WORLD BANK GROUP

# Designing Fiscal Instruments for Sustainable Forests

1818 H Street NW
Washington DC 20433
Telephone: 202-473-1000
Internet: www.worldbank.org

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# Forest-Smart Fiscal Reforms for Extractive Industries

TUAN MINH LE & ERIN HAYDE

## Introduction

**The extractive industry (EI) contributes to deforestation and forest degradation in many ways, both direct and indirect.** It directly contributes to deforestation through land clearing, waste discharge, and other production processes. The EI sector also indirectly contributes to deforestation, in particular through infrastructure development that opens previously isolated forest areas to human encroachment and economic activity. EI activity is also expanding in ecologically sensitive forest basins, threatening ecosystem services, biodiversity, and other important benefits provided by forests.

**Despite the (sometimes considerable) environmental costs incurred because of EI activity, fiscal regimes do not typically include environmental considerations.** Most fiscal regimes for the EI sector focus on promoting industry investment, industry expansion, and (increasingly) formalization or efficiency improvements.[1] Given that in many countries the EI sector is a key component of economic development, policy makers will need to carefully consider the various impacts of any potential fiscal reform.

**There is an opportunity to reduce deforestation and forest degradation associated with extractive industries by reforming the sector's fiscal regime.** There are multiple opportunities to better incorporate environmental considerations into the fiscal regime of extractive industries. Specific instruments might be particularly effective that can be applied under a wide variety of governance arrangements, such as reforming fiscal incentives that inadvertently contribute to forest loss, increasing production- and area-based charges, and implementing variable environmental taxes and taxation-and-rebate mechanisms. These reforms also have benefits beyond the creation of beneficial environmental incentives: They can contribute toward domestic resource mobilization, reduce enforcement and monitoring costs, and complement and strengthen the impacts of other "forest-smart" policies.

**Fiscal policy reforms are nested within a forest-smart policy approach.** Environmental fiscal reforms are not a silver bullet. There are many interrelated causes of environmental

1 One exception is the use of performance bonds for mine reclamation, which was implemented by many developed countries (some as early as the 1970s) in response to widespread crises of "abandoned mines" whereby mining companies defaulted on their obligations to restore degraded land post-operation.

degradation from EI sector activity. As such, policy makers need to adopt a comprehensive, forest-smart approach, which includes strengthened governance and institutional capacities, promoting responsible corporate behavior, empowering communities, and engaging civil society stakeholders.

## The Extractive Industry's Impact on Forests

**EI production can cause a range of impacts to forest landscapes.** EI activity can be associated with a range of deforestation—from undetectable to very significant levels—depending on a number of factors.[2] Policy makers should look beyond deforestation as a measure of impact: The effects of extractive industries on forests can be complex and may not be detectable through satellite imagery.[3]

**EI operations have *direct* impacts on forests.** The EI sector is one of the main drivers of tropical and subtropical forest loss after agriculture, logging, and urbanization, especially in Africa and Asia (McFarland, Whitley, and Kissinger 2015). Large-scale mining (LSM) can directly cause major amounts of deforestation because of its large footprint, tailings dam failures, and waste disposal implications (World Bank 2019). Artisanal and small-scale mining (ASM) has a comparatively minor direct impact on forest loss, though there are exceptions to this (World Bank 2019). Furthermore, direct forest loss from EI operations may also be more intensive than for other land uses; in Brazil, deforestation within "leases was triple the average Amazon clearing rate" (Sonter et al. 2017). While deforestation related to the EI sector may make up a small portion of *global* forest loss, in certain countries, such as in Suriname, it is the lead driver (World Bank 2019). This forest loss reduces biodiversity, reduces the ability of forests to provide ecosystem services, impacts the livelihoods of forest-dependent communities, and contributes to climate change. Direct impacts on forest degradation (such as the pollution of air, soil, and water) come from the disturbance of habitats, basic siltation from tailings mismanagement, and the release of heavy metals and toxins (World Bank 2019). These impacts can often be more severe than deforestation, with long-lasting impacts. Indeed, post-mining forest recovery is often slow and "qualitatively inferior compared to regeneration following other land uses" (Peterson and Heemskerk 2001).

**EI operations also have *indirect* impacts on forests.** While the EI sector *directly* causes a relatively small amount of total deforestation, the *indirect* (or induced) impacts on deforestation are much stronger.[4] For example, in the Amazon Basin indirect or induced deforestation from the EI sector is 12 times greater than that of on-lease (Sonter et al. 2017). One of the most significant indirect impacts on forests from the EI sector is human encroachment into previously isolated forest landscapes. This effect occurs in almost all LSM and many ASM sites (World Bank 2019). High road density is also a key driver of forest degradation; the expansion of roads and railways increases access to forests for various economic activities, which can result in negative environmental and social consequences (World Bank 2019).[5] For example, in Ecuador much of Amazonian deforestation was the result of colonization along oil access roads (Finer et al. 2008). In northern Guatemala, oil and gas development contributed to settlement and expansion of

2 These factors include the type of mineral or compound in question and its distribution, depth, and extraction method, among others (World Bank 2019).

3 For example, the potential effects include species disturbance, changes in forest structure and function, illegal trade, contamination of water and soil, and loss of cultural value (World Bank 2019).

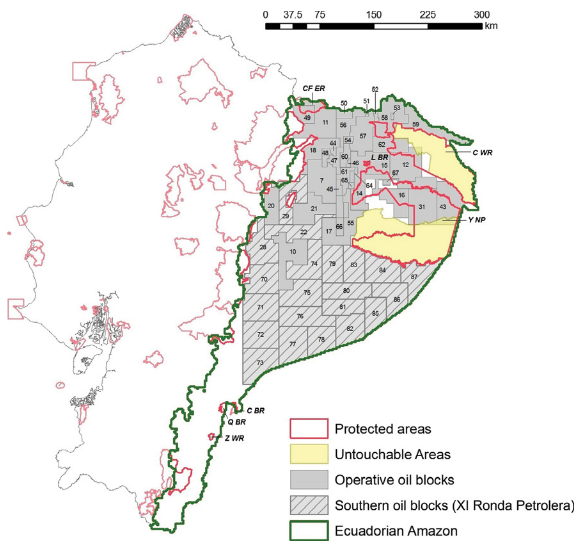
4 See Hund et al. (2013) for a detailed discussion of the direct, indirect, induced, and cumulative environmental impacts from the EI sector.

5 The World Bank estimates that for every kilometer of new roads built through forests, 400 to 2,400 hectares are deforested and colonized (Ledec 1990).

slash-and-burn agriculture within the Maya Biosphere Reserve (Rosenfeld, Gordon, and Guerin-McManus 2003).

**EI sector activity is increasingly located in ecologically sensitive forests.** Hund et al. (2013) found that a third of all active mines and exploration sites are situated in high conservation value areas and stressed watersheds, and certain exploration permits also overlapped with REDD+ projects.[6] In Ecuador, although 32 percent of the Amazon is already covered by operative oil blocks, the government plans to further intensify production to cover 68 percent (Lessmann et al. 2016); see figure 13.1. In contrast, protected and "untouchable" areas cover just 22 percent of the forest. Furthermore, many of these protected and untouchable areas are overlapped by oil and gas blocks, so only 16 percent of the Ecuadorian Amazon is protected and free from oil and gas development (Lessmann et al. 2016). Such expansion makes the environmental damages from EI activity especially concerning.

