THOUGHT PIECE • AUGUST 2021

How Will the Global Economic Crisis Linked to the Covid-19 Pandemic Affect Tropical Forests?

Climate and Forests 2030

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Background

The Climate and Land Use Alliance (CLUA), with the support of Meridian Institute, is exploring the integration of climate and land use with justice, equity, health, and economic recovery through Climate and Forests 2030: Resources for Funders. This focus is intended to inspire innovation and investment in integrated work on forests, rights, and sustainable land use and will inform a new strategic plan for CLUA for the period 2021 to 2030.

To inform the thinking, CLUA commissioned a series of "thought pieces" to provide diverse inputs into developing a more integrated approach for forests and land use. These are meant to stimulate discussion and debate and are not intended to reflect the views of CLUA, its member foundations, or Meridian Institute.

The views expressed in this paper are those of the authors. They have been informed by commentary and input by a range of experts. The authors gratefully acknowledge comments from Astrid Agostini, Chris Barr, Rhett Butler, Augusto Castro, Penny Davies, Chris Elliott, Isadora Ferreira, Thais Linhares Juvenal, Pablo Pacheco, Ewald Rametsteiner, Walt Reid, Frances Seymour, and Daniel Zarin.

Abstract

Economic trends often affect land use as much as or more than environmental policies, especially in the Global South. The Covid-19 pandemic provoked the greatest global economic downturn since the 1930s. Even if global output returns to pre-Covid-19 levels soon, which is far from certain, the pandemic will have long-lasting economic effects. Anyone concerned with the outlook for tropical forests and the associated impacts on climate should consider these effects.

Economic crises affect output, investment, income, exchange rates, prices, government revenue, and spending. Some of these effects increase forest loss and degradation, while others reduce it. When crises lead to lower producer prices for agricultural products and minerals and less investment in building and maintaining roads, deforestation tends to decrease. On the flipside, deforestation can increase if crises reduce non-farm employment and public investment in rural environmental activities and indigenous land rights. A pandemic may lead to similar effects, if fear of contagion and social distancing measures limit governments' abilities to regulate activities in the field. While lower forest product prices may reduce unsustainable logging, they can also discourage reforestation and sustainable forest management.

One year into the crisis, it is too soon to assess Covid-19's medium-term impact on the world economy and the net effect on forests. Some initial signs pointed to lower pan-tropical deforestation — these include reduced demand for biofuels, beef, fossil fuels, and some minerals; delayed or scaled-back mining, energy, and infrastructure investment projects; and less commercial and residential construction. Exchange rate devaluations in some tropical countries, soaring gold prices, declines in government environment budgets, and policies designed to boost extractive industries and agricultural exports point in the opposite direction.

The initial indications are that to date, on balance the pandemic may have modestly increased global deforestation of primary tropical forests, although that is not certain. Many pre-existing trends have proven to be remarkably resilient, despite the major shock. Globally, loss of primary tropical forest in 2020 was 12 per cent higher than during the same period the previous year. That may be crisis-related or simply the continuation of a pre-existing trend towards rising global deforestation.

In recent months, unprecedented fiscal and monetary stimulus policies have tended to reverse some trends that characterized the crisis' economic impacts over the first three months. Some commodity prices, exchange rates, and capital flows have tended to revert towards their pre-crisis levels, and price volatility has greatly increased. Chinese commodity imports have risen; government fiscal and monetary policies have largely sustained food consumption; and construction has started to recover. Even in Latin America — the region worst hit by the crisis — there are few signs so far that the economic collapse has altered prospects for cattle ranchers or soybean growers.

Nonetheless, the global economic recovery remains fragile, uneven, and unusually uncertain. While the International Monetary Fund (IMF) and many other economic forecasters are cautiously predicting the global economy will grow again in 2021, one must take those predictions with a grain of salt.

It seems likely the pandemic's economic effects will significantly affect land use over the coming decade. It is hard to say in what direction, but one can point to a few key variables to keep an eye on. These include demand and prices for commodities linked to forest destruction, exchange rates, public spending on transportation infrastructure and environmental activities, off-farm employment opportunities, migration between rural and urban areas, and foreign assistance trends, among others.

Introduction

Economic trends often influence forest cover and other land uses in the Global South as much as or more than environmental policies. Changes in commodity prices, household incomes, wage rates, and government revenue and spending affect the profitability of farming, forestry, mining, and other activities that shape land use. Since economic crises affect those variables, they can greatly impact deforestation, forest degradation, reforestation, and forest regrowth.[1]

The Covid-19 pandemic provoked what is already the greatest global economic downturn since the Great Depression of the 1930s.[2] In response, governments have provided 12 trillion USD in fiscal stimulus and adopted highly expansionary monetary policies.[3] This unprecedented fiscal and monetary stimulus has eased and, in some cases, reverted the sharp deterioration in many economic variables during the crisis' initial months. Economic forecasters now predict a return to positive global economy growth in 2021.[4]

Nonetheless, the recovery is fragile, downside risks remain high, and outcomes will vary widely between sectors and regions.[5] Global economic forecasts have been over-optimistic in recent years and should be taken with a grain of salt.[6] Even if global output recovers in the next few years, which is far from certain, the pandemic will have long-lasting economic impact. That will affect the outlook for forests and land use, especially in Latin America, where the crisis has hit the hardest.

This paper provides a preliminary assessment of how the crisis may affect tropical forest cover and health. Given the unparalleled level of uncertainty, it focuses on identifying the relevant variables and their possible effects and reviewing the evidence to-date, rather than making forecasts. Its theoretical framework is based on existing literature about how economic variables at different scales affect land use. The empirical discussion draws from initial analyses by inter-governmental agencies, news reports, and some peer-reviewed studies. While the report discusses tropical forests generally, it emphasizes Brazil, Mexico, and Indonesia; and focuses largely on the role of companies, medium and large farmers, and community enterprises, rather than subsistence farmers. Given the central role of beef, palm oil, pulp and paper, soybeans, and timber in tropical forest loss, these commodities feature prominently.[7]

The authors would be the first to admit that there are too many confounding variables and too little data in this case to draw firm conclusions, both in terms of causal attribution and a clear outlook. Nevertheless, they believe the analysis provides a useful framework to further analyze the issue.

The crisis and its effects are evolving rapidly. Unless stated otherwise, the paper's description of the current situation refers to where things stood and what was known as of November 2020.

Section 1 presents a theoretical framework for understanding how economic crises affect forest cover and quality. Section 2 describes the global economic crisis resulting from the Covid-19 pandemic. Section 3 looks at the crisis' impacts in advanced economies that may affect tropical land use. Section 4 provides an overview of the impacts in low- and middle-income countries, and then looks at three specific cases — Brazil, Mexico, and Indonesia. Section 5 examines about what has happened to forests since the pandemic began. While Sections 3 and 4 hypothesize about how the crisis *might* have affected forests based on the theoretical framework and the evolution of the crisis itself, Section 5 assesses the limited information available about the ultimate impacts on the forest. The conclusion summarizes key findings, and the appendix discusses those findings' implications for the strategies of the Climate and Land Use Alliance (CLUA).

1. Theoretical framework

This paper approaches land use change from a standard micro-economic perspective. We assume that anything that increases an activity's profitability will make it expand, and vice versa, although the magnitude of these responses will depend on how labor- and capital-constrained producers are.[8]

[1] *Kaimowitz, Thiele, and Pacheco 1999; Sunderlin and Pokam 2002; Sunderlin* et al. *2003; Wunder 2003; Geveau* et al. *2009.*
[2] *CEPAL 2020.*
[3] *Georgieva 2020.*
[4] *IMF 2020.*
[5] *Georgieva and Gopinath 2020; Georgieva 2020.*
[6] *Burgess* et al. *2020.*
[7] *Pendrill* et al. *2019; Nolte* et al. *2017.*
[8] *Andelsen and Kaimowitz 2001.*

Similarly, whether that expansion takes the form of larger areas, higher yields, or both will depend on which is more profitable.[9] Laws prohibiting activities (and enforcement of those laws) increase their costs, and hence reduce their expansion.

Empirical research supports these conclusions.[10] It generally shows that:

- Higher **agricultural prices** lead to expanding farm area and greater deforestation.
- Higher **mineral and energy prices** encourage mining and oil drilling and may lead them to expand into forested areas.
- Higher **forest product prices** have contradictory effects. They incentivize logging and harvesting of forest products, but also investment in forest management and reforestation.
- Higher **rural wages** and agricultural **input prices** drive up production costs, reducing the incentive to clear forests.
- Greater **off-farm employment opportunities** pull people out of agriculture, causing the same effect.
- Greater **road investments** near forests lower transportation costs, make agriculture more profitable, and encourage deforestation.
- Greater enforcement of **forestry laws** and communal rights discourages deforestation, illegal logging, and usurpation of communal lands by raising the costs and reducing the benefits from those activities.

Changes in government revenue and household income affect land use through the following processes:

- Higher **revenues** allow governments to invest more in activities that increase forest destruction, such as building and maintaining roads near forests, as well as those that decrease forest destruction, such as forest law enforcement, forestry projects, or protecting communal land rights.
- Households increase their **consumption** of products with positive income elasticities when their **incomes** rise, including some products linked to deforestation and forest degradation.
- When household **incomes** rise, they also have more money available to invest in **rural production**, which may lead to greater forest destruction or the opposite.

