In Indonesia, many politicians have interests linked to mining, including Jusuf Kalla and Prabowo. The Kalla Group also has significant investments in infrastructure projects, especially in Eastern Indonesia. While these interests are not all so obviously linked to a political party as in the case of the Bancada Ruralista in Brazil, the pattern is similar: as mining and infrastructure

grew, centers of economic and political power became consolidated and had privileged access to making the rules and policies governing future expansion of investment in the two sectors. This reduces autonomy and degrees of freedom for future policy makers. The implication is that a commitment to extractive industry and infrastructure can become self-reproducing, and future development becomes path dependent (47, 103–105).

Potential future impacts

Our earlier discussion of drivers of forest loss and rights violations suggests that many of these drivers are likely to continue and intensify in the near and medium-term future. Similarly, the discussion in Section 2 pointed to potential future geographies of infrastructure and extractive industry. The policy and legal reform efforts being pursued, especially in Brazil and Indonesia, but also elsewhere, would likely facilitate an expansion of investment in these two sectors. An implication of these discussions is that future impacts of extractives on forest loss, rights and greenhouse gas emissions are potentially significant. Here we draw attention to five "frontiers" as examples of this potential significance. The maps in Appendix 1 also help illustrate the argument.

Amazonia

Three frontiers of future impact merit note in the Amazon. The first is what has been referred to as the 'second Andean arc of deforestation', an area that runs along the western edge of the Basin, in the borderlands between Brazil and the Andean countries. Potential pressures on forests along this belt are significant and include: mining possibilities in Eastern Colombia; proposed multi-modal infrastructure projects in the Peruvian Amazon, in some instance with direct links to Brazil; the expansion of ASGM at different sites in Eastern Peru; and projects along the Rio Madeira linking Bolivia and Peru. Even if only some sub-set of these initiatives goes ahead, the implications for forest loss and community rights (especially Indigenous rights) in this arc will be significant. A second frontier is a belt of increasing mineral production that links the so-called "Arco Minero" of the Orinoco of Venezuela with activity across the Guiana Shield in Guyana, Suriname and French Guiana.

These two frontiers would interact with another belt of potential future impacts. The state of Amazonas is the core of remaining primary forest in Brazil, and to date only the east of the state has seen mining activities of any significance (mostly exploration concessions). However, concessions are now being applied for, or have been granted, along the northern boundary of Amazonas. While the region's geography and lack of transport connections makes such concessions inviable under current conditions, in mid-2016, the Minister of Agriculture presented a map showing plans to develop a series of waterways running to the eastern and northern boundaries of the state and to concession a railway running to the east.[xxiv] These would both facilitate agribusiness investment in the state (the broader message of the Minister's presentation) and make potential mining development in current concessions more feasible.

Indonesia

While Kalimantan is already host to much coal mining, it is also a potential frontier for new mining. An especially significant concession is IndoMet in Central Kalimantan. This is actually a packet of concessions spanning an area of 350,000 hectares, more than twice the size of Greater London. The concessions contain over 1.2 billion tons of mostly metallurgical coal that would be shipped to Asian markets if the projects were developed. It is also a forest area that is home to 6 percent of the world's biodiversity, contains the headwaters for 14 of Kalimantan's 20 major rivers, and provides food, water and livelihoods to 11 million people. An estimated 75,000 hectares of primary forest remains in the concessions owned by IndoMet, and many of these forests have not been independently surveyed. The forests inside the concession areas provide a refuge for large numbers of orangutans who are already critically endangered (106, 107) and have already been displaced by land-clearing in more accessible lowland regions.

In 2016, BHP Billiton sold the whole concession to its minority partner, the Indonesian company Adaro. Currently, only one small mine in the concession, the Haju mine, has been producing one million tonnes of coal per annum since 2015. It is not known when Adaro might look at expanding into its other concessions in the IndoMet area, and it is thought that the expansion is dependent on securing the construction of the Central Kalimantan Railway. However, if current coking coal prices are sustained then Adaro might seek to exploit its other concession areas soon, including ensuring that a rail link is built through either Central or East Kalimantan. This combination of mines and access routes would open up this forest to multiple pressures.

Mesoamerica

Potential future impacts on Mesoamerican forests are significant not for the area of forest that will be affected (for remaining primary forest in the region is limited) but because of the importance of what may be potentially lost. Two iconic potential losses stand out. First is the Darién forest on the land bridge between Panama and Colombia. This stretch of the Central American Isthmus is still roadless, meaning that traffic from Panama to Colombia must skirt the Darién by sea. This has protected this primary humid forest from human and economic pressures. Any effort to finalize the proposed integration of the Mesoamerican and Colombian electricity systems would, however, require that cables pass through, or around, this forest. While some proposals anticipate cables that pass by maritime routes, one considerably cheaper proposal has the cables passing by land through the Darién. While building the cables is not the same as building roads, it remains likely that such a project would require some form of access infrastructure, which would facilitate human encroachment into the forest.

A second example is the forest on Guatemala's northern border with Mexico and Belize. Currently this zone is protected by conservation areas and community-managed forest concessions. Community management of these forests depends directly on the renewal of these concessions, which is not guaranteed. The forest is, however, under growing pressure from road building on both the Guatemalan and Mexican sides, as well as from the drug economy and larger scale timber enterprises interested in the zone. Some of these community-

managed forest concessions expire in 2022, but the government has not yet organized serious discussions about their renewal (108). If they are not renewed, then northern Guatemala is likely to become a frontier of more aggressive forest loss and a widely recognized, successful experience in community forest management will be lost.

Similar challenges threaten the community and Indigenous Peoples' land rights gains made over the past 20 years across the region. Of particular concern are the North Atlantic Autonomous Region (RAAN) in Nicaragua and the Muskitia region in the easternmost part of Honduras, in part because of the impacts that access infrastructure opened by the Patuca dam, as well as by narco-trafficking, will continue to have on colonization, forest loss, invasion of Indigenous territory and human rights. In Mexico, examples of successful community-based natural resource management, which are spread throughout the country, may also face increasing pressure from legal reforms and ongoing violence.

Global similarities and regional differences in EII impacts

There are several similarities in the nature of extractive industry and infrastructure impacts across the three regions discussed here.

In aggregate terms, infrastructure seems a more important driver of forest loss than mining or hydrocarbon extraction. The direct footprints of extractive industry operations on deforestation are relatively limited in space, though there is evidence that the forest degradation effect stretches much further than the mine site. Access infrastructure, on the other hand, facilitates expansion of the agricultural frontier by large agro-industrial and smallholder colonist operations alike. Energy transmission infrastructure, to the extent that it opens access roads, can have the same effect. Furthermore, much new extractive industry investment, especially in more remote forest locations, requires access and energy infrastructure – and while hydrocarbon drilling can follow a "no road-building" inland offshore model, this is far harder for mines. In some sense, infrastructure is the "driver of drivers" of forest loss – it drives extractive industry, it drives expansion of the agro-industrial frontier, and it drives colonization.

While infrastructure has the greater footprint on forests, resource extraction has the larger adverse impact on bundles of rights. Resource extraction (together with dams) has tended to have the more mobilizing effect on local communities than have road, railway or waterway building projects. This mobilization has been an important factor in driving progressive changes in environmental governance. Access and energy infrastructure have catalyzed far less protest. Beyond these distinctions, the bundling of extractives and infrastructure has been associated with a general tendency towards conflict and constraints on civic space, and criminalization of community leaders and activists who are portrayed as "anti-development". While this has been more severe in the Americas than in Indonesia, it is a general global concern.

Across the three regions, infrastructure and extractive industry come bundled together. This is explicit in plans such as MP3EI and COSIPLAN. Efforts to promote investment in the two sectors and the synergies between them drive legal and institutional changes that affect how

forests are governed. They lead to reductions in protected area status, weakened protection of Indigenous territories, and relaxation of environmental assessment procedures, among others.

Two more specific patterns recur. First, transboundary regions appear particularly vulnerable. Examples here include: the Western Amazon, the Guatemala-Mexico border, and the Muskitia. Second, ASGM is increasing and its impacts are severe, especially in these transboundary areas. While in comparison to oil palm, ASGM still has a relatively limited footprint, the footprint is one of total forest loss and environmental sterilization coupled with serious downstream contamination and biodiversity loss related to turbidity and mercury pollution.

5. Regulators of EII expansion in forested areas

Regulation can refer to policies, laws, institutions, bodies of knowledge, and ideas that are designed both to promote and to rein in investments in infrastructure and extractive industry. This section focuses on forms of regulation that seek to limit potential adverse environmental, social and economic consequence of such investments (having dealt with regulations fostering expanded investment in the Section 3 discussion of drivers). Such regulations can be discussed in terms of: the scale at which they are designed and potentially enforced (global, national, subnational), the type of actor exerting regulatory force (state, business, civil society) or the commodity chain (sector or mineral type). Here we opt for scale as the primary mode of organizing information.