**FIGURE 13.1**
OIL AND GAS BLOCKS IN THE ECUADORIAN AMAZON




Source: Lessmann et al. 2016.
Note: Solid gray indicates operative blocks. Hashed gray indicates southern oil blocks, part of the XI Ronda Petrolera. Protected areas are Yasuní National Park (Y NP), Cuyabeno Wildlife Reserve (C WR), Limoncocha Biological Reserve (L BR), Cofán Bermejo Ecological Reserve (CB ER), El Quimi Biological Reserve (Q BR), El Cóndor Biological Reserve (C BR), and El Zarza Wildlife Reserve (Z WR).

**Increasing demand will be placed on the extractive industry sector.** High commodity prices, national development objectives, and the global transition to a low-carbon economy are already impacting the expansion of EI activity (Asner et al. 2013; Bebbington 2012; Lessmann et al. 2016; Alvarez-Berríos and Aide 2015; EIA 2018; RAISG 2018; Reed and Miranda 2007). The global transition away from fossil fuels toward renewable energy sources will increase the demand for certain minerals (World Bank 2017). One important example is cobalt, which is used in the production of rechargeable batteries for cell phones, computers, and electric vehicles. More than half of global production comes from a single country, the Democratic Republic of Congo, and a large amount of this production is unsustainable both environmentally and in terms of human health and welfare (Nkulu et al. 2018). Therefore, policies are needed to ensure that mineral extraction can meet future demand in an efficient and environmentally and socially responsible manner.

## Special Features of Extractive Industries: Paradox of Plenty

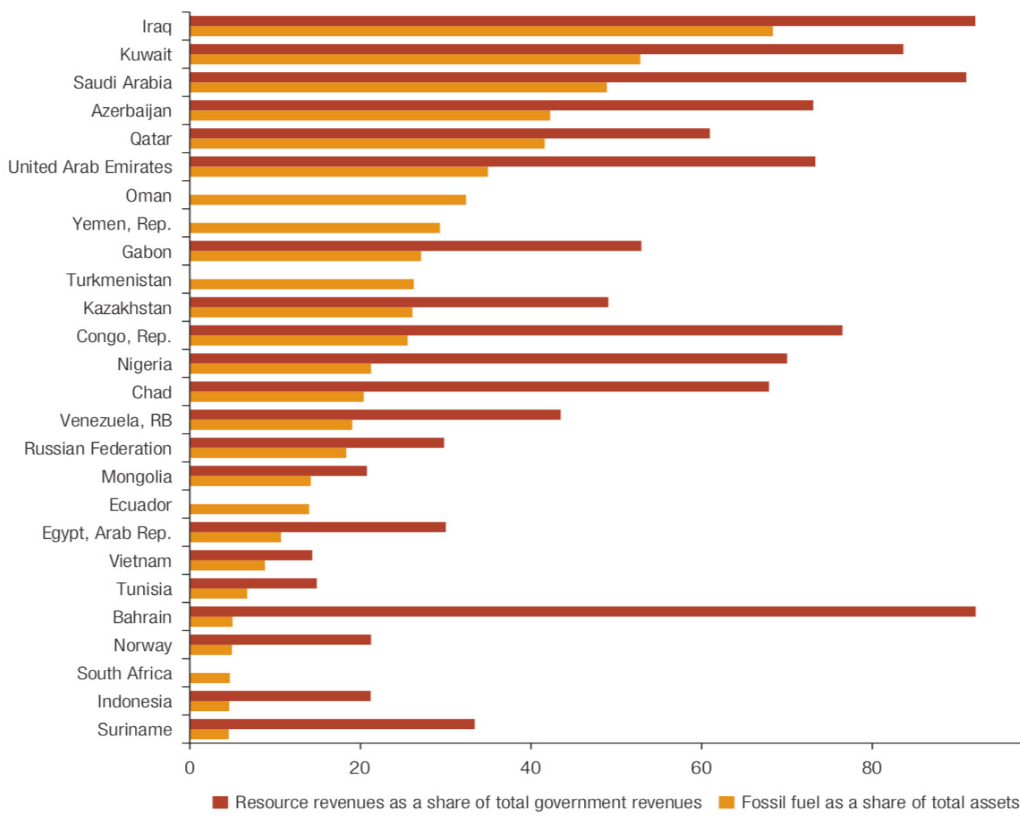
### Blessing or curse?

**In many countries, particularly resource-dependent countries, the EI sector is a key component of economic growth and development.** It can significantly contribute to government

6 This overlap may be an intentional strategy in some cases: For example, both Ecuador and Bolivia explicitly allow oil and gas exploration within national park boundaries (Finer et al. 2008).

revenue (figure 13.2) as well as provide other important economic benefits—for example, by providing rural employment opportunities. The sector is also crucial for the low-carbon energy transition and a resource-efficient economy (World Bank 2017). When the extractive industries are well managed, they can be a significant boon to the domestic economy.

**FIGURE 13.2**
FOSSIL FUEL ASSETS COMPARED WITH GOVERNMENT REVENUES, 2010–2014




Source: Lange, Wodon, and Carey 2018.

**However, the link between the EI sector and economic growth and development is not automatic; it depends on country-level factors such as domestic institutions and macro-management** (for example, see Bailey 2014; Barma et al. 2012; Mehlum, Moene, and Torvik 2006; and Auty 1993). For example, out of the 24 countries that have remained low-income since 1995, two-thirds are classified as resource-rich states or fragile and conflict states, or both, indicating that the availability of resources alone does not guarantee development (Lange, Wodon, and Carey 2018). With weak institutions, poor legal frameworks, and insufficient local capacity, the EI sector can be damaging to domestic economies. For example, the negative environmental externalities resulting from EI production may outweigh the sector's contributions to gross domestic product. Alternatively, the development of the sector could lead to the so-called Dutch disease, leading to a relative economic decline, irrespective of environmental damages (see box 13.1 for more details on Dutch disease and a way in which it might be harnessed to improve forest-related environmental outcomes). A careful examination of the special features of the EI sector as well as its contributions to both the economy, society, and the environment will help determine how the sector should be promoted through fiscal policy.