Economic crises affect all these variables, often through multiple and complex pathways:

- They reduce government revenues and household income. That puts downward pressure on producer prices, especially for products and services whose demand varies greatly when incomes decline.
- Conversely, they may trigger net capital outflows from the Global South, provoking devaluations in tropical countries, which raises the producer prices in national currencies of many primary commodities.
- They tend to lower rural wages and input costs (especially of domestically-produced inputs), which makes production more profitable.[11]
- They reduce off-farm employment and remittances, encouraging people to return to farming, artisanal mining, and harvesting natural products.[12]
- They drive down government expenditures — in general, but especially in activities that are often considered low priority domestically, such as environmental protection.

So, some effects of economic crises tend to decrease forest destruction, while others increase it. Lower commodity prices and reduced government support for infrastructure, productive activities, and social protection near forests tend to protect natural forests.[13] Less off-farm employment, lower rural wages, devaluating local currencies, and lower government support for the environment have the opposite effect. Lower remittances mean people may have to farm more, but with less money to do so.

[9] Andelsen and Kaimowitz 2001.
[10] See Busch and Ferretti-Gallon 2017; Laurance et al*. 2014; Angelsen and Rudel 2013; Pfaff, Amacher, and Sills 2013; Kaimowitz and Angelsen 1998.*
[11] This does not apply to small farmers or miners that do not employ any outside labor.
[12] Saavedra 2020. However, this also means they have less money available to invest in activities linked to forest destruction.
[13] However, this may also limit investment in reforestation, agroforestry, and active forest management.

Economic crises resulting from pandemics also have some unique features. Supply can fall temporarily because workers are sick or because activities shut down due to health concerns; and lower supply typically raises prices. In this case the situation is likely to revert as soon as the pandemic is under control. People may also change their short- or long-term consumption habits based on health risks and regulations, and that may also affect prices. Governments may prioritize national production of strategic goods (e.g., food, energy, technology) over continued globalization and trade-led specialization.

Crises linked to global pandemics affect both tropical countries and high-income countries that engage in financial transactions with them. Depressed high-income economies import less and provide less foreign assistance and remittances. When international commodity prices are lower, multinational companies have less incentive to invest in farming, mining, and drilling in lower-income countries.

Table 1 *(Page 4)* presents pathways through which the Covid-19 economic crisis may affect tropical forests. With such a multiplicity of contradictory trends, one cannot predict the net outcome ex ante. However, this sort of analysis can provide a roadmap for what to look out for. The remainder of the paper examines how these processes have played out to-date in practice and what might be expected in the future.

2. The global economic crisis resulting from the Covid-19 pandemic

It is hard to fathom the magnitude of the economic downturn caused by the pandemic. Global economic output is projected to fall 4.4% in 2020 — by far the largest decline since the Second World War. In Latin America, the worst-hit region, the expected decline is almost double (8.1%); in India, it is 10.3%.[14] Total exports from Emerging Market and Developing Countries are likely to fall 7.7%. Average oil prices are expected to be down 32.1% in 2020. Between the 4th quarter of 2019 and the 2nd quarter of 2020, the world lost the equivalent of 400 million jobs. Globally, an additional 90 million people are predicted to fall below the $1.90/day threshold of extreme poverty this year.

> *Crises linked to global pandemics affect both tropical countries and high-income countries that engage in financial transactions with them.*

The pandemic and related health measures directly affected both the supply and demand of goods and services. Governments restricted the operations of many businesses to limit the virus' spread. Workers were forced to stay home due to illness or to mind for children who could no longer go to school. Consumers went out less to avoid contracting the virus, reducing demand for restaurants, transportation, and entertainment, and saved more to prepare for an uncertain future.

This, in turn, had huge indirect consequences. Businesses laid off workers in response to tanking demand, and the laid off workers were forced to consume less and/or default on loans. Many firms could not cover their debts or raise additional capital. Rising uncertainty made companies hesitate to invest. Defaults and low interest rates put pressure on bank profits and liquidity. Lower corporate revenues, household incomes, and spending depressed tax revenues, just as governments were forced to spend more on health, social protection, and fiscal stimulus. Each process multiplied the negative effects of the others, at least until governments used stimulus measures to put a break on and reverse the downward spiral.

Despite declining demand for fuel, some major oil producers initially maintained their output, triggering a collapse in prices, which fell 60% between February and April 2020. That forced producers to reverse course and curtail production in April, lifting oil prices, although they stayed well below pre-crisis levels.

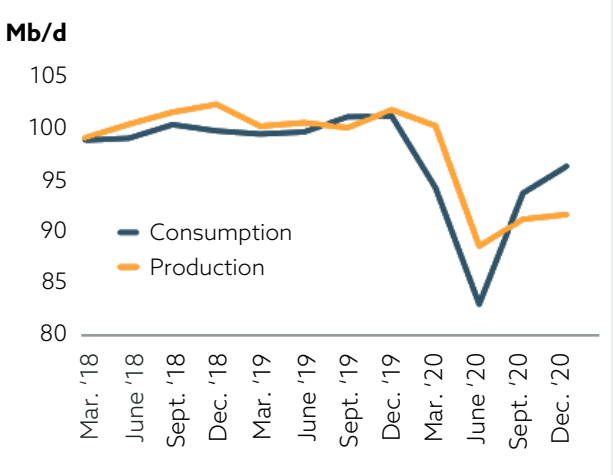
Had these trends gone unchecked, the global economy would have undoubtedly entered a prolonged depression, unlike anything in recent history. However, governments and international agencies responded forcefully. They provided fiscal stimulus and liquidity support to maintain

[14] *Unless stated otherwise, the data in this section comes from IMF 2020.*

TABLE 1: How a Global Economic Crisis Linked to Covid-19 Might Affect Tropical Forest Loss

INITIAL EFFECTS OF THE CRISIS	SECONDARY EFFECTS	TERTIARY EFFECTS	IMPACTS ON FORESTS
Advanced Economies			
GDP ↘	Energy prices ↘	Biofuel crop prices ↘ Biofuel investment ↘	Forest loss ↘
GDP ↘	Energy prices ↘	Oil & coal investment ↘	Forest loss ↘
GDP ↘	Industrial mineral use ↘	Mineral prices ↘ Mining investment ↘	Forest loss ↘
Economic uncertainty ↗		Gold prices ↗ (search for safe havens)	Forest loss ↗
Poverty ↗	Non-staple food and forestry imports ↘	Demand for beef, oil palm, soybeans, paper for printing ↘	Forest loss ↘
Poverty ↗	Remittances ↘ Household income in forest countries ↘	Household consumption & investment in farms ↘	? (depends on relative impact on consumption and investment)
GDP ↘	Foreign aid ↘ (if tied to GDP)	Foreign aid for environment ↘	Forest loss ↗
Profits ↘	Stock market ↘	Foundation funding ↘	Forest loss ↗
Tropical Forest Countries			
International commodity prices, remittances, tourism, and Foreign Direct Investment ↘	Exchange rates devalue	Domestic export commodity prices ↗	Forest loss ↗
International commodity prices ↘	Natural resource private investment ↘	Commodity production ↘	Forest loss ↘
Poverty ↗	Non-staple food consumption ↘	Non-staple food prices and production ↘	Forest loss ↘
Food sector productivity temporarily ↘ (sickness, disruptions)	Food prices ↗		Forest loss ↗
GDP ↘	Off-farm employment ↘ Urban to rural migration ↗	Agricultural labor supply ↗	Forest loss ↗
GDP ↘	Construction & durable good purchases ↘	Wood-product demand ↘	Logging ↘ but forest management / reforestation also ↘
Tax revenues ↘	Public expenditure ↘	Infrastructure investment ↘	Forest loss ↘
Tax revenues ↘	Public expenditure ↘	Environment spending ↘	Forest loss ↗
International loans / grants for government budget support ↗		Public spending ↗	? (depends on composition of public spending)
GDP ↘	Political pressure for deregulation ↗	Environmental laws and enforcement ↘	Forest loss ↗

FIGURE 1: Global Oil Consumption and Production, March 2018 – December 2020



Source: World Bank 2020. Note: Last observation is 2020 Q3. 2020 Q4 shows IEA forecast for consumption and non-OPEC production. OPEC production is assumed to remain constant at September levels.

employment and consumption, keep businesses afloat, encourage investment, restore confidence, and counterbalance deflationary tendencies. The major central banks coordinated hyper-expansionary monetary policies, which included liquidity expansion ("money printing"), purchases of bonds and stocks, and negative interest rates. Together with the easing of lockdowns, this allowed them to partially revert the downward trend and stabilize some economic indicators between May and October 2020. Although unemployment and poverty levels remained unusually high, debt and default levels rose, and many sectors faced major problems, the authorities successfully kept most economies from spiraling out of control, at least in the short run.

The crisis unfolded differently in each region. The virus struck first in China and hit hard. However, thanks largely to its fast and decisive response to the outbreak, the economy quickly began to recover. China is now on track to be the only major country with positive economic growth in 2020.