Regulation constitutes an exercise of power. There are different ways in which power is exercised: a) by sheer force (of numbers, through violence, etc.); b) through legal and/or bureaucratic procedure; and c) through the strength of ideas and the framing of discourse. For each of these forms of power to be effective requires, respectively, that the actor being regulated:

a) Is not able or inclined to respond to force with even greater force
b) Abides by bureaucratic and legal norms and is not able or inclined to circumvent these norms through corrupt practices
c) Cares about the legitimacy of certain ideas in society, is not able or inclined to support the crafting and dominance of other ideas, and cares about what other actors in society (at different levels) thinks about them.

These conditions rarely all apply, and which applies in which location has implications for the effectiveness of different regulatory strategies. For example, in the views of some informants and literature, the mining sector in parts of all three regions is sometimes inclined to respond to social mobilization with the use of force. This view leads some to conclude that in a case like Mexico, the use of open protest as a way of promoting changes in regulations is neither wise nor effective, and that it is more appropriate to promote negotiated settlements between

communities and international companies who care more about what is said about their company and its products. Or, as another example, the opaque forms of ownership of many coal operations in Indonesia means that they may be inclined to use force or to corrupt government and have little reason to worry about international or even national ideas about their sector and their own operations (all of which greatly limits regulatory possibilities).

Local and subnational regulation

A number of interviewees argue that the most important form of social control and monitoring of EII comes from the community level, when a capacity to resist is combined with a capacity to negotiate with the source of large-scale investment. One large NGO in Mexico argues that progress in making mining in Mexico more 'friendly' to community rights and forests is more likely when communities have this capacity and a clear vision of what they wish to achieve, and then the investing company has for whatever reason a willingness to negotiate (in other scenarios the NGO anticipates conflict and repression). Across Mesoamerica and the Amazon, an international NGO specializing in extractive industry issues suggests that the only thing that really makes a difference to the effects of extractive industry on the environment is community capacity to resist. A number of Indonesian interviewees suggest the same, while placing emphasis on the combination of capacities to resist *and* negotiate. The capacity to suggest economic alternatives is deemed as important as it is rare, making the experiences of community-based forest enterprises in Mesoamerica especially important (and important to protect) because these forms of community-based tenure and resource management have helped to sustain forest cover in areas under pressure from extractive industry and infrastructure (though there is recognition that there are limits on the capacity of such organizations to continue presenting a viable alternative).

Evidence of the ability of subnational governments to regulate large-scale investment is scarce and the general perception is that they lack institutional capacity and that corruption is pervasive. The iconic case comes from Indonesia, where giving district authorities the power to grant mining concessions led to a boom in permits to explore for minerals. Central government authorities found that more than a third of 3,635 locally-issued coal mining permits were not "clean and clear," meaning that they either overlapped with other mining rights (in some cases, unscrupulous district heads issued up to eight mining licenses on top of one another) or their recipients owed unpaid land rent and royalties and/or had not produced Environmental and Social Impact Statements.

National regulation: legislative, judicial, procedural and civic

Notwithstanding the constraints of trade agreements, the national level is still the most significant venue at which regulatory standards and practices are conceived and fought over. Many of the actors involved in those processes may be transnational (for instance, the involvement of the government Canada in the definition of mining regulations), but the venue remains national.

Across the countries, similar patterns seem to apply. Ministries of Economy and Finance, of Mining and Energy, and of Transport, and national development banks are among the most important proponents of expanded investment in infrastructure and extractive industry. These bodies also prioritize investment and growth over the regulation of adverse impacts as reflected in the fact that MP3EI in Indonesia dedicated just two paragraphs of a 200+ page document to Monitoring and Evaluation. Only a very few civil society and philanthropic bodies have detailed understanding of how such ministries and banks operate, and fewer still have access to their internal processes. To gain such understanding takes a great deal of time.

That said, central ministries and executive offices have sometimes taken a lead role in regulations designed, ultimately, to reduce forest loss and conflicts over deforestation. In Indonesia, the OneMap initiative began at the demand of the then President Bambang Yudhyono as he became aware that different agencies and ministries had quite different maps of Indonesian forest extent and rights claims – facilitating conflict, corruption and poor forest management (109). In a context of distrust, competition and lack of data sharing among ministries, directives from the Executive Office were necessary to begin to force coordination and the development of shared, single data bases.

Ministries of Environment, government anti-corruption initiatives, and human rights defenders and prosecutors' offices have also exercised important influence at different times – and are also better understood by, and accessible for, civil society. Indonesia's anti-corruption agency (KPK), for instance, played an important role in seeking to clean up coal mining licenses. In Brazil, the Public Prosecutor's office has played an important role in restricting investments and policies that would have egregious impacts on rights and nature. Ministries of Environment have at different times played important roles in strengthening environmental and social regulations in Brazil, El Salvador, Guatemala and Peru. The willingness of such ministries to use Strategic Environmental Assessments (SEAs) to evaluate sector-wide or area-based policy and packets of investments can have a positive influence on the quality of investments and the nature of policy in various countries. SEAs may have played a role in moderating and improving the environmental quality of projects rolled out as part of MP3EI in Indonesia. An SEA of the mining sector in El Salvador generated information and arguments on which the recent law banning mining is based, and the SEA is cited in the text of the law as an important antecedent for the law (110, 111).

The more general pattern is that at any one time there are often 'islands' within national government from which regulations to protect forest cover and community rights can be pursued. Some of these islands are more stable than others, and knowledge of where they are, who works there, and how to systematically strengthen these 'inside' champions for change is an important consideration (not to be confused with the typical approach of building narrow relationships with one or two 'favorite' contacts).

There are also important national level regulatory initiatives from civil society, with particular strengths in the Amazon, Indonesia, and Mexico. One important set of initiatives have been geo-visualizations that seek to aggregate in one cartographic database (i.e., maps) georeferenced information on investments, forests, traditional territories and resource

management institutions, and other modes of natural resource use and governance. The purpose of these initiatives has been to demonstrate both the (deliberate or accidental) chaos of national systems for planning and granting property-rights, and the multiple sets of overlapping claims to resources and space that they have produced. Making explicit this chaos becomes the basis for arguing that such overlapping claims are likely to produce conflict and poor-quality resource and forest governance. The arguments then become the basis for proposals for more careful, systematic land use planning. Active in such initiatives are groups such as the NGO Auriga and the Asia Foundation's environmental governance program SETAPAK in Indonesia, Cooperacción in Peru, and the RAISG network in Amazonia (especially The Instituto Socioambiental (ISA) in Brazil, and Instituto del Bien Común (IBC) in Peru), CartoCrítica in Mexico, and Oxfam in Honduras and Peru. In some instances, these initiatives have been supported or complemented by external, often university-based, actors with expertise in GIS, extractives and infrastructure.

Other national level, civil society-led interventions in regulation are those that have combined advocacy and efforts to move national debates. Again, there are a number of important actors here, such as: Oxfam and Poder in Mexico, Greenpeace in Indonesia, IBASE in Brazil, and Red Muqui in Peru. Their interventions clearly affect debate, although they can be risky as reflected in threats to close or clamp down on NGOs for their work on coal in Indonesia. In a similar vein are those efforts – sometimes led by NGOs, sometimes by activist lawyers, and sometimes by communities – to use litigation as a means of enforcing environmental regulation and rights protection. There are many cases of litigation (case based and strategic) across the countries. At a strategic level, the Guatemalan support NGO, CALAS (Centro de Acción Legal-Ambiental y Social de Guatemala), legally challenged the 1997 mining law and on 19 June 2008 the Constitutional Court agreed that several provisions of the 1997 mining law violated the State´s obligation to protect the environment (112). In response, the Guatemalan government imposed a moratorium between 2009 and 2011, which in practice continues today. At a project scale, in November 2015, the Constitutional Court responded favorably to a legal challenge by CALAS and ordered the suspension of the Sechol mine exploitation license. In other cases, civil society organizations have pressed for greater use of instruments like SEAs in order to reduce environmental and human impacts, and as noted, some argue that the slower than expected roll-out of MP3EI in Indonesia was partly due to the effects of SEAs.