**BOX 13.1** DUTCH DISEASE: CAN FISCAL POLICY ON FOSSIL FUELS IMPACT PRICE INCENTIVES FOR DEFORESTATION?

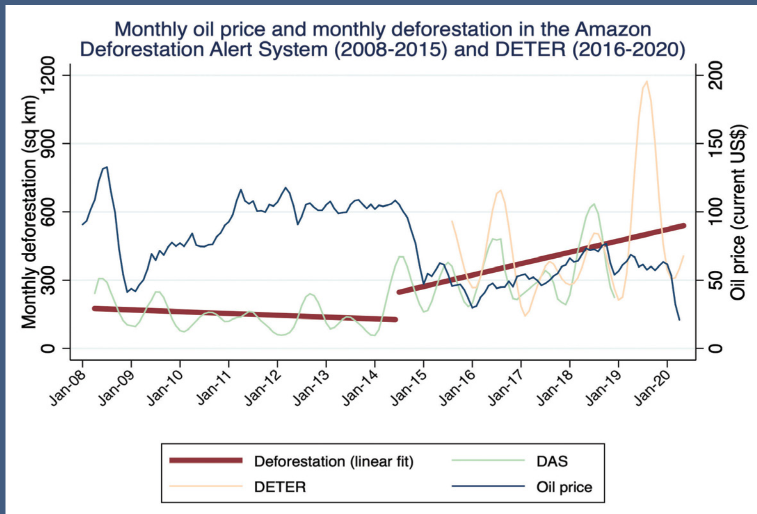
JAMES CUST

**The extraction of resources can have indirect impacts on deforestation by affecting the price incentives for other deforesting activities, such as agriculture**. While resource extraction activity can have direct and indirect impacts on the forest arising from the sector itself, it can also exert structural influences on other sectors of the economy with additional implications for the forest. This structural channel can involve diverting or inducing economic activity in other economic sectors as a result of a booming extractive industry impacting relative prices. Examples of this structural channel include the real exchange rate effects caused by export earnings (macroeconomic Dutch disease) or changing the relative demand for factors and changing factor prices at the regional within-country level (localized Dutch disease).

**Increasing the share of mining products headed for export can reduce incentives for producing other deforestation-related commodities**. In resource-exporting countries, rising resource exports earning foreign currency can put pressure on the competitiveness of other exporting (traded) sectors via an appreciation of the real exchange rate. This is known by the famous term "Dutch disease"—named for the de-industrialization concerns arising from the Dutch gas export boom of the 1970s (Corden and Neary 1982), and its impact on the non-oil sectors of the economy around the world is now well documented (see for example, Harding and Venables 2016). Such phenomena may likewise impact the forest sector for countries that have large export-oriented agriculture or forestry sectors—or those exposed to import competition. Where such sectors take—rather than set—their output prices as a result of international or regional trade, a resource export boom could crowd out these activities. This crowding out could reduce pressure on the forest frontier, leading to reduced deforestation via this structural channel. A positive world price shock for the abundant subsoil resource can exert a similar effect. The resulting boom can see an expansion of the comparatively less land-intensive resource sector. This expansion can appreciate the exchange rate and raise factor prices faced by the land-intensive agriculture or forestry sector, crowding them out. This crowding out can be forest saving in net terms, even if some forest clearance is associated with the expanding oil or mineral sector.

**Early empirical evidence confirms the existence of these theoretical findings**. Analyzing case studies of eight tropical, developing oil-exporting countries, Wunder and Sunderlin (2004) identify anecdotal evidence for this potential Dutch-disease effect. They acknowledge that indirect effects from oil drilling such as road construction and frontier colonization may however reverse this forest-friendly effect, which Sonter et al. (2017) also find. The first empirical evidence on this effect has shown that booming commodity prices of minerals do indeed reduce pressure on the forest. Furthermore, these estimates suggest that the crowding-out effect may exceed the direct clearance effect. This implies that a large area of forest may have been spared from clearance as a consequence of this Dutch disease effect (Cust, Harding, and Vézina 2019).

**FIGURE B13.1.1**
MONTHLY OIL PRICE AND MONTHLY DEFORESTATION IN THE AMAZON, 2008–2020




Source: Original elaboration using 2008–2015 data from the Deforestation Alert System (DAS) published by Imazon (2019), 2016–2020 data from the Deforestation Detection in Real Time (DETER) produced by the National Institute for Space Research (INPE) of Brazil (accessed June 2020), and World Bank Commodity Markets data.

**Fiscal policy on fuels can impact price incentives for deforestation**. It has long been known that the environmental impacts of domestic consumption of fossil fuels can be reduced by taxing fuels or reducing fuel subsidies (see chapter 1). But the Dutch disease mechanism suggests that fiscal policy on fuels creates an additional, previously unknown, co-benefit for reducing deforestation. Consider the example of a country that produces a deforestation-related commodity as well as oil. Some of the oil is used in domestic consumption and some is exported. The export share depends on the country's fiscal policy: For a given level of oil production, a subsidy on oil prices will raise the level of domestic consumption and reduce the level of exported oil. According to the Dutch disease theory, this dependency implies that the fuel subsidy weakens the exchange rate appreciation effect of oil exports, thus reducing the crowding-out effect faced by other traded sectors of the economy, including those that might be more land and forest intensive than the fossil fuel sector. Therefore, actions by government to reduce fuel subsidies or increase taxes on the domestic consumption of fuels might also reduce deforestation by dampening the price incentives for exporting other deforestation-related commodities through the Dutch disease. The same effect holds for a country that imports fuel: As fiscal policy reduces domestic consumption and thereby net imports, it appreciates the exchange rate, which again induces the above mechanisms. It follows that fiscal policy on fuels—for example, by internalizing the social cost of carbon, or simply removing the subsidy below world prices—would have a forest-saving effect relative to the counterfactual, to the extent it reduces domestic consumption and increase oil net exports.

## Institutional and political determinants of fiscal regime

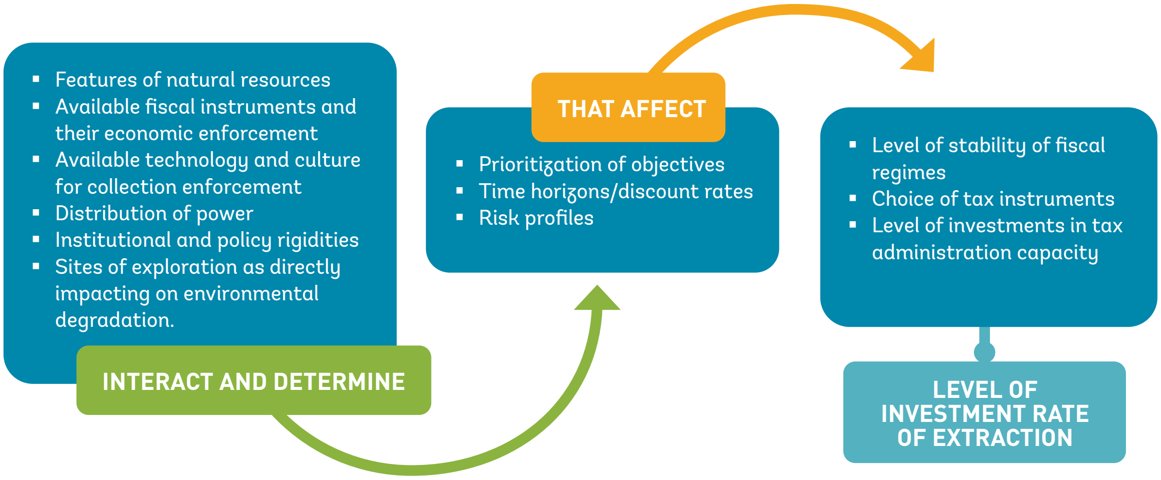
**Given its importance to the economic development of many countries, policy makers will need to carefully consider the impacts of any potential fiscal policy reforms.** On the one hand, several sectoral features indicate that governments should provide more fiscal incentives to EI investors. This is due to the uncertainties and risks associated with the industry, especially regarding volatility in production and prices. Large-scale EI investments also tend to be quite capital intensive and exploration activities require significant expenditures. In addition, investments may not see returns for years; in the case of oil blocks, for example, a firm may not see profits for over a decade.