From China, the virus spread rapidly to Western Europe and the United States, where production, retail sales, and equity markets fell abruptly in February. These trends for the most part reverted in the 3rd quarter, thanks largely to stimulus efforts and a partial return to pre-Covid-19 lifestyles and working habits. It remains to be seen how this autumn's major second wave of Covid-19 infections in the US and Europe will affect economic performance. This time the lockdowns have been less stringent, but the stimulus packages more limited.

In many low- and middle-income countries, the economic effects of the pandemic slightly preceded the spread of the disease within their national territories. Many were hit hard by the decline in international commodity prices (especially the oil producers), and faced rapid capital outflows and depreciating exchange rates before having many infections of their own. The subsequent proliferation of the virus greatly compounded the impacts, especially on employment and tax revenues. Some of these countries were able to respond with fiscal and monetary stimulus, but it was much more modest, due to their resource constraints. While the partial stabilization of the advanced economies and official lending helped to stabilize these countries' terms of trade and access to capital in the 3rd quarter, their economies remained depressed.

At the time of this writing, the medium-term outcome for the global economy is extraordinarily uncertain. The IMF forecasts that the global economy will grow 5.2% in 2021, and almost return to pre-crisis levels.[15] However, they expect this growth to be very unequal. While they predict the Chinese economy will grow 8.2%, they only expect 3.6% growth in Latin America.

Still, this outlook may be way too rosy. Since the Great Recession of 2008-2009, IMF forecasts have systematically overestimated predicted growth rates.[16] The IMF itself recognizes that the medium-term outlook is unusually uncertain. Key risks include: failure to control the pandemic itself and the need to impose new sanitary restrictions; premature withdrawal of fiscal and monetary stimulus policies; skyrocketing public and private debt with potential for spiraling defaults; tightening of financial markets in response to risk concerns; and persisting effects of long-term joblessness and underinvestment in and lack of access to healthcare and education.

[15] *Although the output lost in 2020 would still be lost.*
[16] *Burgess* et al. *2020.*

3. Impacts of the crisis on advanced economies that affect tropical land use

Table 1 identified eight ways that the impacts of economic crises on advanced economies[17] might affect forests and land use in tropical countries. Four are linked to the general decline in economic output and the others to the decline in corporate profits, rising poverty, and increased risk and uncertainty. This section analyzes how each of these have played out during the crisis so far.

Energy prices

In 2020, the pandemic is projected to reduce total global energy demand by 5% and demand for oil by 8%.[18] This is partly due to the general contraction of economic activity, but also because people stayed home more because of the pandemic.[19]

The drop in demand pushed down energy prices, especially until major oil producers agreed to rein in production. That, in turn, put downward pressure on biofuel prices since biofuels are substitutes for oil.[20] As petroleum became cheaper, Malaysia and Indonesia found it more expensive to require that oil refiners include palm oil in their fuel mixtures.

Palm oil and soybean oil (used for biodiesel) and sugar (used for ethanol) prices declined precipitously between January and May.[21] This reduced the incentives for clearing forest for soybeans, palm oil, or sugarcane.

Since then, vegetable oil prices have gradually returned to their previous level, largely due to poor soybean harvests in the United States and an upswing in Chinese demand for palm oil.[22] In November, soybean futures prices were at their highest level in four years.[23] Even so, lower economic output and energy prices continue to exert downward pressure on vegetable oil prices.[24]

Low energy prices also discourage investment in coal and oil production. As a result, global investment in energy is expected to fall by almost one-fifth in 2020.[25] While the indirect macroeconomic effects of less fossil fuel production are complex,[26] the direct effect is a reduction in local forest clearing, hunting, and logging. This is especially relevant in the case of surface mining of coal, which has become an important driver of deforestation in several countries.[27]

Beef prices

During the first nine months of 2020, workers' total income from labor in high-income countries declined 9%.[28] Unemployment soared. While government income support measures compensated for some of this, millions of low- and middle-income families

TABLE 2: World Bank Global Monthly Energy and Metals Price Indexes, October 2019 – September 2020 (January 2019 = 100)

	OCTOBER 2019	DECEMBER 2019	FEBRUARY 2020	APRIL 2020	MAY 2020	JUNE 2020	AUGUST 2020	SEPTEMBER 2020
Energy	96	104	88	*40*	53	65	73	69
Metals	101	102	96	*87*	90	97	110	112

Source: World Bank 2020. Note: Minimal level in italics.

[17] *Much of this discussion also applies to the emerging market economies of China and India.*
[18] *IEA 2020.*
[19] *Broom 2020; Wang, Shao and Kim 2020.*
[20] *Barichello 2020; Elleby* et al. *2020; FAO 2020.*
[21] *The international price indices for vegetable oils and sugar fell 28% and 23% respectively during that period (FAO 2020b).*
[22] *FAO 2020; Neo 2020. Chinese palm oil consumption dropped a bit between January and March but later grew from April through September (Neo 2020).*
[23] *Food Business Now 2020.*
[24] *Elleby* et al. *2020; FAO 2020.*
[25] *IEA 2020.*
[26] *See Wunder 2003. The effects of energy prices on exchange rates and tax revenues are discussed in Section 4.*
[27] *Bebbington et al. 2018.*
[28] *ILO 2020.*

TABLE 3: FAO Global Food Price Indexes, October 2019 – October 2020 (2014-2016 = 100)

	OCTOBER 2019	DECEMBER 2019	FEBRUARY 2020	APRIL 2020	MAY 2020	JUNE 2020	AUGUST 2020	OCTOBER 2020
Food (general)	95.2	101.0	99.4	92.4	*91.0*	93.1	95.8	100.9
Vegetable oils	84.1	101.5	97.6	81.2	*77.8*	86.6	98.7	106.4
Sugar	77.8	83.0	91.4	*63.2*	67.8	74.9	81.1	85.0
Meat	101.6	106.6	100.6	96.9	95.4	94.8	92.2	*90.7*

Source: FAO Food Price Index. Note: Minimal level in italics.

faced increasing hardships.[29]

As families earned less, worried more about the future, and became less willing or able to go out in the middle of the pandemic, their consumption patterns shifted. They generally saved more, including some of the emergency assistance they received from governments. They ate more at home and less at restaurants.[30] Less trips to the market often translated into fewer fresh fruits, vegetables, and flowers.[31]

Comparatively speaking, food purchases generally do not change that much when lower-middle class people earn less income. However, meat and dairy products, especially beef, are a partial exception.[32] Just as people tend to consume more beef (and eat out more) when they have more income, they buy less when their incomes fall and they stay at home more.[33] Meat sales dipped in some high-income countries, largely due to less eating in restaurants.[34] Food safety concerns, linked to media coverage of zoonotic diseases and industrial meat production, may have also discouraged meat consumption.[35]

Globally, world meat production in 2020 was forecast to be 1.7% lower than in 2019. This was partially due to a sharp drop in global pork production because of African swine fever disease, but falling beef production, especially in the United States and Australia, also played a role.[36]

It is hard to say how much the decline in beef production affected the incentives for extensive cattle ranching, which is the largest direct cause of deforestation in Latin America. One global commodity market model found the global economic downturn could be expected to reduce international meat prices by 7-18% in 2020 compared to a business-as-usual situation;[37] and international beef prices did modestly decline.[38] Nevertheless, the same model predicted that beef prices would recover rapidly, and Latin American beef exports have been increasing.[39]

One major reason declining beef consumption in high-income countries did not affect Latin American cattle ranchers more was that China's beef imports from the region continued to expand. In part this simply reflected a continuation of the long-term rise in China's appetite for animal protein. However, the need to substitute lost pork production due to swine fever and China's rapid success at vanquishing the

[29] These hardships were much more severe in middle-income countries. For example, Latin America´s workers lost 19.3% of their total income from labor and received little support from governments (ILO 2020).
[30] Rude 2020.
[31] ECLAC and FAO 2020.
[32] Elleby et al. *2020.*
[33] Gallet 2010; Zhou et al. *2020.*
[34] The shift away from eating in restaurants, hotels, and cafes also largely explains the sharp decline in palm oil consumption and imports in India, the world´s largest importer of edible oils (Fernandes 2020). Indian palm oil imports were 13.9% lower in August 2020 than in August 2019 (The Hindu 2020).
[35] Attwood and Hajat 2020.
[36] FAO 2020.
[37] Elleby et al. *2020.*
[38] ECLAC 2020.
[39] ECLAC and FAO 2020.

virus were also key.[40]

In sum, the economic crisis modestly reduced the incentives to clear forests to expand pastures, but other factors compensated for that. The net effect has probably remained small so far.

Mineral prices

With less construction and production of durable goods during the first months of the crisis, the demand for metals such as aluminum, copper, nickel, and tin declined sharply, pushing down international prices between 10% and 17%.[41] However, by the 3rd quarter most prices had recovered or surpassed their 2019 levels, driven by the recovery of the Chinese economy and pandemic-related supply disruptions.[42]

The crisis led the world's largest mining companies to cut back their capital expenditures.[43] Whether that reduces pressure on forests is likely to depend on what happens in the coming year or so.

In contrast, gold prices and production tended to rise during the crisis, reaching an all-time high of $2,067 US dollars per ounce in August.[44] Investors looked to gold as a safe haven and safeguard against possible inflation driven by massive money printing in an uncertain climate with very low interest rates.

