

Five Years After the Adoption of the Paris Agreement, Are Climate Change Considerations Reflected in Mining Contracts?



Table of Contents

Key Points	3
1 Introduction	5
2 Climate-Related Provisions in Investor–State Contracts	6
2.1 Climate Change Mitigation	6
2.1.1 Energy Sources	6
2.1.2 Deforestation	7
2.2 Climate Change Adaptation	7
2.2.1 Climate Risk Assessment and Community Vulnerability Assessment	7
2.2.2 Water Use	9
2.2.3 Tailings Dams	9
2.2.4 Closure Plans	10
3 Conclusion	11
Endnotes	12

Key Points

- The energy transition will be [mineral intensive](#): production of certain critical minerals is [estimated to increase](#) by more than 450% by 2050. The mining and metals sector [already contributes 5–7% of greenhouse gas](#) (GHG) emissions globally and, as production increases, so too will emissions linked to the sector.
- Although fragile states in Africa contribute minimally to GHG emissions, they have a high degree of vulnerability to the impacts of climate change. Governments can and should mobilize the mining sector to play a meaningful role in meeting their climate mitigation and adaptation needs and those of project-affected communities. The increased demand for critical minerals to produce renewable energy and battery solutions tends to increase investment flows into the mining sector of several of those states, making it all the more crucial for their governments to ensure that new mining investments support sustainable development objectives. Requiring mining companies to contribute to sustainable development objectives, including climate objectives, can increase a country's [competitiveness in international markets](#), leverage the sector's contribution to GHG emissions reductions, and minimize its impact on the country's environment and communities.
- Recognizing that laws are the ideal legal instrument to regulate the mining sector's contribution to climate mitigation and adaptation, governments may still consider updating model mining development agreements (MMDAs), or negotiating climate-related contractual provisions, as a stop-gap measure in the absence of relevant laws. In this paper, we explore whether governments are using, and how they can use, investor-state contracts to advance climate goals in the context of the mining sector.
- Based on our review of publicly available mining contracts signed by five fragile states in Africa (Chad, the Democratic Republic of Congo, Guinea, Mozambique, and Sierra Leone) post-Paris Agreement, we conclude that in large part the contracts reviewed do not include climate-related provisions. Robust climate provisions may be absent because these issues are regulated by laws rather than contracts.
- Though an exhaustive review of climate-related laws was outside the scope of this research, we found that some fragile states in Africa include climate-related provisions in law to varying degrees. For example, [Guinea's 2019 Environmental Code](#) encourages all companies, including in the mining sector, to use renewable energy and mandates the environment minister to implement the National Strategy for Climate Change Adaptation.
- We synthesize our findings and recommendations for six categories of contractual provisions, considering the most critical climate-related impacts and contributions of mining projects. Though the analysis focuses on contracts concluded by five fragile states in Africa, our policy recommendations are general in nature and apply to all host governments that do not already have robust laws in place to ensure that the mining sector contributes to climate change mitigation and adaptation objectives. Our recommendations for governments updating their model mining development agreement or negotiating contractual provision are as follows:
 - **Integrate renewable energy into mining projects.** Governments can support increased renewable power integration by requiring mining companies to use renewable energy sources. No evidence of this practice was found in the contracts reviewed.
 - **Reduce deforestation.** To restrict forest conversion, governments could require mining companies to account for direct, indirect, and induced impacts on forests at every stage of the operations, as well as [systematically applying the mitigation hierarchy](#) throughout the life-cycle of the mine. The absence of provisions on deforestation in the contracts analyzed may be because this aspect is regulated by laws rather than contracts.
 - **Require a climate risk assessment and community vulnerability assessment.** Mining contracts should expressly require mines to comply with national adaptation plans (NAPs) and climate adaptation guidelines where such instruments have been [developed by the host country](#). Community development requirements contained in community development agreements (CDAs) should require mining companies to incorporate climate change adaptation strategies when requested by affected communities. None of the contracts reviewed includes provisions on climate change adaptation strategies.