**On the other hand, the government needs to capture a certain share of revenues from the sector.** Because extractive industry resources (that is, minerals and oil and gas) are exhaustible, the resources used today are forgone tomorrow. Governments collect revenues from the sector to account for the user cost trade-off associated with exploitation. From an economic point of view, there is also an economic rent associated with the sector and governments collect revenues to tap into this resource rent.[7]

**The preferred fiscal regime in a given country is determined by geological and institutional characteristics as well as political vested interests.** These determinants impact the prioritization of objectives, which affects the choice of the fiscal regime and ultimately the decisions made by firms and investors (figure 13.3). The incumbent's discount rate exerts the most dominant effect on the choice of tax instruments—and the level of investment for enhancing the tax administration capacity. Impacts on the environment play a rather weak role as a fiscal regime determinant. Consequently, countries typically ignore the specific impact on forests in favor of new investment in or expansion of mining exploration sites.

7 "Resource rent is the price of a natural resource in situ whose supply is fixed at a point in time, thus resulting in scarcity relative to demand. Markets for many natural resources in situ are missing or very limited, so there is no observed market price, or rent. The rent is incorporated in the market price of the resource only after it is extracted and sold, along with the costs of other inputs used for extraction. Rent is commonly measured as the difference between the market price of a resource and its costs of production" (Lange, Wodon, and Carey 2018). However, resource rents alone do not guarantee development: Strong institutions and governance capacities are needed to ensure that rents are used to invest in other assets and not entirely used for consumption.

**FIGURE 13.3**
GEOLOGICAL, INSTITUTIONAL, AND POLITICAL DETERMINANTS OF FISCAL DESIGN FOR EXTRACTIVE INDUSTRIES




Source: Updated from Barma et al. 2012.

**What is not usually part of the calculation for both the government and firms operating in the sector is the cost to the environment.** While the Natural Resource Charter recommends that the government carefully consider the whole chain of decisions—taking measure of all environmental, social, and economic factors before deciding on extraction (Bailey 2014)—this is not always followed in practice.

**Environmental fiscal instruments and reforms therefore have a role to play within a forest-smart policy approach.** Certain fiscal policies and instruments may be able to help incorporate environmental considerations into the decision-making of firms while promoting the sustainable growth of the sector.

## Extractive Industry Regulatory Chain: Environmental Fiscal Instruments, Challenges, and Policy Implications

**The next section identifies individual fiscal policy interventions that are effective at different stages in the extractive industry regulatory chain.** Specific fiscal instruments are discussed along with the ways in which the selected fiscal policy can impact the exploitation and exploration profile of the firm to minimize the expected impact on forest landscapes. While the discussion is organized around the EI regulatory chain (figure 13.4), policy makers will need to determine which instruments to implement outside of this framework; here, it is used to illustrate how each instrument is effective at reducing deforestation and forest degradation at different points in the chain. The fiscal instruments under discussion are summarized in table 13.1.

**FIGURE 13.4**
EXTRACTIVE INDUSTRY REGULATORY CHAIN


Source: Alba 2009.

**TABLE 13.1**
SELECTED FISCAL MECHANISMS, THEIR EXPECTED IMPACT, AND SOME KEY NOTES ON THEIR APPLICATION

| FISCAL MECHANISM | EXPECTED IMPACT | NOTES ON APPLICATION |
|---|---|---|
| ▪ Removal of fiscal incentives associated with deforestation | ▪ Reduce adverse incentives for firms to engage in deforestation | ▪ Can be applied under a wide variety of governance arrangements<br>▪ Government determines incentives to be offered before contract negotiation |
| ▪ Higher tax burdens for EI sector overall | ▪ Reduce fiscal basis for comparative advantage between sectors that may be promoting higher than optimal investment in the EI sector | ▪ Can be undertaken under a wide variety of governance arrangements<br>▪ Government increases the overall tax rates for the EI sector to reduce over-investment |
| ▪ Sufficient budget allocated to line ministries (i.e., ministry of environment) | ▪ Increase enforcement of ecologically designated boundaries, especially where EI blocks overlap or encroach on these sites<br>▪ Enable development of consistent application and enforcement of policies | ▪ May require additional investments in governance capacity to ensure that increased budget translates to increased enforcement<br>▪ Budget allocation determined by central government |
| ▪ Variable environmental tax rates that increase for mining operations located within ecologically important sites (PAs, NPs, NRs, HCV sites) | ▪ Increase access costs to ecologically important sites (increase ore cutoff grade threshold to operate in such sites)<br>▪ Incorporate environmental costs into tax regime | ▪ Can be undertaken under a wide variety of governance arrangements, as the needed tax rate calculations are relatively simple<br>▪ Government determines different environmental tax rates for operations based on location, where operations located in key ecologically designated sites are charged a higher tax rate |

| | | |
|---|---|---|
| ▪ Production-based charges (per unit royalty on output, ad valorem royalty, and variable royalty; area-based fees like property taxes) | ▪ Increase ore cutoff grade to minimize expansion of EI activity in ecologically sensitive forests | ▪ Can be undertaken under a wide variety of governance arrangements, as administrative costs are relatively low<br>▪ Government reduces, replaces, or supplements profit-based taxes with higher production-based taxes<br>▪ Governments could impose variable environmental tax rates on production-based taxes to increase impact |
| ▪ Area-based charges | ▪ Increase fixed costs of operators, which encourage investments in productivity | ▪ Can be undertaken under a wide variety of governance arrangements, as administrative costs are relatively low<br>▪ Government reforms fiscal regime to include area-based fees |
| ▪ Variable environmental tax rates that increase with the size of the mining operation | ▪ Increase in taxes to account for higher income, technical capacity and potential environmental destruction | ▪ Can be undertaken under a wide variety of governance arrangements; however, administrators must have access to information on firm sizes<br>▪ Government determines different tax rates for different firm/operation sizes, where larger firms/operations are charged a higher tax rate |
| ▪ Variable environmental tax rates on EI inputs, based on environmental criteria | ▪ Promote the use of sustainable inputs and transition away from unsustainable inputs | ▪ May require more advanced administrative capacities, as information would need to be known on EI inputs and their relative environmental impacts<br>▪ Government determines variable tax rate schedule for relevant EI sector inputs, firms pay more for inputs associated with higher environmental damage (pollution, emissions, etc.) |
| ▪ Taxation-and-rebates ("feebates") | ▪ Provide fiscal incentives to firms to reduce environmental damages from production | ▪ Can be undertaken under a wide variety of governance arrangements (third-party certification agencies should be used in jurisdictions with low administrative capacities)<br>▪ Government implements a tax-and-rebate system whereby all operations are charged a relatively high tax rate to account for environmental damage; firms are then offered rebates when they prove that their production was sustainable (e.g., through third-party or government-sponsored certification agencies) |
| ▪ Performance bonds combined with damaged land tax | ▪ Promote effective land reclamation post-operation | ▪ Can be undertaken under a wide variety of governance arrangements; however, administrators must have access to information regarding environmental damages<br>▪ Government collects performance bond from firm after contract negotiation and returns the bond post-operation; government also collects damaged land tax from firms based on marginal damage costs to society |