In recent decades rising gold prices have generally led to greater deforestation, especially by artisanal and small-scale miners.[45] The Covid-19 crisis magnified that process. As prices rose and other livelihood options crumbled, many people flocked to artisanal mining, creating a veritable gold rush.[46]

Forest product prices

As a result of lockdowns, falling household incomes, and high levels of uncertainty, global construction output is projected to contract 3.1% in 2020 (5.3% if one excludes China).[47] As with many other sectors, the slump was worse in the 2nd quarter and then eased, especially in China and the United States.

Largely as a result, imports of tropical forest products to the European Union (excluding the United Kingdom), United States, Japan, China, and India fell significantly in the first seven or eight months of 2020 compared to the same period the previous year. In most cases imports exhibited clear signs of recovery by August; however, EU imports came under pressure again as the epidemic worsened in a new wave later in the fall.[48]

Previous research in China, Japan, and the United States shows that domestic lumber prices tend to decline when construction does.[49] In this case, the

TABLE 4: Global Metal and Mineral Prices, 4th Quarter (2019 – September 2020)

	4TH QUARTER 2019	1ST QUARTER 2020	2ND QUARTER 2020	3RD QUARTER 2020	SEPTEMBER 2020
Aluminum	1,754	1,691	*1,498*	1,708	1,744
Copper	5,898	5,634	*5,351*	6,525	6,705
Nickel	15,349	12,690	*12,237*	14,266	14,857
Tin	16,693	16,267	*15,731*	17,690	17,951
Gold	1,482	1,583	1,710	1,912	1,922

Source: World Bank 2020. Notes: All $/mt, except gold, which is $/oz. Minimal level in italics.

[40] ECLAC 2020; FAO 2020; Rude 2020; The Cropsite 2020. China´s pork production fell 40% in 2019, largely as a result of swine fever (de Alba 2020).
[41] ECLAC 2020.
[42] World Bank 2020. Outside China, global demand for most minerals remains depressed.
[43] Mining.com 2020; ECLAC 2020b. In some cases, the pandemic itself also forced shutdowns in operations.
[44] World Bank 2020.
[45] Alvarez-Berríos and Aide 2015; Swenson et al. *2011.*
[46] Quijano-Vallejos 2020.
[47] Businesswire 2020.
[48] ITTO 2020, 2020c; Downs 2020. In the Chinese case, the volume of tropical sawn wood imports increased 2%, but the average price fell 13%.
[49] Hansen and Luppold 1992; Zhang et al. *2015; Prestemon* et al. *2018.*

evidence seems mixed. While China and the United States reported a modest decline in the average unit prices of imported tropical sawn wood, the trend varied greatly, depending on product origin and timber species.[50] World Bank tropical timber price statistics for Africa and Southeast Asia show few price declines after the 2nd quarter.[51]

Some products and sectors fared better than others. Many families repaired and remodeled existing houses rather than purchase or build new ones.[52] While the closure of offices and schools meant less demand for paper, the boom in online shopping and home deliveries drove up cardboard use. Falling fuel prices and demand for paper hit wood pellet and pulp markets especially hard.[53]

On balance, these trends probably made legal logging in the tropics less profitable, at least for a few months. Low pulp and wood pellet prices and high uncertainty may have discouraged new investments in wood fiber and forest plantations.

Remittances

Remittances are extremely important for low- and middle-income countries. In 2019, they brought in more foreign exchange than either Foreign Direct Investment or Overseas Development Assistance.[54]

Migrant workers living in the United States, Europe, and the Gulf Cooperation Countries were disproportionately affected by the economic crisis, compared to native-born workers. The loss of jobs and incomes left them with less money to send home to their families. During the pandemic it became harder for new migrants to arrive. Consequently, remittance flows to low- and middle-income countries are projected to decline by 7.2% in 2020, and the trend is likely to continue through 2021.[55]

The largest decline in remittances has been outside the tropics, in Eastern Europe and Central Asia. Of the tropical regions, Sub-Saharan Africa, Southeast Asia, and the Andean countries were among the most affected. In aggregate, Latin American remittances were practically constant, falling in some countries, but rising in others; they are expected to decline significantly in 2021.[56]

Remittances affect the agricultural investments, labor supply, and food consumption of households that receive them, as well as macroeconomic indicators such as exchange rates and tax revenues. *Ex ante*, it is hard to say whether, on balance, a drop in remittances would increase or decrease forest clearing or logging.[57] However, it is likely to reduce investment in household tree planting.

International tourism

Following decades of remarkable growth, tourism had come to generate some 10% of global GDP.[58] In tropical countries, tourism is a major source of both foreign exchange and employment. For instance, some 10 million Africans work directly and 14 million indirectly in the sector.[59] In certain regions, ecotourism has created new livelihoods options, playing a leading role in market-based conservation, and in integrated conservation and development strategies in the buffer zones of protected areas.[60]

Yet, by early May, Covid-19 restrictions (and voluntary travel avoidance) had brought global air traffic to a standstill (declining some 95%).[61] And, unlike most other sectors discussed here, tourism has been slow to recover and it may take years for it to regain its previous levels. Globally, the World Bank estimates that 50 million jobs in the travel and tourism sector may disappear.[62]

As with remittances, the impact on forests of these large foreign exchange losses and related macroeconomic effects is ambiguous. However, lost local tourism employment in rural areas will undoubtedly jeopardize strategies that use ecotourism revenues as incentives for maintaining standing forests. As more people fall back on agriculturally-based livelihoods, the environmental pressures on forests may increase.

International assistance

Many tropical country governments and civil society organizations rely significantly on international

[50] *ITTO 2020.*
[51] *World Bank 2020.*
[52] *AJOT 2020.*
[53] *AJOT 2020; Heller 2020.*
[54] *World Bank 2020b.*
[55] *Ibid.*
[56] *Ibid. Latin American remittances fell sharply in the 2nd quarter but recovered in the 3rd quarter.*
[57] *Ospina, Peterson, and Crépin 2019; López-Feldman and Chavez 2017.*
[58] *WTO 2019.*
[59] *Taylor 2020.*
[60] *Büscher and Fletcher 2020.*
[61] *IATA 2020.*
[62] *Zeufack* et al. *2020.*

assistance for their activities related to forests and environment. The economic downturn in high-income countries could significantly reduce that assistance, although that is still uncertain.

Many high-income countries are committed to maintaining their Official Development Assistance (ODA) as a percentage of Gross National Income (GNI). That means that when their economies shrink, their international cooperation may shrink as well. It has been estimated that if countries with advanced economies were to maintain the same ratio of ODA to GNI as in 2019, total ODA could decline from $11 to $14 billion US dollars in 2020.[63]

Most 2020 ODA budgets were approved before the pandemic, so the main impact is not likely to be felt until 2021. One major bilateral donor, the United Kingdom, has already announced that it will reduce its total ODA in 2021 from 0.7% of GNI to 0.5%, at least partially because of the pandemic.[64] It is unclear how the crisis might affect the percentage of ODA that goes to forests, climate, and environment. However, on balance, it is likely to complicate efforts to mobilize resources.

While ODA is often tied to GNI, philanthropic funding tends to track the equity markets. Like the rest of the economy, global equity markets fell precipitously at the beginning of the pandemic. However, by September they had regained much of what they had lost, thanks largely to massive monetary injections by central banks.[65] Future foundation funding will depend heavily on how this evolves going forward.

Summary

The economic downturn in advanced economies led to declines in international commodity prices, commodity imports, and related investments, which could have reduced pressure on tropical forests (gold is a notable exception).[66] However, most declines were effectively counteracted by the impact of stimulus policies and other factors. It is too early to assess the effects of the decline in remittances and tourism, and a potential reduction of Overseas Development Assistance.

4. Impacts of the crisis on tropical countries that affect land use: An overview

The crisis hit many key tropical forest countries hard. Real GDP is expected to fall more than 5% in 2020 in Bolivia, Brazil, Colombia, Ecuador, India, Malaysia, Mexico, Peru, Philippines, Republic of Congo, Thailand, and Venezuela. In some countries the drop will probably exceed 10%. Two notable exceptions, however, are Indonesia and the Democratic Republic of Congo, where the projected decline is less than 2.5%. Overall, Latin America and Asia have been significantly more affected than Sub-Saharan Africa.[67]

Exchange rate devaluations

The initial impetus for the deterioration of these countries' economies was the decline in commodity prices, foreign direct investment, and tourism precipitated by the events in China, Europe, and the United States. Economic uncertainty and rising country risk premiums magnified these effects and triggered heavy capital outflows, especially from Latin America.

These trends prompted devaluations of national currencies in Brazil, Colombia, Indonesia, Malaysia, Mexico, Peru, and other tropical countries. That, in turn, drove up domestic producer prices for commodities (including agriculture), which offset at least some of the decline in international prices, and its potential to put a break on deforestation.[68]

Massive interventions by central banks and international financial institutions in March, designed to inject liquidity into the system and stave off fiscal crises, partially stabilized the situation, at least temporarily. Many countries' risk premiums decreased, and their capital outflows were reversed.