Finally, networks that link NGOs and religious organizations around the impacts of extractives and infrastructure on rights and well-being have played important roles in knitting subnational initiatives into national processes, as well as in linking the question of natural resource governance to much more fundamental questions of faith. These networks have varying degrees of formality, taking form in the relationships among the WALHI[xxv] network across Indonesia and Islamic organizations, and the networks linking parts of the Roman Catholic church, NGOs, and communities in Guatemala, El Salvador, Honduras, Brazil and Peru. Such networks seem to be especially important in sustaining organizations and motivation over time. Several interviewees drew attention to the potential importance of building collaboration among NGOs, communities and religious organizations as a means of broadening the base of support for forest governance and forest-dependent communities' rights, and in that way also building the legitimacy of claims to protects forests and communities. The involvement of religious

organizations has also been central to critical legislative change because of the legitimacy and convening power of these bodies. Without the Catholic Church's involvement, the law banning mining in El Salvador would not have passed. In Panama, following protests over a new law that would have allowed the development of enormous copper reserves within the Comarca Ngöbé-Bugle, the government created a high-level commission, made up of representatives of the government and civil society, with the Catholic Church as mediator and guarantor of dialogue. As a result, on 18 March 2011, the law was repealed. Following additional protests in 2012, a law was passed that prohibits exploration and exploitation concessions for metal and non-metal mining in the Comarca, and in its annexed areas and in Ngöbé-Bugle communities adjacent to those areas, and cancels all the concessions that had been granted previously (113). In Indonesia, the Islamic organization Muhammadiyah has pursued legal cases against foreign investment in natural resources, though how this has influenced dynamics in the sector is less clear (114).

Global rules

The global venues for the setting of rules governing EII are complex and diverse. These venues are no longer dominated by the international financial institutions (IFI), or by the OECD countries, or even just the G7. Furthermore, rule setting occurs in both the formal sphere and the voluntary sphere.

Among IFIs, the regional development banks (Inter-American Development Bank, Asian Development Bank) appear more important in EII investment (primarily infrastructure) than the World Bank. At the same time, new sources of finance and rule setting venues have emerged with the Asian Infrastructure Investment Bank and Chinese and Indian investment banks. In some instances, these banks lend directly to projects, but in other cases they lend to local investment banks who then lend onwards. Chinese lending to the Brazilian Development Bank (BNDES) is a clear case in point, but entities such as the Central American Bank for Economic Integration (BCIE) also serve as vehicles for financial flows.

While the general sense is that the rules and safeguards associated with these new flows of finance are more flexible than those of traditional IFIs, reports from Friends of the Earth on Chinese investment in BNDES suggest that this is not necessarily the case. While initial evidence from Latin America suggests that Chinese investment safeguards (applied either by companies themselves or by Chinese financial institutions) are not especially strong, evidence also suggests that Chinese investments in extractive industry are not the worst performers either (115). Ongoing research on safeguards linked to Chinese financial flows in infrastructure will further strengthen the evidence base.

Home country investment rules for corporations have global significance and so constitute another venue for potential influence. Some of these venues are better understood than others, and groups such as Mining Watch, for example, have sought to use Canadian venues to influence Canadian mining investment overseas, with some successes as well as failures.

The extent to which global rule setting is important depends on how far the value chain linked to the investment is itself global and where the commodity is sold. Thus, while the majority of Indonesia's coal is exported, it is primarily to Chinese and Indian markets in which traditional advocacy organizations have less leverage (116). Also, as Indonesia moves to bring more of the coal value chain within the borders of its country, with Indonesian coal supplying Indonesian power plants, part of whose ownership resides with the same holding groups involved in the production of the coal, global rules will have less purchase. Some working on this issue see scope for additional advocacy to influence Indonesian public opinion on coal, as a strategy to influence rules allowing significant public subsidy to coal miners. In Mexico, notwithstanding growing transnational investment, the mining sector is still dominated by nationally-owned private companies, including the country's three richest individuals, which moderates the extent to which global rules can be used to exercise pressure on the sector.

Infrastructure investments – even when internationally financed – are not directly associated with commodities, and so it becomes harder to influence such investments at the consumer end of commodity chains. In Latin America, the tendency of governments to boycott and threaten to de-fund the Inter-American Commission on Human Rights (IACHR) as soon as the Commission finds against their extractive industry and infrastructural projects (Brazil, Ecuador, Nicaragua), reduces the power of the IACHR to affect regulations. The extent to which the Extractives Industry Transparency Initiative (EITI) exercises influence over mining and oil and gas investment in these countries is debated, but Indonesia, Peru, Colombia, Honduras and Guatemala are members of the Initiative, and civil society within EITI has made some, albeit halting progress in introducing environmental performance and beneficial ownership into EITI statements. The tussles between civil society and government and company members at the 2016 global EITI meetings in Lima show that this is a steep hill to climb.

The International Council on Mining and Metals (ICMM) is an important rule setting venue for extractive industry, and particularly for mining. Its rules are voluntary, applied and monitored internally for its member companies. While its primary role is to enhance the reputation of its members, this is achieved through establishing basic standards and monitoring their enforcement. ICMM can only, however, influence its members. To the extent that, for example, Indonesia's increasing resource nationalism leads international mining companies to leave and to be replaced by national companies, the influence of ICMM rules on mining practice in Indonesia would decline.

Companies also send executives and staff on training courses to a number of globally respected venues. These include the Sustainable Minerals Institute at the University of Queensland, the Colorado School of Mines, and the Columbia Center of Sustainable Investment at Columbia University. Such centers are venues for defining "rules in practice" affecting the behaviors of mining company workers. While there is much slippage between what is discussed in a short course and what is done in a mining region, there remains a relationship. In this sense, the curriculum and pedagogy at such centers is part of the soft definition of rules and practices governing extractives and infrastructure (of course, so too are business schools).

Finally, on an optimistic note, at the same time as Brazil has been flexibilizing rules governing access to and investments within forested areas, it also made commitments in December 2016 at the 13th UN Biodiversity Conference to restore 22 million hectares of degraded land, and to support a project of ecological corridors to interconnect protected areas in Brazil with areas in other countries in South America. These commitments repeat promises that Brazil made within the Paris Agreement to reduce emissions by 37 percent by 2020 and 43 percent by 2030. Indonesia's commitments under Paris are also significant. Such global commitments might be used as leverage for forms of environmental accountability.

Similarities and differences across the regions

Recurring similarities across the three regions and globally are:

- That grassroots strategies to resist, negotiate, and demand transparency and accountability in the face of expanding EII can play an important role in regulating the design and implementation of projects"
- The importance of non-sectoral government agencies in gaining traction over large-scale investment, in particular anti-corruption agencies, public ministries and the offices of prosecutors and human rights defenders
- The significant role played – and to be played – by the development of spatially explicit analyses of investments and their effects. Though the resources invested and the numbers of organizations involved in such efforts are limited, their visibility and effects are outsized, and there is (slowly) growing traction to the idea that data on all natural resource based activities should be centralized in the form of initiatives such as OneMap (Indonesia) or spatial development plans.
- The importance of understanding the regulation of extractives, infrastructure, oil palm, protected areas, and territories as a whole, and not issue by issue, sector by sector. The same interests participate across these sectors, and owners lobby for similar rule changes regarding land and forest governance, often without input from Indigenous territories and communities. Certainly, this package of activities and issues characterizes much of Honduras, Guatemala, Indonesia and Brazil as well as Colombia, Ecuador and Peru in the western Amazon.
- The relative absence of capacity to conceive of viable economic and energy alternatives (over and above existing livelihoods and energy systems) in the face of the narratives of "development" that arrive with large-scale investments. While the forest management enterprises in Guatemala and Mexico are important exceptions to this pattern, viable strategies to reduce the adverse impacts of EII investment on forests also require proposals for other modes of living in and from forests, and for generating energy. In this sense, proposals for viable large-scale decarbonization of energy systems and livelihood generation are integral to strategies for success, but thus far there is limited capacity in civil society to work on these.
- The growing diversification of investment in EII (from China, India, Southeast Asian countries and elsewhere, and also from national capital and finance capital investing in

public-private partnerships for infrastructure projects) challenges efforts to monitor financial flows, guarantee the implementation of social and environmental safeguards, and to hold these sources of investment accountable. Such knowledge is important for successful strategies, yet is very limited in civil society, the research community and, indeed, in many government agencies. Support for developing such knowledge is important.

The most significant difference among the regions is the differential weight of domestic capital and domestically circumscribed value chains, and the consequent implications for regulatory options.

- While domestic capital is relatively unimportant for infrastructure and extractive industry in Central America and the western Amazonian countries, it is much more significant for Brazil, Indonesia, and Mexico, both in the form of private capital and public sector investment. Such capital is less prone to transnational leverage, while at the same time may have more opaque forms of influence over domestic institutions of regulation.
- Across the three regions, coal in Indonesia is a somewhat unique case (though coal is important in Colombia). It shows some signs of becoming a more closed value chain dominated by domestic investment coupled with Chinese and Indian investment. Some organizations that understand the coal sector see opportunities to reduce forest loss due to coal through a combination of work to strengthen regulations (and thus increase operating costs), enhance community capacity to negotiate, and slow down investment in coal-based power plants. The strengthening of clean energy options will also be another necessary part of any such transition.