| | | |
|---|---|---|
| ▪ Fiscal incentives for afforestation during post-operation | ▪ Promote effective land reclamation post-operation | ▪ Can be undertaken under a wide variety of governance arrangements<br>▪ Government offers fiscal incentives (e.g., tax rebates or reduced rates) for afforestation of land post-operation |
| ▪ Fiscal component to control systems for remaining infrastructure<br>▪ E.g., fees for mining/oil road use, linked to deforestation rates | ▪ Reduce access to isolated forest areas, reduce encroachment of economic activity, including settlement, hunting, and others<br>▪ Penalize deforestation by both informal and formal operations that use existing access roads | ▪ Can be undertaken under a wide variety of governance arrangements; however, administrators must ensure that road fees do not become an opportunity for corruption or bribes<br>▪ Government enacts fees (which could be linked to local deforestation rates) on access roads post-operation |

Note: EI = extractive industry; HCV = high conservation value; NP = national park; NR = nature reserve; PA = protected area.

## Award of contracts and licenses

*Contract negotiation*

**Countries promoting EI investments may participate in a "race to the bottom,"** whereby governments reduce tax rates and environmental standards to attract or retain economic activity. In most developing countries, governments attract EI firms by providing substantial fiscal incentives for investment. Companies have been able to secure considerable outright tax holidays, tax rate reduction, or various exemptions in the form of base depleting deductions (that is, for depreciation and other costs) and value added tax exemptions. For example, in Zambia EI royalties were set at 0.6 percent, a figure much lower than those of neighboring countries, which did not charge less than 2 percent and in some cases charged as much as 20 percent (Baunsgaard 2001; Fraser and Lungu 2008). Development contracts in Zambia have also been mostly negotiated and agreed upon with investors in secret.

**Subsidies or other tax incentives that are determined to contribute to deforestation should be removed or reformed.** The removal of adverse subsidies may free up domestic revenues that could be used for other policy objectives, such as environmental goals or other development projects. Where the removal of subsidies is not feasible (because of economic impacts, political resistance, or other reasons), it may be necessary to reform subsidies to align environmental and economic objectives. To strengthen beneficial environmental outcomes, any incentives offered should promote sustainable forest management, mixed land use, and effective land reclamation post-operation.[8]

**Mining and other extractive industry cost-benefit analysis could give sufficient weight to environmental criteria.** A common problem in resource-rich developing countries is that this analysis is normally disregarded, or if it is conducted, insufficient weight is given to environmental criteria. Cost-benefit analyses or environmental impact assessments should at least include both direct (on-lease) and indirect/cumulative (off-lease) impacts on deforestation (Sonter et al. 2017).

8 For example, depreciation rules could be provided for EI assets that meet certain environmental criteria.

When the true value of forest assets and their contributions to local and national economies are incorporated into these analyses and other evaluations, the benefits of some EI projects may no longer outweigh the costs.

**Fiscal concessions should be evaluated for their contribution to deforestation and forest degradation.** During contract negotiations, it is normal for EI firms to negotiate concessions regarding fiscal and environmental legislation. While offering concessions to companies might incentivize investment, fiscal administrators should ensure that this investment does not come at the expense of sustainable development. Any concessions offered to companies should therefore be evaluated for their potential contributions to deforestation and forest degradation.

**Evidence suggests that the EI sector enjoys a comparative advantage in fiscal policy compared with other sectors.** For example, in Zambia the EI sector enjoys a corporate tax rate of 25 percent compared with the national average of 35 percent (Fraser and Lungu 2008). In their study of the mining fiscal regime for the case of Tanzania, Shukla and Le (1999) found that special incentives far and above those normally granted were routinely provided to the EI sector. This implies that there is room to increase the tax burden of mining and other extractive industry operators (Fraser and Lungu 2008). An increase in the tax take for the EI sector will not directly impact environmental decisions; however, on a macro scale, it would contribute toward balancing the advantages the sector currently enjoys at the expense of less environmentally damaging activities.

**Artificially low taxes and fees could therefore be increased.** If more EI activity is occurring than is desirable in terms of the macroeconomy and development objectives, an increase in the overall fiscal costs could reduce over-investments, particularly those near rich biodiversity hotspots. Tax mechanisms with the potential for reform include income tax for employees, corporate taxes on profits, value added tax paid on services purchased by the mines, border taxes paid on EI imports and exports, and mineral royalties (Fraser and Lungu 2008; Weeks and McKinley 2006).

*Exploration and discovery*

**Budget allocations to relevant line and environmental protection ministries (for example, the ministry of environment) should include enough funding for enforcement activities.** Protected area and other high conservation value site boundaries should be enforced so encroachment onto ecologically important sites is minimized. Stronger budgetary support would enable the development of a supportive policy and regulatory environment for forest-smart development and enable key capacity building (World Bank 2019). Furthermore, sufficient budgetary allocation for forest administration can help policy makers and administrators stay ahead of the development of the EI sector, adequately address both LSM and ASM, and ensure that policies are consistently applied and enforced (World Bank 2019).

**While the location of geological mineral reserves cannot be changed, fiscal policies may be able to better incorporate environmental damages in ecologically sensitive sites.** Governments can charge differential environmental tax rates on the basis of location. Sites located in or adjacent to officially designated protected areas, national parks, national reserves, or other high conservation value areas could be charged a higher tax rate than sites in less ecologically sensitive areas. By charging a higher rate in ecologically important areas, the government better internalizes the environmental costs of EI production into the fiscal regime.[9]

9 This depends to some extent on the ability of policy makers to choose an effective environmental tax rate that incorporates all the estimated damages incurred through EI production. See chapter 1 for more details on choosing effective environmental tax rates.

**When variable tax rates are well-targeted, they can influence whether firms operate in a given location.** Variable environmental tax rates should be used for taxes and fees that *increase* the ore cutoff grade used for a given site. An ore cutoff grade is the minimum grade (or quality) required for a mineral or metal to be economically mined/processed. Production-based charges are a prime candidate because these charges tend to increase ore cutoff grades (see table 13.2).

**The royalty, for example, is normally considered a regressive and therefore inefficient fiscal mechanism, but it might be particularly useful in this case.**[10] If firms face a royalty that is too high compared to the value of the mineral ores in a given site, the firm will choose not to exploit that site. In 2003, Peru *reduced* royalties to spur additional investment, which led to an oil exploration boom (Finer et al. 2008). If royalties were increased instead (at least for certain geographical sites), this could help minimize production in ecologically important regions.