[63] *OECD 2020.*
[64] *Worley 2020.*
[65] *IMF 2020.*
[66] *Gold is a notable exception.*
[67] *IMF 2020.*

[68] *On the other hand, currency devaluations increased the debts in national currency of companies with dollar-denominated debts, which reduced their ability to invest in environmentally-destructive activities.*

TABLE 5: Foreign Currency Exchanges Rates per US dollars, January – November 2020

	JANUARY 2020	APRIL 2020	AUGUST 2020	NOVEMBER 2020
Brazil (real)	4.05	5.16	5.13	*5.76*
Colombia (peso)	3,297	*4,073*	3,711	3,845
Indonesia (rupiah)	13,948	*16,325*	14,470	14,625
Malaysia (ringgit)	4.13	*4.32*	4.24	4.15
Mexico (peso)	18.9	*24.5*	21.9	21.4
Peru (sol)	3.33	3.41	3.51	*3.61*

Source: United Nations 2020. Note: highest – most devalued – in italics.

Some countries' exchange rates appreciated, although most failed to return to their previous level.[69]

Rising poverty

Meanwhile, the virus was spreading in low- and middle-income countries. Many governments were forced to follow China and most high-income countries and impose social distancing and lockdown measures. By May, the World Health Organization declared South America the epicenter of the global epidemic. Many millions of people lost their jobs and incomes.[70] The combined effects of the external economic shocks and the domestic spread of the virus were devastating. The number of extremely poor people is likely to rise by more than 100 million in 2020, and hundreds of millions of others have been forced to reduce their consumption. In Latin America large percentages of the population reported running out of food during the lockdowns.[71]

With such a stark plunge in the earnings and consumption among lower income households, one might have expected domestic consumer food prices to fall. In some cases, they probably did. On average, however, domestic food prices have tended to rise.[72] This has largely been due to market distortions, supply and distribution disruptions caused by the pandemic, and the effects of currency depreciation on the price of imported foods. It is less clear what has happened to domestic producer prices, but there are few indications that changes in domestic food prices have significantly affected forests, one way or the other.

Rising economic hardships in urban areas also slowed migration from rural to urban areas and triggered substantial reverse migration from these areas back to rural villages. Sizeable reverse migration to the countryside has been reported in Kenya, Madagascar, Mexico, Nepal, Pakistan, Peru, and Uganda, among others.[73] In India, an estimated 25 million people returned to the rural areas, because they lost jobs or out of fear of the virus; and of those about 10% said they planned to stay in the villages and farm.[74] Such reserve migration increases demand for rural land and increases pressure on forests.[75]

Tax revenues and public spending

In practically all low- and middle-income countries, taxes have shrunk markedly in response to reductions in consumption, commodity prices, household incomes, and corporate projects. On average, revenues fell by even more than total economic output percentage-wise.[76]

[69] *ECLAC 2020; IMF 2020c.*
[70] *ILO 2020.*
[71] *World Bank 2020.*
[72] *ECLAC 2020b.*
[73] *Boillat and Zähringer 2020.*
[74] *Rural Marketing 2020.*
[75] *Boillat and Zähringer 2020; Fox* et al. *2020; Sunderlin and Pokam 2002.*
[76] *IMF 2020d.*

These countries' governments have been able to partially compensate through increased borrowing, at least in the short-run; aided by low-international interest rates, stepped-up lending by the IMF and multilateral development banks, and debt relief measures. This allowed most middle-income countries to increase their government expenditures as a percentage of Gross Domestic Product (GDP).[77]

Even so, the crisis strained the budgets of almost all these governments. Not only did they have less revenue, but the pandemic forced them to spend much more on health, social protection, and other compensatory measures. In addition, unless their economies can recover very swiftly, few governments will be able to sustain their current spending levels; and that is far from certain.

Three types of government expenditures affected by the crisis are likely to have major effects on forests and land use: infrastructure (especially road and port building and maintenance),[78] cash transfers / food assistance, and environmental protection / forests. Infrastructure and transfers tend to increase pressure on forests, while environmental measures tend to reduce it.[79]

Many governments have prioritized investments in infrastructure in their recovery efforts. They typically have existing pipelines of projects that have already been designed and perceive them as having large multiplier effects. Nonetheless, studies suggest fiscal constraints generally outweigh the urge to boost infrastructure investments during economic recessions; and that may happen in this case as well.[80]

Another common crisis response has been to institute emergency cash transfers, school feeding programs, and food assistance.[81] To the extent that this increased consumption of domestically-produced food products and sustained their prices, this may have increased pressure on forests.[82]

Governments cut spending on forests and environment in Brazil, Ecuador, Mexico, and Uruguay, among others, and additional cuts are likely in 2021.[83] However, some of these budgets were already trending downwards and it is hard to separate out the pandemic's specific effects. Anecdotal reports from multiple countries claim the pandemic caused decreased environmental monitoring and law enforcement efforts which increased illegal logging, mining, and forest clearing. They ascribe this decrease to budget cuts, health restrictions that impeded government officials from going to the field, and diversion of staff resources to other pandemic-related activities.[84] On the other hand, some countries, including India and Pakistan, have established large reforestation programs to create jobs as part of their economic recovery programs.[85]

With foreign direct investment, tax revenues, and employment collapsing, governments have faced great pressure to reduce environmental and labor regulations and protection for indigenous peoples and traditional communities. Corporate mining, energy, agriculture, and infrastructure interests have taken advantage of this to attempt to roll-back regulations they have traditionally opposed. This includes efforts to relax requirements for environmental impact assessments and consultations about proposed investment projects; to open new areas for mining and drilling; to freeze titling of communal lands; and to limit corporate liability and penalties for environmental violations.[86]

Summary

By stimulating currency devaluations and urban to rural migration and weakening government environmental efforts, on balance, the pandemic and associated economic crisis may have increased pressure

[77] *IMF 2020d. On the other hand, low-income countries had little choice other than to severely cut government expenditures.*
[78] *Besides the roads issue, public infrastructure projects often require wood products for building construction and furniture.*
[79] *As do investments in titling communal forest lands.*
[80] *Carranza, Daude, and Melguizo 2011; Beuran, Gachassin, and Raballand 2015.*
[81] *ECLAC and FAO 2020; Hepburn* et al. *2020; IMF 2020.*
[82] *Alix-García* et al. *2013; Ferrero and Simorangkhir 2020; Wilebore* et al. *2019. Alix-García* et al. *concluded that cash transfer projects in Mexico increased deforestation; however, Ferrero and Simorangkhir found the opposite in Indonesia.*
[83] *ECLAC 2020b. The pandemic itself also directly hindered public employees´ ability to engage in field activities, such as efforts to control illegal logging and forest fires.*
[84] *ECLAC 2020b; Fair 2020; FAO 2020c; Golar* et al. *2020; Lopez-Feldman* et al. *2020; Saavedra 2020; Zahawi, Reid, and Fagan 2020.*
[84] *One review documents a massive increase in illegal logging and forest product extraction in eleven protected areas in Nepal in the two months following the country's lockdown (Fair 2020).*
[85] *Sen 2020.*
[86] *ECLAC 2020b; Minería PanAmericana 2020; Rojas 2020.*

on forests during its initial months. Despite rising poverty, a combination of market distortions, currency depreciation, and government cash transfers and food programs have kept most domestic food prices from falling — which might otherwise have reduced deforestation. How the crisis will affect government infrastructure investments in or near forest areas remains uncertain.

5. Three case studies: Brazil, Mexico, and Indonesia

Brazil

Brazil has been one of the countries worst hit by the pandemic. The government has reported more than five million coronavirus cases and more than 160,000 deaths. Economic output is projected to decline 5.8% in 2020.[87] Construction fell dramatically between January and March, although it started to partially recover in April.[88]

Government revenue fell from 31.8% in 2019 to 28.0% in 2020 and the fiscal deficit jumped from 1% to 12% of GDP.[89] As a result the debt burden is expected to rise from 76% of GDP to 98%.[90]

Between January and May, the national currency, the real, devalued by 32%, making it the worst performing currency in the world.[91] The real subsequently appreciated a bit, but is nowhere near previous levels.

Average unemployment rose from 11.9% in 2019 to 13.4% in 2020.[92] Nonetheless, the percentage of households earning less than half the minimum wage fell by 23.7%, thanks largely to an emergency aid program introduced in April which initially provided over $100 US dollars/month to 67 million Brazilians.[93] However, the government found it difficult to sustain the program's high cost — which the IMF estimated would be 4.6% of national GDP during its first nine months.[94] Consequently, the government reduced the payments by half in August and plans to end them entirely in December.