6. Key challenges in addressing the EII-forest relationship

How can the impacts of EII on forests and community rights be mitigated or eliminated? Across interviews, publications, websites and other data sources, certain ideas recur, suggesting a common sense of what could work if it were delivered systematically. At their core, these ideas combine mechanisms to increase transparency, public debate and scrutiny, and accountability with community-based capacity building in the defense of rights and in negotiation skills. There are clearly recognized needs for the provision of alternative livelihood opportunities for forest residing communities, and for alternative energy sources that would take pressure off forest lands. In these closing paragraphs, we elaborate briefly on the sorts of responses that interviewees and the literature indicate should be part of a forward-looking strategy.

Information. Experience has shown that increasing the quality, availability, and circulation of information on the actual and potential relations among extractives, infrastructure, forests, and community rights is a powerful contribution.[xxvi] One strategy involves bringing geographic visualizations (i.e., maps) of overlapping resource rights and concessions into academic,

technocratic, and public discussions, in order to demonstrate not only the pressure on forests and communities but also the lack of any system of sensible, spatially-aware natural resource planning. These maps circulate and change debates. For instance, maps showing the extent of hydrocarbon concessions in the Peruvian Amazon in the mid-2000s influenced the thinking of international financial institutions around oil and gas development and energy planning in the basin.[xxvii] A recent and more technologically savvy initiative is the partnership between Amazon Watch, the Institute of Man and Environment of Amazonia (IMAZON) and Google Earth, with the objective of producing a multimedia report showing the relationship between the construction of large hydroelectric complexes, such as on the Madeira and Xingu rivers, and the increase in deforestation in Brazil.

Spatial planning. The type of information described above is an essential input into spatial planning processes. Each region reveals the recurrent problem of overlapping concessions and resource rights, as well as the very wide extent of resource extraction concessions (mining, oil, gas, timber, oil palm) in forested areas. The ubiquity of these problems reflects, in turn, a failure of planning systems and points to the need for much more explicit and coordinated spatial planning in the public sector. Without planning instruments that consider multiple resources simultaneously as well as pre-existing resource rights and claims, national systems for granting natural resource concessions will continue to produce conflicting claims on land and forests, and hence local conflict and weaker forest protection. This problem has been recognized within some parts of government as demonstrated in the OneMap initiative in Indonesia and in calls for regional land use planning in some ministries and subnational authorities in Latin America.

To be effective, however, land use planning requires communities to have equal access to information and to be involved in all phases of the planning process – including participation in public consultations, upfront investment decisions, and project monitoring. The demand for "popular consultations" in Mesoamerica and parts of the Amazon reflects a demand for such access and participation (though it may mostly reflect a demand for communities' right to veto large-scale investment in their territories). Attempts to strengthen the rigor and enforceability of spatial planning would therefore have to address both the technocratic and democratic dimensions of planning.

Free, Prior, and Informed Consent (FPIC). The struggle to pass legislation and regulations to ensure FPIC and to institutionalize its practice runs across all regions. Although some express concern that consultation processes can become a tool for dissipating protest and turning disagreements over values and principles into a negotiation over design and compensation, promoting and defending FPIC remains especially important in the contexts outlined for each of the regions. Those scans reveal efforts to reduce the scope of democratic participation in investment approval and to limit the rights of Indigenous and traditional peoples to exercise voice over investments in their historic territories. Protecting these rights and spaces for democratic participation in determining forest use and control thus becomes imperative not only to enhance community voice over forests but also as a defensive strategy.

Strengthening environmental licensing, environmental and social safeguards and protections at the national level. As much as value chain level regulation may be important as a means of exercising accountability over EII investments through legal regulations and advocacy in consumer countries or the development of safeguards for financial flows (117, 118), it is hard to see how national regulatory measures cannot be a central pivot of any strategy. These measures would involve establishing a more demanding process for securing initial environmental license, promoting broader and more systematic use of SEAs, and subjecting investments to more effectively implemented and monitored standards and safeguards. This national governance focus is the primary concern of most civil society organizations, and to work on this front is also to build a national public debate on forest protection and the relationships between resource extraction and "development" as part of building broader constituencies for forests and forest dwellers.

As civil society, technical support, philanthropic or donor agencies pursue strategies that aim to enhance such national, public sector regulatory measures, it is important to recognize that, at least in the countries examined in this study, some parts of governments have worked hard to develop or strengthen instruments for environmental protection in general, and the protection of forests and forest-dependent communities in particular. Some examples of these 'islands' within government have already been noted in this report: Ministries of Environment, ombudspersons and anti-corruption commissions, agencies linked to Indigenous Peoples, etc. Within their own governments, these islands are caught in asymmetric relations and constantly seek to protect their advances from being undermined by other parts of government. If national regulation is important, as is argued here, then civil society, philanthropic and donor collaborations with such islands within government is an essential part of any strategy for enhancing the protection of forests and community rights.

Accountability and transparency. Much of the power of information provision comes from its connection with public debate and with mechanisms for enhancing accountability and transparency. These mechanisms include journalism, litigation/forensic inquiry, and formal transparency and accountability mechanisms.

Journalism has a vital role in this regard – both journalism that reports on specific, illustrative, cases (i.e., stories) as well as sustained collaborations between information generation centers and journalists that help build cadres of journalists with the tools, relations, data, and vocation to report on the relationships among forest loss and degradation, forest communities, and EII. While not necessarily widespread, such collaborations exist across a range of media and clearly elicit responses from companies and governments. The most important challenge in these collaborations is to move from the reporting of specific cases to the development of longer-term collaborations, such that journalism does not only produce *stories* about forest loss and the impingement of community rights but that it also produces a *public debate and public sphere* in which these issues are a constant part of national discussion. Social media work has a critical role to play in such processes also.

The regional studies also show the importance of litigation and forensic inquiry as a means of fostering accountability and making policy more transparent. Again, these processes have been

pursued by both government and civil society organizations. In the government sphere, for instance, the Public Ministry in Brazil and KPK in Indonesia have each taken actions that defend the rights of people affected by deforestation and/or have addressed and reversed some of the factors driving conflicts. A range of NGOs and private lawyers have taken cases protecting forest users and targeted at changing laws. Litigation emerges as a critical element in the portfolio of strategies that have been used to protect forests and communities.

Linking information generation and analysis related to forests and extractives with formal venues for transparency and accountability[xxviii] related to open government, business, and human rights and extractive industry remains a challenge. Three limitations in this regard are that these venues address transparency around financial and rights issues far more than around environment and climate impacts; certain corporations and financial flows are subject to much less scrutiny in these areas than are others (with more attention paid to OECD registered transnationals); and less progress has been made on subjecting infrastructure investment to formal accountability mechanisms than, for instance, extractive industries. That said, efforts of civil society organizations to bring attention to climate and environment into the EITI process seem important. Company scorecards can serve as another vehicle for linking information, transparency and accountability, though only some companies will pay attention to such scorecards.

These possible areas of focus draw attention to the cross-scalar nature of work addressing the implications of EII for forests and the rights of forest dependent communities.

7. Conclusions

So, “how significant are extractive industry and infrastructure as drivers of deforestation and rights violations in communities living in and near to forests?” This analysis of Amazonia, Indonesia, and Mesoamerica suggests answers to this question should distinguish between experience to date and likely future impacts. To date, the aggregate impact of extractive industry on forest cover has been limited, though the impacts on rights have been more serious. The impact of infrastructure has been much more substantial insofar as roads, waterways, rail, and energy transmission have been essential for the expansion of the agricultural frontier into forests. Looking ahead, the impacts of extractives and infrastructure seem likely to be much more significant. In each region, there are plans for large-scale investment in these sectors, designed to expand resource extraction and agricultural economies in forested areas. These plans are accompanied, to a greater or lesser extent, by legislative changes designed to facilitate investment by, among other things, weakening measures that protect forests and Indigenous and community territory. In cases where forest loss is associated with the expansion of the coal sector, there will be a double impact on emissions: from forest burning and logging, and from coal burning.