**Production-based charges have other notable advantages for governments under budgetary and other constraints.** Production-based charges provide up-front revenues and are more stable compared to profit taxes (table 13.2). Such charges might be especially attractive to developing countries, which tend to have a low discount rate and therefore prefer present cash flows to future revenues. Furthermore, production-based charges tend to have low and intermediate costs of administration (Barma et al. 2012), making them more accessible for countries with low governance and other capacities.

**TABLE 13.2**
SELECT ECONOMIC IMPACTS OF ALTERNATIVE TAX REGIMES

| TYPE OF TAX/FEE | ORE CUTOFF GRADE | COST OF ADMINISTRATION | REVENUE VARIABILITY |
|---|---|---|---|
| Per unit royalty on output (nominal) | Increases | Low | Low |
| Ad valorem royalty | Increases | Intermediate | Intermediate |
| Variable royalty | Increases | Intermediate | Intermediate |
| Property tax | Increases | Intermediate | Low |
| Profits tax | Unchanged | High | High |
| Profits tax with cost depletion | Decreases | High | High |
| Profits tax with percentage depletion | Decreases | High | High |

Source: Adapted from Barma et al. 2012.

10 Resource economics literature would recommend using progressive fiscal instruments such as profit-based taxes (Alba 2009; Halland et al. 2015). However, this policy choice disregards both the environmental impacts from EI production as well as country-specific political, economic, and institutional settings. Technical recommendations on fiscal regimes cannot be one size fits all, and for sustainable development, the factor of the exploration site location is too important to be discounted.
Furthermore, there are problems associated with profit-based charges that are especially relevant to countries with governance and other constraints. One important problem with profit-based (especially corporate) taxes is information asymmetry between firms and the government. Fiscal administrators might not have access to firms' accounts and therefore may not be able to determine an appropriate amount of revenue to collect. For example, the government may be constrained in its ability to collect profit taxes because of corruption or low administrative capacity. In Ghana, the government still faces some trouble evaluating the accounts of EI firms and usually just accepts the results of the firm's self-assessment reporting mechanism (Ayee et al. 2011). For these reasons, production-based taxes may be more appropriate in countries with low governance capacities.

## Regulation and monitoring of operations

*Extraction*

**Formalization and efficiency gains can be promoted through certain fiscal instruments.** Increasing efficiency in the EI sector helps reduce resource intensity; therefore, it improves productivity while reducing the demands on the environment. Area-based fees, like property taxes, could be used to encourage efficiency gains. Area-based charges increase the costs EI operators face regardless of their production output (that is, fixed costs increase); to reduce their overall costs, firms must invest in productivity-enhancing improvements. However, additional policies will also be needed, like public investments in R&D and funding for project cost sharing to aid in technology adoption, along with strengthened enforcement, to ensure that increased productivity does not come at the expense of further land degradation.

**Variable tax rates can better incorporate environmental damages associated with EI production.** Policy makers can implement variable tax rates that increase with the size of the mining operation (World Bank 2019). Similar to environmental tax rates that vary with the *location* of EI production, the increase in taxes for larger operations accounts for the higher potential environmental destruction as well as for the higher income and technical capacity associated with LSM and other large-scale EI projects. While this might not impact the levels of environmental destruction, it would at least better incorporate the environmental costs of EI production into the cost structure of operators. This approach is used in both Ecuador and Colombia, in part to help facilitate the formalization of their ASM sector (World Bank 2019).

**Environmental input taxation can reduce the environmental impacts resulting from EI production** (IGF-OECD 2018). Inputs could be taxed differently based on environmental criteria (Macey 2017). Many environmental impacts arise from the extractive industries' use of chemical, fossil fuel, and water inputs. Governments could then implement differential taxes on these inputs to encourage firms to source more sustainably. Under this policy, environmentally damaging inputs should be taxed more than less damaging inputs. Differential environmental tax rates create an incentive for firms to reduce their use of "dirty" inputs in favor of "cleaner" inputs to reduce their tax burden (that is, input substitution effect). Policy makers would need to determine what objectives they would like to achieve (for example, reducing emissions or forest degradation), which environmental tax rates to adopt, and which inputs should be taxed.

**Taxation-and-rebate mechanisms can also help improve the sustainability of EI production.**[11] Taxation-and-rebates, or "feebates," are one fiscal policy that can be used to target the performance of companies based on specified criteria, such as the sustainability of production (Adamowicz and Olewiler 2016). Taxes and royalties target output and therefore create a disincentive for *production* itself; the feebate gives governments the opportunity to target the *method of production* instead. With a feebate, the EI operator is charged a high tax based on the assumption that production was unsustainable. When operators can prove to the government that production was more sustainable than assumed, they are offered a rebate on their taxes. A feebate scheme for the EI sector could be based on either the stored carbon biomass remaining on the land as directly monitored by governments,[12] or on whether the firm has acquired a

11 Earlier in this publication, this mechanism was discussed for forestry (chapters 5, 6, and 7) and agricultural production (chapter 12), and a similar feebate scheme could also be applied to extractive industry production.

12 Described in more detail in chapter 5.

sustainability certification.[13] Third-party sustainability certifications exist already for the EI sector (Kickler and Franken 2017); however, policy makers could also create a government-sponsored certification scheme (like the Indonesia Sustainable Palm Oil scheme or the Mexican Forest Certification System). With this mechanism, problems with traceability are remediated,[14] as firms who cannot prove their sustainable supply chains face a higher tax burden.

*Post-operation*

**EI production has environmental impacts after operation because of the quality of land remaining at the site.** Depending on the terms of the contract and development agreements between the government and EI firms, firms may leave without consideration of land reclamation or the quality of the land after they finish mining. The additional costs of remediation are a challenge specific to the extractive industries,[15] and any tax policy instruments to internalize environmental damages will vary in performance depending on the broader regulatory environment of the industry.

**Effective land reclamation is needed to ensure that a former mining site is sustainably productive, ecologically healthy, and economically attractive.** Land regeneration following mining and other EI activity occurs more slowly and is qualitatively inferior compared with that after other land uses (Banning et al. 2008; Bradshaw and Chadwick 1980; Hüttle 1998; Peterson and Heemskerk 2001). Furthermore, some countries have struggled with firms abandoning mining sites post-operation; for example, in the United Kingdom the Woods Reef asbestos mine was abandoned in 1983 and had not been rehabilitated after 27 years (White et al. 2012). Policies are needed to ensure land reclamation efforts effectively address this long-term degradation (Shrestha and Lal 2006). One way to incentivize effective land reclamation is through performance bonds (see box 13.2).[16]

13 Described in more detail in chapters 6 and 7.

14 Mineral ores from ASM are often processed with ores from LSM, which restricts the ability to identify the source of the ores and whether they were produced sustainably (Nkulu et al. 2018). Using a feebate mechanism in this way puts the burden of proof on operators to show that illegally or unsustainably produced ore has not been mixed in.