Despite the pandemic, Brazil's agricultural sector has done well this year, especially the groups most associated with deforestation: cattle ranchers and soybean farmers. Employment in agriculture and forestry only fell 4% in Brazil between December 2019 and February 2020 and March and May 2020, compared to 14% in Colombia, and may have subsequently increased.[95]

Agricultural exports rose 17.5% from January through April. While shipments to the European Union slumped 7% from January to June, exports to China more than compensated. Soybean, beef, pork, and cotton exports to China rose especially fast.[96] Despite low international soybean prices during the first part of the year, thanks largely to the large devaluation and rising export volumes, Brazil's soybean farmers will make record profits this year.[97]

Brazilian beef exports are expected to reach record highs in 2020. Between January and August, the country exported 16% more beef than the previous year. Exports to China rose a staggering 145% in the same period, fueled by the currency devaluation and China's need to find a substitute for pork meat due to African Swine Fever. China now accounts for almost half of Brazil's total beef exports. Cattle prices have also remained above historic levels.[98]

Since the pandemic, domestic food prices have also risen significantly faster than the general consumer price index. Agricultural export growth, currency devaluations, and large cash transfers to low-income households helped to sustain them. Domestic beef and soybean oil prices are among the prices that have risen, further fueling deforestation.[99]

Brazilian mining output fell sharply in the first months of the pandemic, largely due to heavy rains and a Covid-19 outbreak in the Itabira iron ore complex.[100] However, output and exports soon recovered, thanks to currency depreciation and high iron ore and gold prices. By the 3rd quarter, total output was above the

[87] *IMF 2020.*
[88] *CEPAL 2020.*
[89] *IMF 2020d.*
[90] *Maki 2020.*
[91] *Szalay and Gross 2020.*
[92] *IMF 2020.*
[93] *Neri 2020.*
[94] *IMF 2020e.*
[95] *CEPAL 2020.*
[96] *The Cropsite 2020; ECLAC and FAO 2020.*
[97] *Colussi and Schnitkey 2020. Global soy prices rose sharply after August; however, by that point Brazil had sold most of its crop (Mano and Weinraub 2020).*
[98] *Meat and Livestock Australia 2020.*
[99] *Salati and Tooge 2020.*
[100] *ECLAC 2020.*

same period in 2019. This included a large jump in the Amazonian state of Para,[101] which accounted for 43% of national mining turnover in 3rd quarter 2020. Iron ore and gold revenues rose sharply in the 3rd quarter, and the Brazilian Mining Institute (IBRAM) increased its medium-term forecast of mining investment.[102]

The forestry sector did not fare as well as agribusiness or mining. Wood product exports declined 24% in the first six months of 2020, with pulp and paper accounting for most of that. Export volumes were stable, but international prices dropped sharply. Even so, this does not seem to have discouraged plantation investment, which tends to be based on longer planning horizons.

On the other hand, Brazilian hardwood timber prices were relatively constant in dollar terms but rose in local currency as the real depreciated.[103] These timber prices are the most relevant forestry prices when it comes to logging natural forests in the Amazon.

It is less clear what has happened to investment in roads, railroads, ports, and similar infrastructure. The fiscal crisis greatly constrained public infrastructure investment, which may fall 10% this year.[104] In response, the government redoubled its efforts to attract private investment, through public-private partnerships. These partnerships are linked to efforts to mobilize funding for 18,000 kilometers of new or improved roads, some of which could affect Amazon and Cerrado forests and woodlands.[105] How successful these efforts will be remains to be seen. A September survey found private investors much more pessimistic about the outlook for infrastructure investment than in 2019.[106]

Government spending on environmental law enforcement, monitoring, deforestation prevention and control strategies fell sharply in 2020 and is programmed to fall even more in 2021. The environmental agencies' total budget in 2021 is likely to be 35% less than in 2020. However, this trend began before the pandemic but accelerated this year.[107] Efforts are also underway to relax requirements for environmental impact assessments, permit mining in protected areas and indigenous territories, and provide tenure security for farmers who illegally occupied public lands.

In summary, many of the trends we have seen during the economic crisis might be expected to increase pressure on Brazil's forests — pressure which was already growing before the pandemic hit. Most relevant agribusiness companies, farmers, ranchers, miners, and loggers received higher prices for their products, especially those that relied significantly on exports. Environmental regulation was further weakened. Some relevant infrastructure projects were probably delayed, but it is hard to assess to what extent. The crisis' impact on domestic poverty and internal demand has so far been dampened by cash transfers and stimulus but that could change, as the latter are to be cut back.

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Mexico

Mexico has suffered an even greater economic downturn than Brazil. Analysts expect its GDP to decline 9% in 2020. As of November 92020, it had 734 Covid-19 deaths per million, almost as high as Brazil's 762, and more than four times the global average of 162.[108]

Unlike Brazil, however, Mexico's tax revenues did not decline as a percentage of GDP.[109] Mexico was also much more conservative in its borrowing and fiscal stimulus. Despite the growing need for investment in healthcare and social protection, government expenditures declined in 2020, which may have further deepened the recession.[110]

Sharp declines in petroleum prices and tourism revenues, capital flight, and lack of fiscal stimulus led

[101] *Venditti 2020. Para accounted for 43% of national mining turnover in 3rd quarter 2020.*
[102] *Venditti 2020.*
[103] *ITTO 2020a and 2020c.*
[104] *Neder and Durão 2020.*
[105] *Ministério da Economía 2020.*
[106] *Reuters 2020.*
[107] *Cardoso 2020. Jair Bolsonaro, who was elected President in 2018, has generally been unfavorable towards civilian environmental regulatory activities.*
[108] *https://www.worldometers.info/coronavirus/ Accessed on November 9, 2020.*
[109] *They did decline in absolute terms.*
[110] *IMF 2020d.*

to a rapid devaluation of the Mexican peso in March and April. Since then it has strengthened, but without regaining previous levels.[111]

Without the massive cash transfer programs seen in Brazil, the pandemic has caused much greater economic hardship in Mexico. Almost half the population (46%) earns less than before the pandemic and 30% report that at least one person in the household lost their job. As in Brazil, domestic food prices rose faster than the general consumer price index, but in this case, it happened despite falling (effective) demand for food.[112]

Mexico is not a global food exporting powerhouse, like Brazil. While it exports fruits and vegetables, it imports a large share of its grains and other food necessities. Among the main products linked to deforestation in Mexico are cattle, soybeans, and avocados. Many of the soybeans involved in deforestation are used to feed pigs and chickens for domestic consumption and export, mostly to Asia.[113]

Exports of these products rose during the first eight months of 2020 compared to the previous year. Avocado exports rose 6.5% to $2.1 billion US dollars. Cattle and beef exports jumped 18.2% to $1.8 billion US dollars. Pork exports (linked to soybean-fueled deforestation) were up 39.9% to $606 million US dollars.[114] While this growth was much more modest than in Brazil, it may have been sufficient to fuel deforestation in certain regions such as Michoacan (avocados) and Campeche (soybeans and cattle). Again, currency depreciations probably favored this growth.

Mining concessions cover over one fifth of Mexico's forests.[115] Sanitary restrictions related to the virus and the decline in copper and zinc prices provoked a sharp drop in mining in April and May, but it rapidly recovered. In late May, the government declared mining an "essential activity" and lifted all sanitary restrictions.[116] By November, Canadian and Mexican companies were announcing major increases in mining investments, and predicting that foreign direct investment in mining in 2020 would be 7% higher than in 2019.[117]

Perhaps the greatest impact of the pandemic on forests in Mexico was the heavy blow it dealt to the community forestry enterprises. For decades, community enterprises have supplied the majority of the country's legal timber production and have generally managed their forests well. That has helped to avoid forest degradation and, in some cases, deforestation.[118]

In recent years, these enterprises have faced growing threats from organized crime, cuts in government forestry budgets, excessive regulatory burdens and taxation, and an aging population base.[119] The pandemic and economic crisis magnified these threats and created additional ones. By May, the construction sector had lost an estimated 400,000 jobs; and less construction meant less demand for wood.[120] Wood sales by community forestry enterprises fell more than half in the first months of the pandemic, affecting about 100,000 jobs.[121] In April, the paint companies stopped buying pine resin, causing some 10,000 families to lose their livelihoods.[122] Tourism to forest communities all but disappeared.

Government austerity measures led to a 75% cut in the forestry agency's operating budgets.[123] Along with safety measures limiting travel to the field, that made it much harder for communities to process their forestry permits and plans. This has opened the way for illegal logging and more frequent and severe fires.

From an infrastructure perspective, the most important project is the proposed 1,400 kilometer "Maya train," which would circle around the Yucatan Peninsula. This multi-billion dollar project would directly affect significant areas of forest, making it more profitable to clear new areas for soybeans and land speculation.[124]

Despite initial delays due to the pandemic, construction began in May. The government exempted the project from Covid-19 -related sanitary restrictions, declaring it an "essential activity."[125] The government initially planned to use tourism taxes to generate much of the required funding, but after the

[111] *CEPAL 2020.*
[112] *Ortega 2020. Little reliable information is available on how much food consumption diminished.*
[113] *De Alba 2020.*
[114] *GCMA 2020; Ortiz 2020.*
[115] *Ortíz-Aranda and Madrid-Zubirán 2017.*
[116] *Redacción Opportimes 2020.*
[117] *Sanchez 2020.*
[118] *Bray 2020.*
[119] *Hernandez 2020.*
[120] *Hernandez 2020c.*
[121] *Hernandez 2020b.*
[122] *Flores 2020.*
[123] *ECLAC 2020b.*
[124] *Godoy 2020.*
[125] *Ibid.*

pandemic practically wiped out international tourism, the government used regular budget resources to keep the project on schedule.

In summary, despite major structural differences between Mexico and Brazil and quite distinct government responses to the crisis, both cases present common trends often associated with increased pressure on forests. Large devaluations and the recovery of relevant international commodity prices led to renewed expansion of agriculture and mining activities that threaten forests. Both governments reduced environmental spending and infrastructure investments apparently continue to move forward. Unlike Brazil, Mexico has had a strong community forestry sector, which has been hard hit by the crisis. The community enterprises were already facing major challenges before the crisis and many may not survive this latest blow. That may prove to be the largest lasting (negative) effect on the forests.