To be worried about these projections is not to be anti-development, or to put “forests before people”, but to have concerns about a particular model of development and its implications for

climate change, biodiversity loss, and community and human rights. In thinking about how to improve the relations among extractives, infrastructure, forest and forest peoples, certain iconic examples cycle through publications and pronouncements, and give some guidance for action. Some examples relate to the important role that can be played by coordinated GIS mapping and visualization as a means of informing public debate and monitoring and managing pressures on forests. Others relate to particular instruments for addressing the potential effects of extractives on rights and natural resources, such as the moratorium on mining projects in Guatemala, the recent law banning mining of all scales in El Salvador, and community-based consultations across Latin America. Other examples focus on direct forest management, in particular the experience of ACOFOP (Association of Forest Communities of Petén) and its member organizations in Guatemala and several key community forest networks in Mexico. A final iconic example is the alliance among Munduruku Indigenous Peoples, scientists, activists, and the state public prosecutor that led to the suspension of the São Luiz do Tapajós dam in Brazil (119). Such examples give some guidance for action, but their very rareness gives pause and suggests that their successes owe much to their particular and not-easy-to-repeat contexts.

Notably these examples have not been pursued by any one actor. Mining moratoria and the OneMap initiative have been led, ultimately, by government agencies in partial response to NGO and legal campaigns and proposals, but also because of innovators within the state; mapping and visualization initiatives are typically led by research centers and NGOs (OneMap is an exception); community-based capacity building is led by NGOs, communities, and religious organizations. Extractive industry enterprises have engaged in biodiversity offsets and efforts to reduce emissions (though some question the net effect of offsets on forest loss c.f. Virah-Sawmy, Ebeling, and Taplin 2014 (120)). Government initiatives tend to be led by regulatory agencies such as environment ministries, by planning bureaus, and by agencies charged with human rights protection and corruption control such as Public Prosecutors' and Human Rights Ombudsman's offices/ministries. Sectoral ministries of energy, mines, agriculture, and forestry have been less innovative. Within civil society and the research sector, networks of community-based organizations, NGOs specializing in extractive industry and certain analytical techniques, and a handful of international NGOs tend to lead initiatives. Within the corporate sector, innovation is particularly concentrated in international companies concerned with reputational risk, and with access to greater financial resources. There is much distrust across these groups of actors, and even across different government agencies and among NGOs (109). There is also a range of opinions regarding viable strategies: at one end, the argument is that the only way to effect change is to collaborate with innovators in each of these sectors, while at the other end the argument is that success comes from sustained community-based resistance that renders investments untenable.

Attention to these issues remains patchy. Indeed, even as organizations have begun to pay more attention to infrastructure and the synergies between infrastructure and extractive industry investment, it is important to remember that groups like the Mott Foundation and the Bank Information Center were well ahead of the curve and in the early 2000s were producing reports that have turned out to be prophetic (12, 45). This final point is important. It may well have been that in the mid-2000s, when concerns about the coming impact of infrastructure and extractives on forests were being discussed, decision makers felt the evidence base was too limited, or the

issues too sensitive. For whatever reason, many organizations pushed the issue to one side. The question is whether this time around, with more evidence at hand and clearer evidence on future planned investments, the same will happen again.

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Notes

[i] A bundle of rights may include the rights to use a resource, to manage it, to transfer (assign or reassign) management and use rights, and the right to own. https://land-links.org/wp-content/uploads/2016/09/USAID_Land_Tenure_Property_Rights_and_NRM_Report.pdf (1).

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[viii] These changes are defined as: reducing the spatial extent of protected areas (downsizing), eliminating their protected status entirely (degazettement), and allowing more human activity within protected areas (downgrading) (2, 3).

[ix] Global Witness (2016) On Dangerous Ground (Global Witness, London) Available at: https://www.globalwitness.org/en/campaigns/environmental-activists/dangerous-ground/ [Accessed March 12, 2018].
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[x] Global Witness (2016).

[xi] Amazonia (sometimes referred to as Pan Amazonia to recognize that it stretches beyond Brazil) is an enormous region covering about 40 percent of the South American continent. It includes the Legal Amazon of Brazil, northern Bolivia, eastern Peru, eastern Ecuador, south-eastern Colombia, southern Venezuela, southern Guyana, southern Suriname and southern French Guiana. Our research focuses on the Legal Amazon of Brazil and the Andes-Amazonian countries.

[xii] Mesoamerica includes Mexico and the six Hispanophone countries of Central America (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama). Our research included separate scoping exercises for Mexico and Central America, though there are clear connections within the larger Mesoamerica region, and our discussion addresses this distinction.

[xiii] The *Lava Jato* scandal was a massive corruption and money laundering operation originating in the Brazilian hydrocarbon company, Petrobras, involving illegal and inflated payments for infrastructure projects, many of which involved the company Odebrecht. The scandal has stretched into many countries in Latin America and elsewhere, and has led to criminal cases against political leaders in several Latin American countries.

[xiv] Auriga, data shared with authors.

[xv] *Maquila* refers to a manufacturing model involving the assembly of imported component parts and the re-export of the finished product. Companies involved in maquila style operations are also often given tax exemptions.

[xvi] Mexico is somewhat distinct, with high levels of investment in energy (dominated by hydrocarbons), oil and gas pipelines, and mining.

[xvii] The transitions literature recognizes the importance of such alternatives (48). Elaborating such alternatives is demanding and requires not only identification of alternative sectors for growth, but also clearly thought out pathways from these sectors to revenue generation for government and means for socio-economic inclusion, as well as the conditions required for their political viability. That said, large-scale transitions to renewable energy, food sovereignty based on small-scale agriculture coupled with continuing niches for EII might be parts of such alternatives at a national scale.

[xviii] Key informant, Jakarta, personal correspondence with A. Bebbington, 2017.

[xix] The rise of PPIs will increase the number of actors involved in EII investment, complicating relationships of accountability and presenting challenges to organizations trying to understand and monitor financial flows.

[xx] Also referred to as *Lava Jato*, or the “carwash” scandal – noted above.

[xxi] The scandal has involved payments around the world, as the referenced BBC News article indicates.

[xxii] Data from: Hansen et al. (76); Global Forest Watch; the Jaringan Advokasi Tambang Mining Advocacy Network (JATAM); FERN; and Woods Hole biomass data (77), with the data being retrieved from: http://whrc.org/publications-data/datasets/pantropical-national-level-carbon-stock/.

[xxiii] See: https://climatealliancemap.org/

[xxiv] Presentation by Minister Blairo Maggi, The Nature Conservancy, Arlington, VA, July 29, 2016.

[xxv] WALHI is the Indonesian Forum for the Environment, the Indonesian member of Friends of the Earth International.

[xxvi] Consider, just as examples: the influence of studies assessing the full socio-environmental implications of the Inter-oceanic highway in Peru; the influence that studies on the environmental impacts of early rounds of road building in the Brazilian Amazon had on subsequent IFI approaches to infrastructure; the ways in which mapping of EII in Latin American has gained presence in public debate.

[xxvii] Here we draw on interviews from earlier research.

[xxviii] Venues such as the Extractive Industries Transparency Initiative, the Roundtable for Sustainable Palm Oil, or the Ombudsman’s office of the International Finance Corporation, for instance.

Appendix I. Extractive Industry and Deforestation: Select Cases

The following maps show how the geographies of forest loss relate to the geographies of significant extractive industries and protected areas in select countries in each of the three study regions.

Figures 1 and 2 are for the Amazon Basin (Brazil and Peru), Figures 3, 4 and 5 for Mesoamerica (Guatemala, Honduras, and Panama), and Figures 6 and 7 for Indonesia (Sumatra and West Papua).

All maps were prepared by Clark University (team lead: Professor John Rogan) based on Hansen et al. (2013) and national concession and protected areas data. Supplemental data from the World Database on Protected Areas and Global Forest Watch.