15 The challenge is even more pronounced when international prices of resources fall steeply. At such times, governments may be willing to sign EI exploration and exploitation contracts or development agreements without any provisions on post-operation remediation.

16 See also Adamowicz and Olewiler (2016); Cheng and Skousen (2017); Davis (2012, 2015); Gerard (2000); Gerard and Wilson (2009); Kuusela and Amacher (2016); and Rosenfeld, Gordon, and Guerin-McManus (2003).

### BOX 13.2 PERFORMANCE BONDS

**A performance bond (or contract bond) is a bond issued to guarantee satisfactory completion of a project by a firm**. In the case of mining, a firm posts a performance bond with the regulating authority, and the bond is released when land reclamation is successfully accomplished. If site reclamation is not completed, the firm forfeits the bond and the proceeds are used by the government to finance reclamation. In practice, bonds are typically set based either on expected reclamation costs or on the area (for example, per acre or hectare).[a]

**Performance bonds transfer risk and responsibility from the public to the private sector**. Performance bonds act as a guarantee that the firm will pay a certain amount if they fail to meet an obligation. This provides firms with a direct monetary incentive to comply with reclamation obligations. Performance bonds also ensure that resources will be available for reclamation even if the firm fails to meet its obligations. Furthermore, bonds shift the burden of proof to the firm: Once a bond is posted, it is the firm's responsibility to demonstrate that the reclamation meets the terms of the agreement before the bond can be released.

**Performance bonds are used in the EI sector worldwide**. Despite having some drawbacks (Gerard 2000; Shogren, Herrigies, and Govindasamy 1993; White et al. 2012), international experience with performance bonds indicates that the procedure is effective at ensuring reclamation in the case of default when bond rates correspond to actual reclamation costs (Cheng and Skousen 2017). Thus, mine reclamation performance bonds are used throughout the world. For example, Canada, Australia, New Zealand, China, and the United States all have established mine reclamation bond programs, which are typically implemented at the subnational (that is, state or provincial) level; the United States' reclamation bonding system has been in place since 1977.

a In some cases, bond amounts may be set too low (Morrison-Saunders et al. 2016). For example, Goldcorp posted a performance bond of $1 million to Guatemala for the Marlin gold mine; however, by its own estimates total closure costs are closer to $17 million and experts estimated costs of up to $49 million (Goodland 2012).

**It may be appropriate to combine performance bonds with an environmental fiscal instrument.** While many countries utilize performance bonds, their effectiveness is still unclear (Edwards and Laurance 2015). Therefore, it might be appropriate for countries to use a *combination* of fiscal policies instead. For example, White et al. (2012) derive an optimal mechanism for mined land reclamation that combines a performance bond with a "damaged land tax" to account for lost ecosystem services. The performance bond is implemented in the standard way (see box 13.2) and reduces the risk to the regulator of default. The environmental, or damaged land, tax rate is set equal to the marginal costs of environmental damages (that is, standard Pigouvian taxation). Under this combination, the bond addresses the regulator's risk-sharing concerns and the environmental, or damaged land, tax provides additional incentives for reclamation.

**To ensure effective reclamation management, fiscal incentives for afforestation and revegetation can be provided to EI producers.** One important component of land reclamation management is reforestation or revegetation on mined lands (Karu et al. 2009; Sheoran, Sheoran, and Poonia 2010; Shrestha and Lal 2008). By providing fiscal incentives (like rebates, reductions, or subsidies) for afforestation, policy makers can help the landscape recover during the post-operation phase.[17]

17 Furthermore, if and when the site is reopened for other economic activity, fiscal incentives could be offered to land users who engage in agroforestry-specific practices. Agroforestry has been shown to provide important ecological and economic benefits (such as carbon sequestration) in post-mining landscapes (Dixon et al. 1994; Quinkenstein et al. 2012).

**To address deforestation and forest degradation resulting from the remaining infrastructure after site closure, fiscal charges can be added to infrastructure control systems.** EI infrastructure can be used by local populations and increases the access to previously isolated forests for economic development. While increasing access is generally considered welfare-enhancing, the impact on ecologically sensitive forests can be large. Control systems could be set up to manage access to these infrastructure elements; for example, a control system could be put in place for oil and mining access roads, such as road closure or fees for use.[18] This would reduce the access to isolated forest areas, reducing encroachment of economic activity including settlement, hunting, and others. Furthermore, road fees could be linked to local deforestation rates, which would penalize deforestation by both informal and formal operations that use existing access roads (Nelleman and INTERPOL 2012). However, policy makers should consider the impacts on vulnerable populations, such as rural or forest-dependent communities, when determining whether or not to institute road closures or fees.

## Collection of taxes and royalties

**Many different fiscal mechanisms can influence environmental outcomes for the extractive industries.** Alba (2009) and Le and Viñuela (2012) note that the extent to which taxes and royalties are collected efficiently would be dependent upon both the quality of the fiscal regimes and the capacity of tax administration as well as the agencies involved in the mineral contracting, regulation, and collection of revenues. However, it is worth noting that negotiations on fiscal regimes in resource-rich, governance-constrained countries typically take place in largely informal, uncertain, and nontransparent arenas—all attributed to the ubiquitous time consistency and commitment problems, ultimately leading to low collection (Le and Viñuela 2012). Such governments may have high discount rates and low incentives toward long-term investments in enhancing the capacity of administration of taxes, fees and royalties.

## Revenue management and allocation

**The collection of extractive industry revenues presents a double-edged fiscal instrument. The extent of its economic as well as social benefit generation depends on multiple factors:** (1) the level of the tax intake (including a share of the rents from EI projects); (2) efficiency in resource allocation; and (3) the quality of their ultimate use. Mismanagement of revenue collection and its allocation would risk perpetuating corruption, inequalities, and even civil conflicts—on top of the detrimental sequential impact on the environment, including deforestation and forest degradation. First, governments will need to optimize revenue collection. This involves collecting appropriate amounts of rents from the EI sector as well as understanding how to manage the resources sustainably (Ossowski and Halland 2016; Barma et al. 2012; Hund et al. 2013; Nkulu et al. 2018).

**Fiscal administrators could ensure that tax revenues are used to invest in public goods and other assets.** Administrators can use tax revenues to provide a secure investment environment through the provision of public services, including health, education, and infrastructure (Fraser and Lungu 2008). Additionally, as these resources are nonrenewable and therefore depleting, countries should use some portion of revenues to invest in productive assets, such as human or renewable natural capital (Lange, Wodon, and Carey 2018). To address deforestation and forest

18 Alternatively, a fly-in, fly-out model could be used, provided that local populations directly benefit from EI site development (Laurance 2008).

degradation, revenues should be used to invest in post-closure land reclamation and afforestation. With careful macroeconomic management and strong institutions, revenues can be used to finance sustainable growth (Lange, Wodon, and Carey 2018).

### Implementation of sustainable development policies and projects

**This stage of the EI regulatory chain relates to the way EI resources are allocated and used to promote sustainable development.** As Alba (2009) notes, the efficiency to be attained depends on key elements like the quality of public investment management and the design and implementation of community development and environmental protection programs in regions affected by EI activities.