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Indonesia

Compared to Brazil and Mexico, Indonesia's economy has been less affected by the economic crisis, with real GDP expected to fall 1.5% in 2020.[126] The country also seems to have a much lower number of Covid-19 cases and fatalities per million inhabitants. Initially, the rupiah depreciated more than 15%. However, by June it had returned to almost pre-Covid-19 levels and has stayed in that general range since.

Government revenue declined from 14.2% of GDP in 2019 to 11.8% in 2020, while expenditures rose from 16.4% to 18.1%, pushing up the fiscal deficit.[127] The spending increase was partly devoted to food assistance, cash transfers, and other social protection measures to mitigate the crisis' impact.[128]

Household surveys found a sharp increase in unemployment, lost earnings, and food insecurity between February and May, linked largely to pandemic-related lockdown measures. The situation improved markedly when the government lifted those restrictions in June but failed to fully recover. One out of every ten heads of household who had been working in February were unemployed in August and 10% more households reported eating less than they should, compared to before the crisis.[129]

The crisis hit urban areas harder and when urban dwellers lost their jobs, some shifted to agriculture.[130] Anecdotal evidence suggests some rural families who lost their sources of income turned to illegal logging and harvested more forest products.[131]

Between 2001 and 2016, palm oil and timber plantations were Indonesia's largest direct causes of deforestation.[132] The country accounts for 55% of global palm oil exports, which, in turn, make up 26% of the nation's exports.[133]

During the first half of 2019, national oil palm production declined 9.2% and export volumes shrunk 11.4%. The Indonesian Oil Palm Association (GAKPI) attributed this drop to the crisis depressing global demand, reduced investment due to low prices in previous years, and drought.[134] Nonetheless, production started rising again in July. By September, monthly production volumes and export values were higher than in September 2019, driven in part by rising demand from China.[135]

In 2019, Indonesia used around 40% of its palm oil production to make biodiesel. But, as noted previously, low petroleum prices made it harder for biodiesel to compete as an energy source.[136] Expansion of the processing capacity to produce biofuel from palm oil was also delayed by travel restrictions, which made it harder to bring in foreign

[126] *IMF 2020.*
[127] *IMF 2020f.*
[128] *The government also expanded subsidized agricultural credit.*
[129] *Nonetheless, domestic consumption of vegetable oil experienced modest growth (FAO 2020).*
[130] https://www.covid19indonesia.net/events/ipglobalhousehold
[131] *Golar* et al. *2020.*
[132] *Austin* et al. *2018.*
[133] *OECD 2019.*
[134] *Parama 2020.*
[135] *Rustandi 2020.*
[136] *Fitch Ratings 2020.*

experts.[137] This helped to keep domestic demand for oil palm below what had been expected.[138]

With regards to wood-fiber plantations, pulp and paper prices had already collapsed by mid-2019, due to new mill capacity coming online.[139] Many expected prices to pick up again in 2020, but the pandemic dashed those hopes — leaving prices fluctuating near their January 2020 level through October.[140]

In such a capital-intensive industry, however, once a multi-billion dollar pulp mill exists, companies have strong incentives to keep mills running at close to full capacity, independent of the price. Price expectations affect new investments but have less effect on the throughput of existing mills.[141]

Overall, total wood product exports only shrunk about 2% in the first nine months of 2020 compared to the previous years, from $8.5 billion to $8.3 billion US dollars.[142] That includes wood panels, furniture, and sawn wood, as well as pulp and paper.

Mining is one sector where the economic crisis may have reduced pressure on forests. New mining investments were almost two-thirds below the initial target for 2020, and could reach their lowest in a decade. This is largely due to plummeting demand for coal, linked to low oil prices.[143] Coal mining has been a major source of recent deforestation in the country.[144]

Companies from different sectors have used the crisis to press for more favorable government policies. In the name of reactivating the economy, the government approved an "Omnibus" law that modifies 79 existing laws and weakens environmental regulations. These include regulations related to environmental impact assessments, how much land must remain as forest, and company liability for forest fires in their concessions.[145] The government also attempted to scrap timber licensing requirements negotiated as part of its Forest Law Enforcement Governance and Trade (FLEGT) Voluntary Partnership Agreement (VPA) with the European Union, but was forced to backtrack.[146]

The government blamed the pandemic for a reduction in new permits to communities to manage local forests, arguing that health restrictions hampered on-site verification. After issuing permits for 1.5 million hectares in 2018 and then again in 2019, authorities reduced the 2020 target to 400,000 hectares.[147] Ministry of Forestry forest law enforcement and community assistance programs were also cut back.[148]

Mining is one sector where the economic crisis may have reduced pressure on forests. New mining investments were almost two-thirds below the initial target for 2020, and could reach their lowest in a decade.

Summary

It is harder to discern the expected net effect of economic crisis on forests in Indonesia. As in Brazil and Mexico, recessionary and deflationary trends in palm oil in the 2nd quarter largely reverted in the 3rd quarter, but pulp and paper and mining faced continuing low prices. Companies successfully used the crisis to justify government roll-backs of environmental regulations, but it is too early to assess how large an impact that will have.

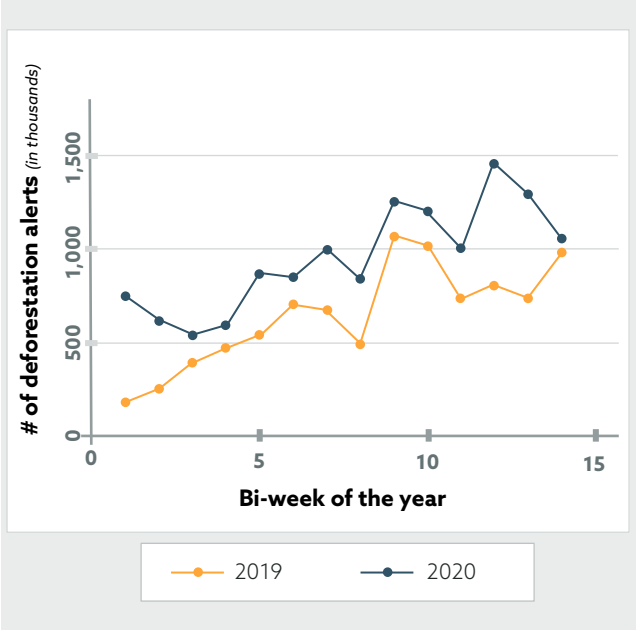
[137] *Listiyorini 2020.*
[138] *Indonesia had also set an ambitious target of 20% of its vehicle production being comprised of electric and hybrid vehicles, but the Covid-19 crisis may have derailed that. It is unclear what effect that may have on the oil palm sector or coal mining (Just Auto 2020).*
[139] *Hancock Natural Resource Group 2020.*
[140] *https://fred.stlouisfed.org/series/WPU0911*
[141] *In the case of the large Asia Pulp and Paper OKI mill in South Sumatra, which reportedly faced shortages in its local wood supply that led it to import a portion of its fiber, the currency depreciation has increased the cost of those imports and given the company greater incentive to push the government for access to new sources of fiber from local natural forests.*
[142] *ITTO 2020b.*
[143] *De los Reyes and Jones 2020. The two previous years' investments had surpassed government targets.*
[144] *Bebbington* et al. *2018.*
[145] *Farand 2020.*
[146] *Jong 2020.*
[147] *Atika 2020.*
[148] *Golar* et al. *2020*

6. The net effect on tropical forests: the initial evidence

The previous section described the performance of relevant economic indicators and speculated about how they might affect pressure on forests, based on the literature. This section reviews the still-preliminary evidence regarding what happened to deforestation and forest degradation in the immediate aftermath of the outbreak of the pandemic.