A. Amazonian Basin: Brazil and Peru

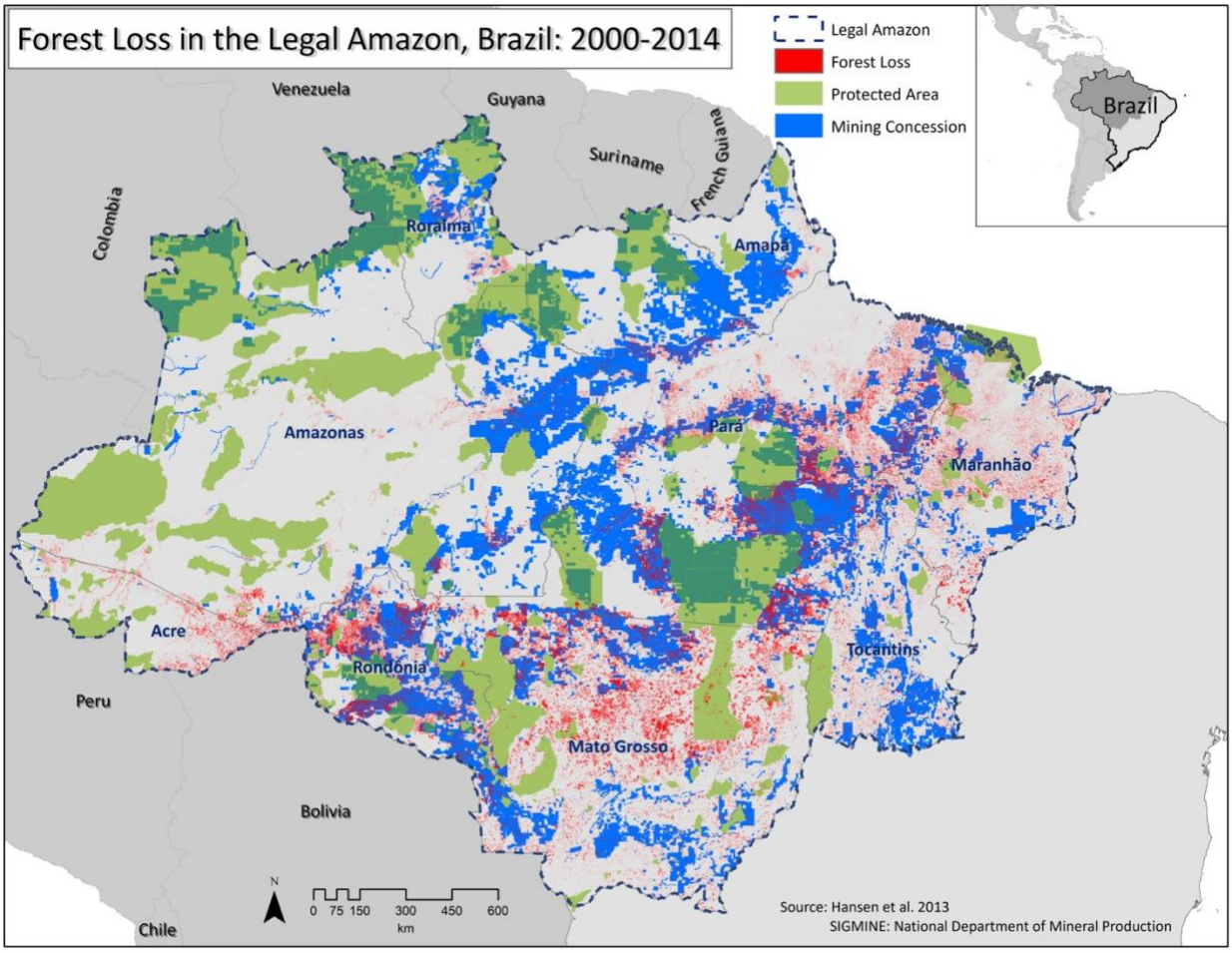

Figure 1. Mineral concessions, protected areas, and forest loss in the legal Brazilian Amazon.

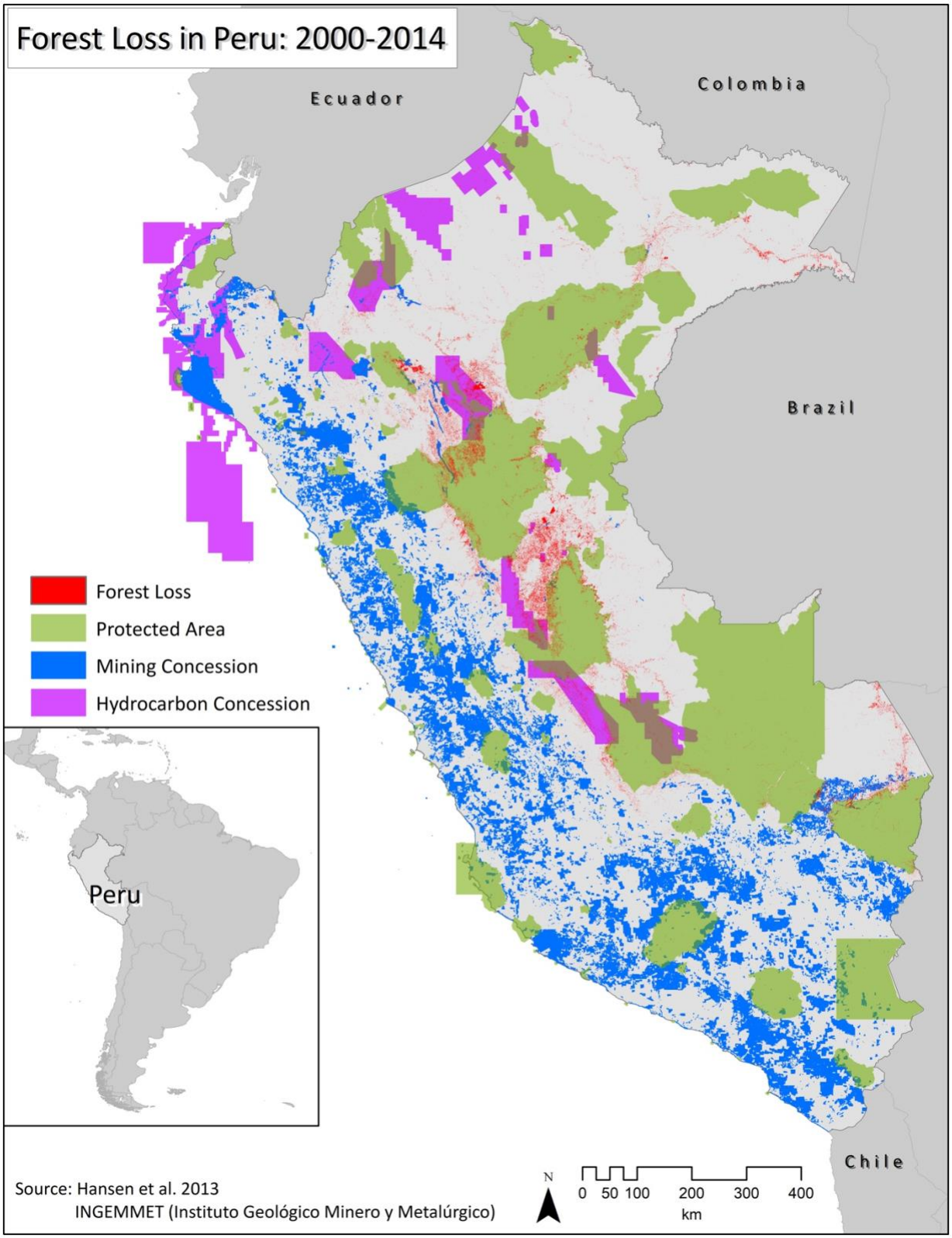

Figure 2. Mining and hydrocarbon concessions, protected area, and forest loss overlaps in Peru.