**However, by all accounts, this stage of the EI regulatory chain exposes the weakest link in sustainable development.** High discount rates in many resource-rich developing countries mean that policies tend to be designed regardless of environmental aspects. Some key issues in resource management in resource-rich or resource-dependent countries indicate the following:[19]

- More attention could be paid to the efficient allocation of resources to clean up or reforest project sites post-operation.
- Public investments in the overall public financial management system could be backed by strategic documents instead of serving political vested interests.
- Guidance on sustainable development investment decisions could be provided, and several key functions of effective public investment management could be further developed.
- Effective "gate-keeping" functions could be instituted.
- Implementation capacity, including procurement and project management (coupled with planning), could be strengthened to avoid chronic underspending of the environment-sensitive investment budget.

## Fiscal Policies and Beyond

### The role of fiscal policy in a forest-smart mix

**While the fiscal policy mechanisms discussed are not silver bullets, they can complement and strengthen the impacts of other forest-smart policies for the EI sector.** First, some of the fiscal reforms mentioned can increase domestic revenue mobilization, which can be used to improve forest-smart governance and institutional capacities. Removing fiscal incentives that inadvertently encourage deforestation not only reduces the incentives for deforestation but also potentially frees up revenues that can then be used for further forest-smart reforms or investments in public goods or other assets. Implementing higher overall tax burdens for the EI sector (for example, increasing the corporate income tax rate on par with rates for other industries) can equally raise revenues for further reforms. Providing sufficient budget allocation for enforcement can help key ministries improve the good governance of the sector and is one of the most important fiscal reforms to enable forest-smart EI sectors.

**Second, the fiscal mechanisms described can reduce monitoring and enforcement costs while improving environmental outcomes.** Variable environmental tax rates (based on location, size

19 Country examples have been assessed and summarized in Rajaram et al. (2014).

of operation, or inputs) can raise revenues while reducing enforcement and monitoring costs if firms choose not to operate in ecologically sensitive forests, or if the reduction of "dirty" inputs brings firms into compliance with or go beyond environmental standards. Production-based charges can also reduce enforcement and monitoring costs if they cause firms to avoid operations in ecologically sensitive forests. Area-based charges (by incentivizing the formalization and increased efficiency of the sector) reduce material demands on the environment, bring operators into compliance with environmental regulations, and can complement efficiency-enhancing investments (like technical support and capacity building). Tax-and-rebate mechanisms also reduce the costs of monitoring and enforcement, especially when used in combination with third-party sustainability certification agencies. Using performance bonds and control systems with fees in combination with these other policies can also help reduce monitoring needs.

## A forest-smart policy mix

**Fiscal policy alone will not be enough to address the deforestation and forest degradation caused by extractive industries.** Environmental impacts on forests from EI activity are caused by many interdimensional factors, both economic and noneconomic. Policy makers then need to adopt a comprehensive, forest-smart approach, which includes strengthening governance and institutional capacities, promoting responsible corporate behavior, empowering communities, and engaging civil society stakeholders.[20] Integrated land use planning will be key for greater efficiency and transparency in policy planning and implementation (World Bank 2019).

**Policy makers can create an enabling environment for forest-smart EI activity by improving governance.** Policy and legislative frameworks that integrate forest-smart approaches should be robust, stable, and consistently applied; furthermore, the roles and responsibilities of different actors should be clearly understood. Increasing transparency in the sector is also a key strategy.[21] Governments can also help develop forest-smart EI activity through coordination between ministries and different levels of authority. If forest landscapes are well-governed, the environmental impacts on forests can be relatively minor even when operators are not completely forest-smart (World Bank 2019). Legislative frameworks should recognize the different scales of EI operation and adapt policies accordingly. Different policy responses may be required for ASM versus LSM; ASM policies should support miners while encouraging formalization and improvements in production practices. In particular, environmental requirements for ASM should be cost-effective for and comprehensible to operators.

**Policy makers can also create an enabling environment for forest-smart EI sectors by promoting responsible corporate behavior.** Governments should require operators to undertake comprehensive environmental impact assessments prior to extraction. Policy makers should also enact specific laws that promote the implementation of forest-smart activities, like rehabilitation

20 For more comprehensive details on forest-smart policies for the mining sector, see World Bank (2019).

21 Increasing transparency in the EI sector includes publishing contracts, annual reports, and fiscal regimes, as well as increased transparency along the commodity supply chain itself. In particular, a robust monitoring and chain of custody system is needed (Chatham House 2015). Environmental impact assessments and management plans alone will not protect against adverse environmental impacts from EI sector activities. An effective monitoring system should be enacted that considers both the direct and indirect environmental impacts of EI production (Rosenfeld, Gordon, and Guerin-McManus 2003). Transparent commodity supply chains are essential for tracing the impact on the environment from EI production (Nkulu et al. 2018). The Extractive Industries Transparency Initiative (EITI) establishes a global standard for good governance practices of oil, gas, and mineral resources and promotes open and accountable management of the industry. While not focused on sustainability dimensions, the EITI is a crucial policy for the extractive industries and such reporting and disclosure measures can support environmental objectives, including the protection of biodiversity. For example, compliance with the EITI can contribute to the integration of biodiversity values into national accounting and reporting, one of the strategic targets of the Convention on Biodiversity (Timpte, Marquard, and Paulsch 2018).

requirements. Government can also support mechanisms for companies to fulfill their offset obligations, including development of the REDD+ mechanism to mitigate mining impacts (World Bank 2019). Policy makers can improve forest outcomes by encouraging the progressive formalization of ASM in part through providing technical support and capacity building as well as removing existing barriers to formalization (World Bank 2019).

**Policy makers can enable forest-smart EI activity by empowering communities and engaging stakeholders.** Policy makers can ensure that local communities are empowered by the establishment of clear forest tenure and rights, and the awareness of and support for exercising these rights. In particular, tenure systems should recognize and respect both modern legal and indigenous and/or customary rights (World Bank 2019); policy makers can also involve community organizations in forest management and protection. Policy makers can also establish requirements for and mechanisms to support the inclusion of local stakeholders in the planning and decision-making processes.

**Monitoring of EI performance throughout all stages of the chain is critical to enhance transparency and accountability on both sides, government and sector investors.** The current setting of EITI, while necessary, is in no way sufficient. Transparency should be enforced across the entire value chain to inform better design and effectuate the implementation of appropriate regulatory and fiscal instruments, including those addressing the EI externalities and their detrimental impact on deforestation and forest degradation.

**Finally, diversification of the economy can enable countries to grow out of their dependence on extractive (and carbon-intensive) resources.** With progress being made toward global economic decarbonization, the value of fossil fuel resources will be diminished (Cust, Manley, and Cecchinato 2017; Lange, Wodon, and Carey 2018). Natural resource–dependent developing countries will need to diversify their economies while avoiding increased carbon risk from fossil fuel–based industries and infrastructures to deal with a declining global demand for fossil fuel and high-carbon resources (Lange, Wodon, and Carey 2018).

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