Globally, the University of Maryland and Global Forest Watch found that loss of tropical forests increased 12% in 2020 compared to 2019, which was a slight acceleration of the growth already experienced in 2019.[149] These results are broadly consistent with previous estimates from other sources earlier in the year. For example, using biweekly deforestation alerts, Saavedra examined clearing of primary humid tropical forests in 70 countries between 1 January and 12 July 2020 and compared it with data from the same period in 2019.[150] He found there were 150,000 more deforestation alerts in 2020 than in the same period in 2019, and that the increase began before the government lockdowns (See Figure 2). The 2019 and 2020 curves basically move in parallel along seasonally determined variations, except for January / early February (pre-Covid-19, pre-lockdown) and June (bi-week 12/13). While the alerts rose in countries with low government effectiveness, they declined in countries with effective governments.[151]

FIGURE 2: Global Biweekly Number of Deforestation Alerts in Primary Tropical Forests, 2019-2020



Analysis of similar data by WWF Germany found a sharp uptick in "forest disturbance alerts" in April and May, compared to 2016-2019, especially in Africa and Asia. Total alerts between February and June were 77% higher than the average of the previous three years.[152] Another study of the alerts focusing specifically on the first month after lockdown measures were enacted found a similar increase in alerts. The area affected by the alerts was almost double that of the same period in 2019 and the spike in alerts affected more than two-thirds of the 103 countries analyzed.[153] Notably, however, some of the upticks in alerts that WWF Germany identified occurred *before* lockdown measures were put in place in the countries in question.[154]

Loss of primary tropical rainforest jumped in Colombia and Peru in 2020, confirming previous reports, and remained roughly at 2019 levels in Bolivia.[155] Increased 2020 deforestation has also been reported in Cambodia, Madagascar, and Nepal. However, the quality of evidence varied depending on the country.[156] In Peru, deforestation apparently decreased between 15 March and 15 April, the epidemic's first peak, but later surpassed previous year's levels.[157]

Colombia suffered a marked upsurge in forest fires after the government declared a lockdown in March.[158] In Nepal, however, rising Covid-19 cases were associated with fewer and less severe fires.[159]

In our three case study countries — Brazil, Mexico,

[149] *Weisse and Goldman 2021.*
[150] *Saavedra 2020.*
[151] *Saavedra 2020..*
[152] *Gross* et al. *2020.*
[153] *Brancalion* et al. *2020.*
[154] *In the Brancalion* et al. *(2020) case, they did not look at the period just prior to lockdown measures.*
[155] *Weisse and Goldman 2021.*
[156] *Fair 2020.*
[157] *Lopez* et al. *2020.*
[158] *Amador-Jiménez 2020.*
[159] *Fox* et al. *2020; Paudel 2020.*

and Indonesia — the evidence points to increased forest destruction in Brazil and Mexico but is less definitive with regards to Indonesia. Loss of primary rainforest in Brazil's Legal Amazon rose 15% in 2020 compared to the same period in 2019.[160] However, given an even stronger pre-Covid-19 acceleration in Amazon deforestation (i.e., from 2018 to 2019), triggered by the Bolsonaro administration's effort to dismantle previous forest protection policies, the impact of Covid-19 on Brazilian deforestation remains ambiguous.[161]

In Mexico, total primary forest loss increased slightly in 2020. Illegal deforestation also reportedly rose in Chihuahua, Hidalgo, Tlaxcala, and the Yucatan Peninsula in the initial months of the crisis.[162] Again, however, it is uncertain to what extent this was simply the continuation of a pre-existing upward trend in deforestation or the result of the pandemic and associated economic crisis.

The Indonesia story is even less clear. Unlike Brazil and Mexico, Indonesia's loss of primary forest had been trending downwards since 2017 and continued to trend down in 2020.[163] During the first 20 weeks of 2020 deforestation alerts increased; however, deforestation in oil palm concessions apparently fell in approximately the same period.[164] Wildfires were down from January to September compared to the previous year, but that might have been due to wetter weather.[165]

Summary

The evidence suggests that deforestation increased in many countries in 2020. However, the role that the pandemic and associated economic crisis played in that increase remains unclear since some countries were already on an upward trajectory and there are many confounding factors. The most one can say is that in many countries, including Brazil and Mexico, any deflationary / recessionary effects of the crisis have probably not been sufficient to date to lower deforestation rates below their recent levels.[166]

[160] *Weisse and Goldman 2021.*
[161] *Azevedo 2020.*
[162] *Lopez* et al. *2020.*
[163] *Weisse and Goldman 2021.*
[164] *Chain Reaction Research 2020.*

7. Conclusions

Economic downturns greatly affect land use, albeit in multiple and often contradictory ways. Their deflationary effects generally reduce pressure on forests, especially when they depress producer prices for commodities or constrain access to funding for investments in production or infrastructure. Conversely, they tend to increase pressure on forests to the extent that they push people back into agriculture or natural resource extraction or lead governments to cut back on environmental regulation, communal land titling, and promotion of community forestry.

Initially, it appeared the first set of effects might dominate in the case of the global economic crisis linked to the Covid-19 pandemic. Global lockdowns, declining employment, earnings, consumption, tightening financial markets, and exceptional economic uncertainty initially led commodity prices (and in some cases production) to decline sharply between February and April; and it seemed logical to conclude that might lead to less deforestation. Even if deforestation continued to rise it might still be less than it would have been without the crisis.

However, since May we have seen a strong rebound in asset and commodity prices. Many key commodity sectors recovered rapidly thanks to massive fiscal and monetary stimulus, especially, but not exclusively, in high-income countries; China's rapid control of the epidemic within its borders; and supply shortages caused by a diverse set of factors. Despite delays, capital continued to flow for large production and infrastructure projects. Governments reduced their environmental spending and interest groups took advantage of the crisis to successfully press for the dismantling of environmental and social regulations. In some places people who lost access to other sources of income probably increased forest clearing and natural resource extraction to survive. As a result, on balance, there is so far little evidence that the crisis reduced deforestation and forest degradation. In certain periods and countries, it may indeed have increased it — though in most places it is likely that pre-Covid-19 trends continued unabated.

[165] *Taufik 2020.*
[166] *Again, the Indonesian evidence does not permit any substantive conclusion about the net impact on deforestation.*

That said, this is by no means the final word. The apparent rapid recovery from the economic crisis could still prove short-lived. Political gridlock could lead to a premature end to fiscal stimulus in some countries. Emerging markets may lack the wherewithal to maintain their own stimulus measures. Growing private and public debt burdens and bankruptcies may yet trigger bouts of financial tightening and declining investment. Any of these trends could depress commodity and asset markets, and potentially reduce some pressures on forests.

As more time goes by and more data become available, it may well also be that initial impressions about the crisis' effects prove mistaken. Little is known at present about how the crisis has affected more subsistence-oriented land uses or important tropical forest regions such as the Congo Basin and the Mekong. We know that deforestation increased dramatically in Cameroon, but the reasons and outlook remain unclear.[167]

Even so, the conceptual framework and hypotheses presented in this paper should still provide a starting point for monitoring and assessing the multiple pathways by which the current pandemic may affect forests and land use going forward.

As a result, on balance, there is so far little evidence that the crisis reduced deforestation and forest degradation. In certain periods and countries, it may indeed have increased it — though in most places it is likely that pre-Covid-19 trends continued unabated.

[167] *Weisse and Goldman 2021.*

Appendix

Possible implications for the Climate and Land Use Alliance (CLUA)

1. While commodity markets could still falter, the default assumption should probably be that national currency producer prices for commodities that threaten natural forests will remain reasonably high; although it is still not clear to what extent that will be the case.

2. Latin American economies are likely to remain depressed with strong fiscal constraints for some time. That will contribute to political instability (and possibly to authoritarian governments), generate pressure to attract foreign capital, and lend credence to the idea that environment is a luxury the region cannot afford. It will also favor further growth of illicit activities and attacks on environmental and land defenders. On the other hand, it may constrain public investment in large-scale infrastructure projects.

3. The crisis is likely to make Indonesia more sensitive than ever about its oil palm sector. Recent studies have shown that changes in oil palm prices have surprisingly large effects on Indonesia's overall economic growth, even higher than oil prices. Oil palm is also a major source of employment.

4. Growth in beef consumption may stall. If it does, two relevant factors are likely to be 1) declining incomes among lower-middle class consumers, who have relatively high income elasticities of beef consumption; and, 2) increased concerns over health issues linked to the pandemic.

5. The Covid-19 pandemic has hit the Indian economy much harder than many other countries and came at a time when the country was beginning to experience other significant economic difficulties. One should not necessarily assume that India will mimic the Chinese experience when it comes to rising commodity imports.

6. High gold prices combined with massive unemployment is likely to stimulate artisanal and small-scale mining (ASM) and illegal mining interests. The best that can be hoped for in such circumstances is probably to mitigate some of the worst effects of such mining, through constructive engagement with these sectors.

7. Some mineral prices will be heavily influenced by overall global growth, others more by growth specifically related to digital uses and renewable energy. The mining sectors associated with these two groups may behave quite differently, and we should be conscious of the distinction.

8. The crisis highlighted how much biofuel (palm oil, ethanol, wood chip) prices tend to decline when fossil fuel prices do. That relation will require greater attention going forward, both in the context of the crisis and of the longer-term transition from fossil fuels to renewables.

9. The pandemic negatively affected the demand for forest products and tourism services provided by community forest enterprises. It is hard to say how that will evolve, but it must be monitored.

10. Most bilateral and foundation funding is at least partially tied to economic growth and financial markets: ODA funding because countries have set targets in terms of percentages of GNI, and foundations because their endowments tend to track the stock market. The crisis will make it harder to maintain existing levels of bilateral and foundation funding, although it is difficult to predict how the share of that funding allocated to climate and forests might shift.

11. Some countries may invest in public employment reforestation projects similar to what India, Pakistan, and arguably Mexico (Sembrando Vida) have done. On balance, however, the great uncertainty and income losses associated with the crisis are likely to limit tree planting.

12. Distinct types of forest products may fare quite differently over time in the current economic environment. Pulp and paper, furniture, and construction materials have performed quite distinctly and that is likely to continue.

13. Recent experience has once again highlighted that once multi-billion dollar pulp mills (or for that matter coal plants) go online, their demand for raw materials is unlikely to respond much to short-term fluctuations in demand and prices. Their fixed costs are so high that despite low prices, it is usually more profitable for them to maintain their activities as near to capacity as possible. Hence, if one wants to influence these sectors, it is key to focus on investment decisions related to capacity expansion.

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AUGUST 2021

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