B. Mesoamerica: Guatemala, Honduras, and Panama

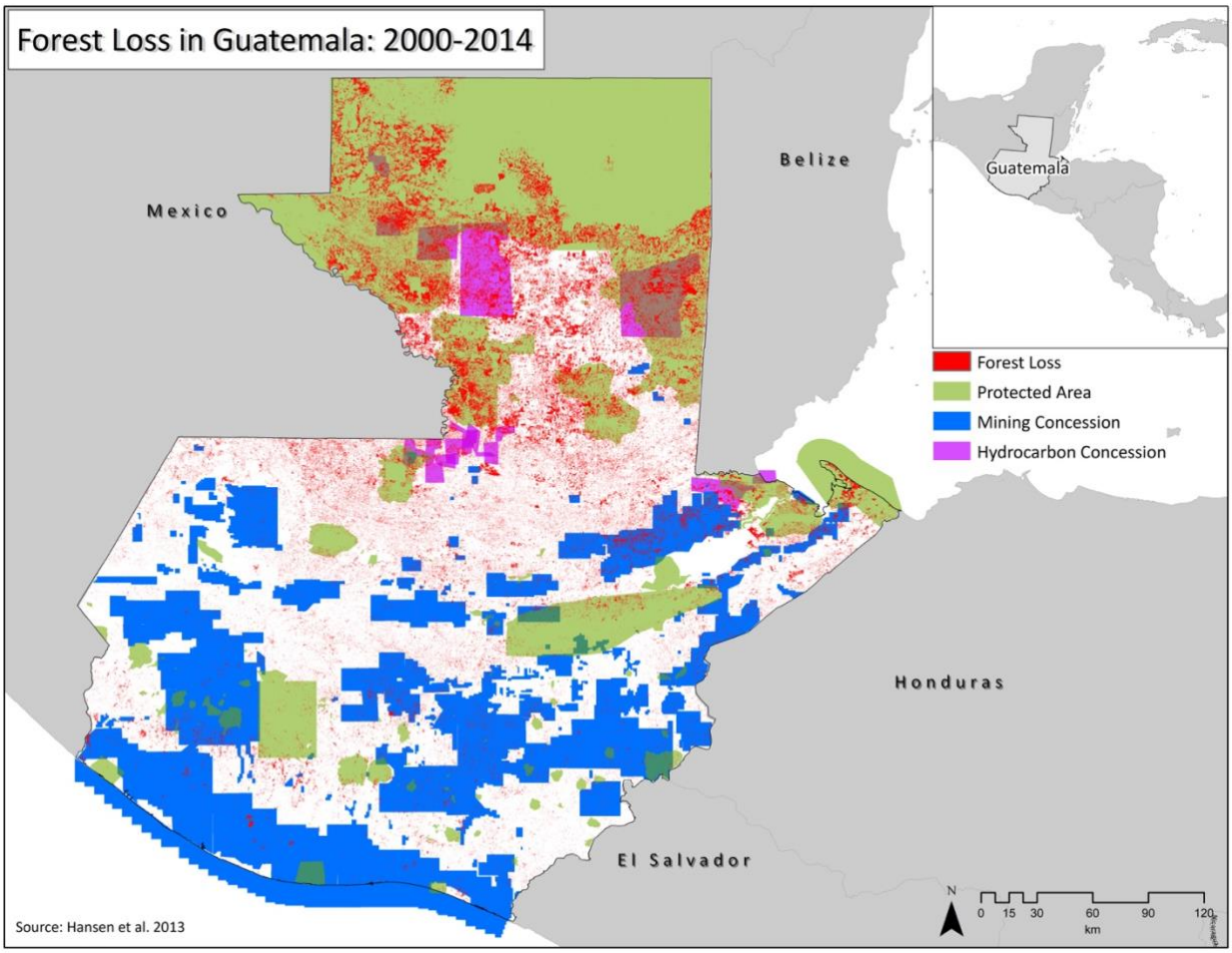

Figure 3. Mining concessions, protected areas, and forest loss overlaps in Guatemala.

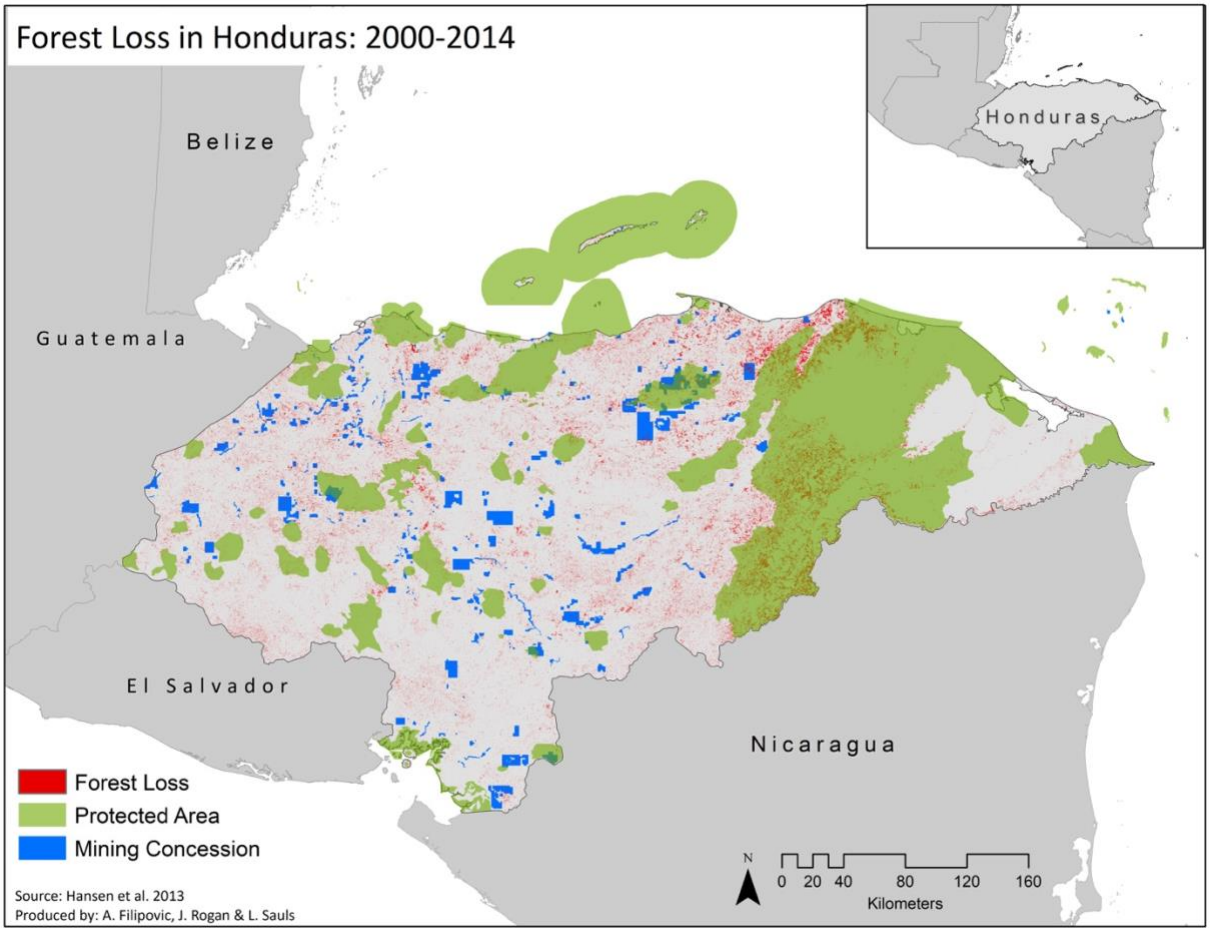

Figure 4. Mining concessions, protected areas, and forest loss in Honduras.

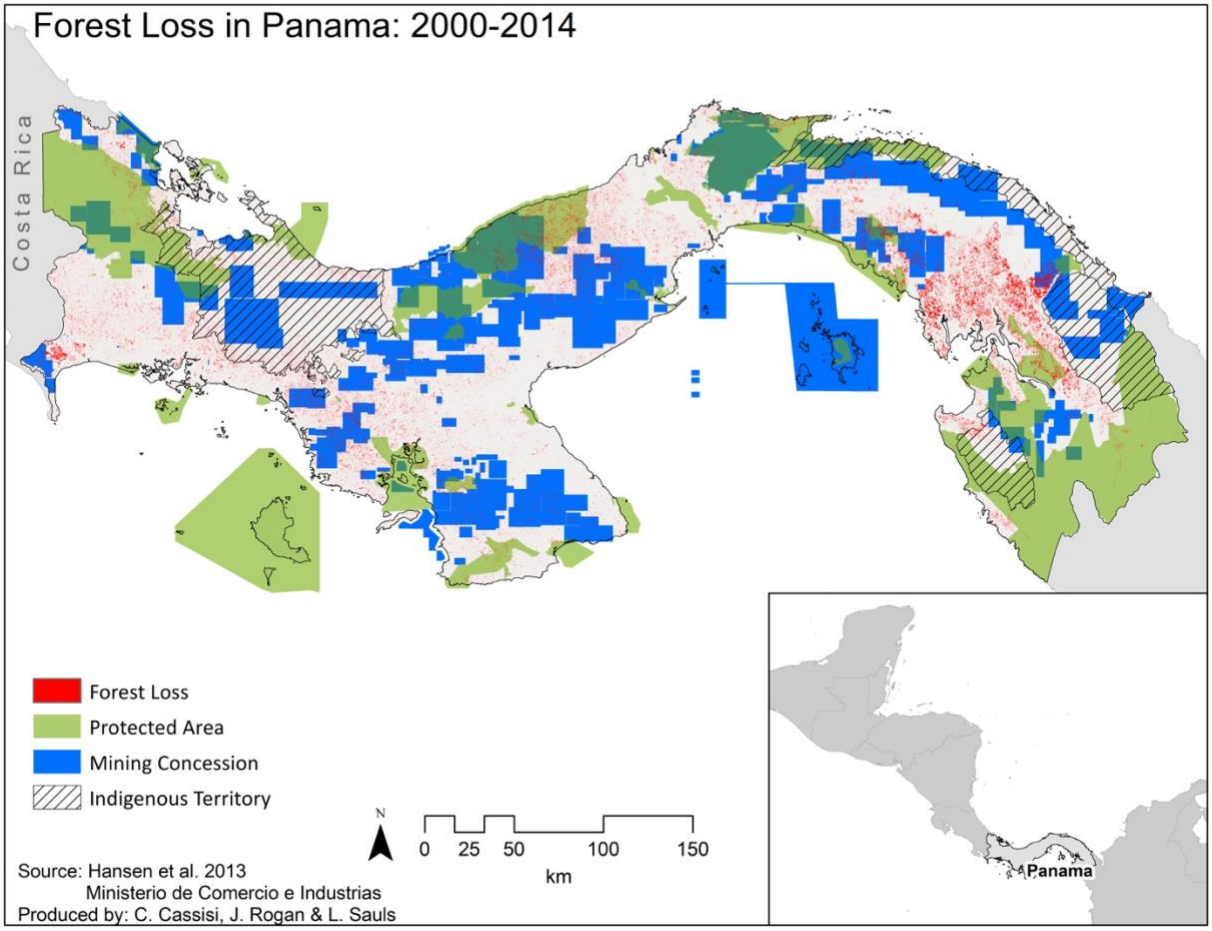

Figure 5. Mining concessions, protected areas, indigenous *comarcas*, and forest loss in Panama.

C. Indonesia: Sumatra

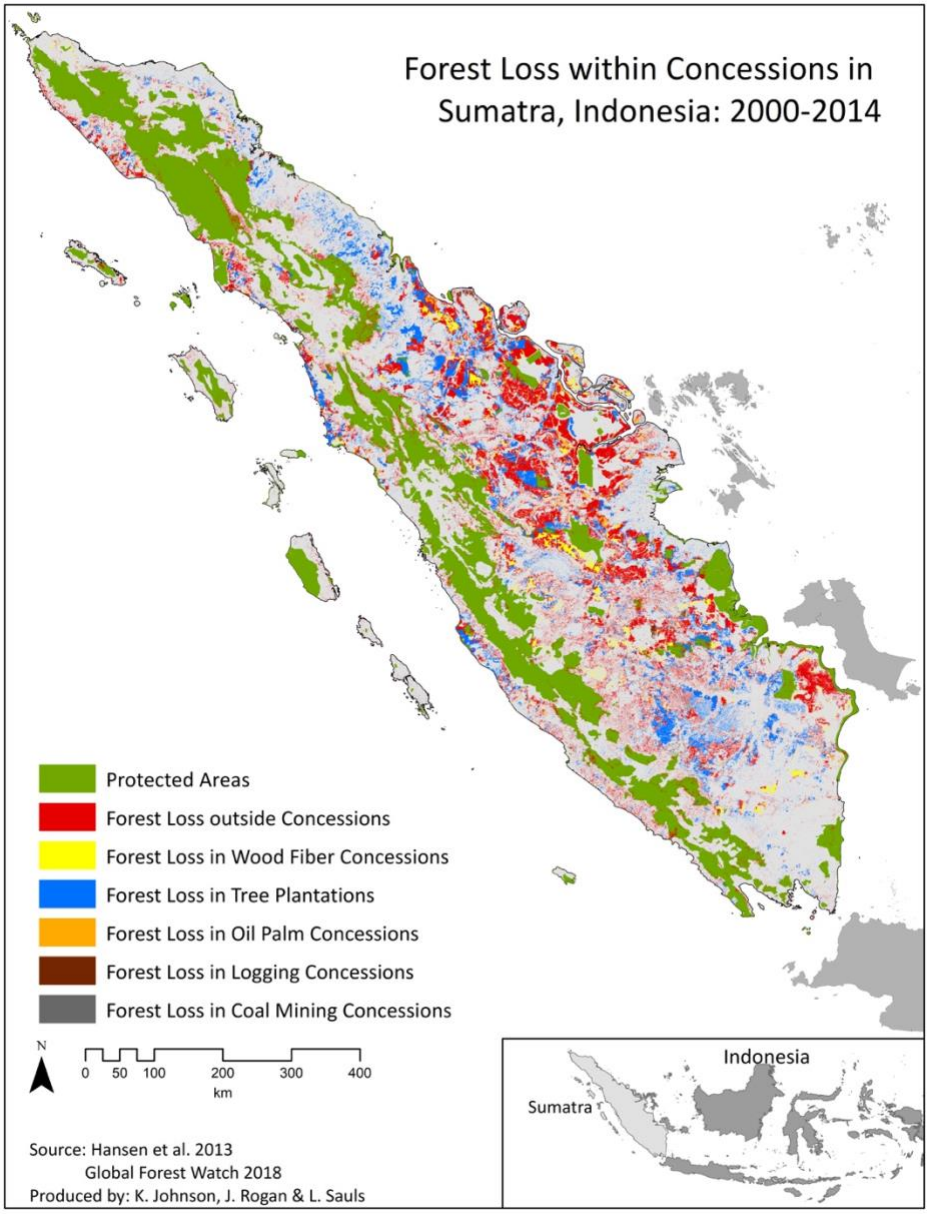

Figure 6. Natural resource concessions and forest loss in Sumatra, Indonesia. This figure includes concessions for oil palm, wood fiber, logging and tree plantations in addition to coal and mining, and shows deforestation within each concession type.

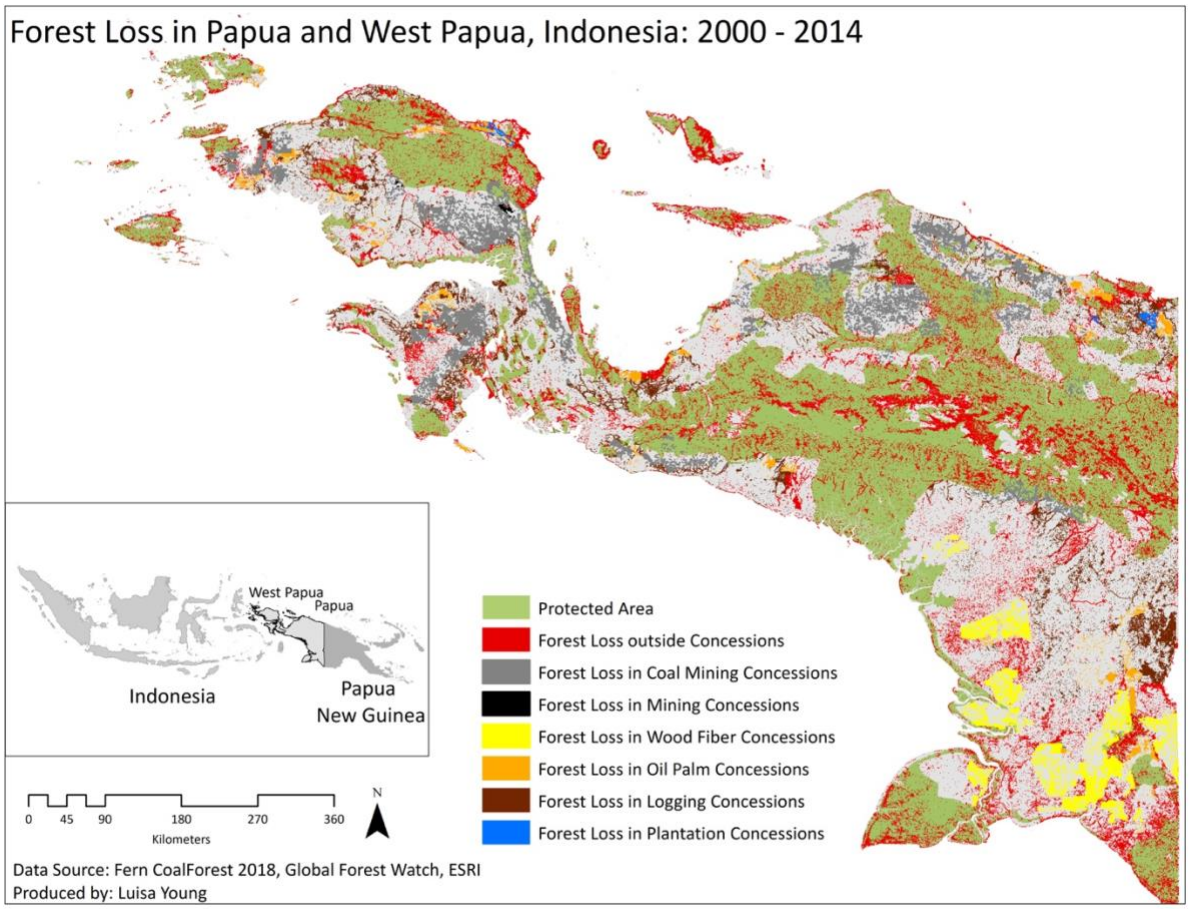

Figure 7. Natural resource concessions and forest loss in West Papua, Indonesia. This figure includes concessions for oil palm, wood fiber and pulp, logging, and tree plantations in addition to coal and mining, and shows deforestation within each concession type.