- **Regulate water use.** Governments should expressly condition the grant of water rights to mining companies on [stringent obligations regarding water use efficiency](#), include penalties for water overuse or release of non-treated waste water, and provide for a grievance mechanism for downstream communities whose water rights are impacted. The contract should include obligations for the mine to create shared-use opportunities to increase the [access to water for communities](#) and reserve the government's ability to alter water allocation to mining operations based on fluctuations in the amount of available water and the number of users reliant on the water source. The absence of provisions on water use in the contracts reviewed may be because this aspect is regulated by laws rather than contracts.
- **Require tailings dam design justifications.** The risk of tailings dam failure, exacerbated by climate change, can be significantly reduced by requiring companies to justify their tailings dam design. None of the contracts reviewed includes detailed provisions on tailings dams. The contract should ban dams upstream of communities and require that the mining plan demonstrate that the tailings dam follows the latest global safety standards and that ongoing maintenance and remediation activities will be conducted. Companies should model the risk of tailings dam failure due to climate-related risks in the environmental and social impact assessment (ESIA); and, the environmental management plan (EMP) should include the obligation to demonstrate that the tailings dam is adequately monitored for failure risk, with the goal of achieving zero failures. Tailings storage should use the best available technology. Relevant provisions only appear in eight of the contracts and are very limited in scope.
- **Integrate climate risks into closure plans.** While more than half of the contracts analyzed require mining companies to plan in advance for the closure of the mine and the environmental rehabilitation of the mine site, none requires them to integrate climate risks into closure plans. Contracts should:
 - Mandate that closure plans be submitted at the beginning of the project along with the ESIA.
 - Describe how the company intends to avoid or mitigate the environmental impacts associated with halting its operations.
 - Include rehabilitation strategies that reflect an understanding of the changing relationship between the ecosystem and the climate.
 - Require companies to model the long-term sustainability of rehabilitation projects.

1 Introduction

At the 2015 Paris Climate Change Conference, the world's governments set an ambitious goal of limiting global temperature rise to 1.5 °C over pre-industrial levels. To meet this goal, global anthropogenic CO₂ emissions must decline steadily and reach net zero by about 2050.² The pathway to a low-carbon future requires a fundamental shift away from fossil fuels and toward clean energy technologies.

This transition will be mineral-intensive: the World Bank estimates that the production of minerals could increase by more than 450% by 2050 to meet the growing demand for clean energy technologies.³ How these minerals are produced will have a lasting effect on the clean energy transition. The mining and metal sector contributes 4–7% of greenhouse gas (GHG) emissions globally.⁴ Without adequate regulation to incentivize climate-friendly sustainable operations, increases in mineral extraction risk increasing the sector's carbon footprint.⁵ In addition, climate change acts as a risk multiplier by increasing the risk of flooding, drought, and landslides and, as such, exacerbates the negative externalities caused by poor mining practices.

First and foremost, climate change considerations should be incorporated into the climate, environmental, water, forestry, energy, or mining laws of mineral-rich countries. For example, in 2016, Kenya passed a climate law that requires climate mainstreaming in all sectors.⁶ Guinea's 2019 Environmental Code encourages the use of renewable energy wherever possible and mandates the environment minister to implement the National Strategy for Climate Change Adaptation.⁷ But the pace of legislative processes is often slow—and in countries where the legislation does not include climate change mitigation and adaptation requirements,⁸ countries may turn to contractual provisions to compel the mining sector to shift to climate-sensitive practices. This paper assesses the extent to which this is being done through an analysis of all publicly available mining contracts signed by fragile states in Africa⁹ after the adoption of the Paris Agreement in December 2015 that appear on ResourceContracts.org (21 contracts).¹⁰

Though the magnitude of African fragile states' contribution to global GHG emissions is minimal, these states have a comparatively high degree of vulnerability to the impacts of climate change.¹¹ In this context, governments

can and should mobilize the mining sector to play a meaningful role in meeting their climate mitigation and adaptation needs and those of project-affected communities. In addition, the increased demand for critical minerals to produce renewable energy and battery solutions tends to increase investment flows into the mining sector of several of those fragile states,¹² making it all the more crucial for their governments to ensure that new mining investments support each country's sustainable development goals. Doing so, with respect to climate action, furthers both a country's competitiveness in international markets¹³ and minimize the mining sector's footprint on the country's environment and communities.

Though our analysis focuses on contracts concluded by fragile states in Africa, the policy recommendations that we draw from their analysis apply to all host governments that do not already have robust laws that operationalize mitigation and adaptation goals and are eager to leverage and strengthen the role of their mining sectors in achieving sustainable development.

Our recommendations envision generating long-term savings over the life of the mines, even if some of those recommendations may in practice represent higher upfront costs for mining companies. For example, adopting renewable energy sources, though possibly more expensive at the outset, is more cost-effective than fossil fuels considering the life of a mine.¹⁴ Avoiding deforestation early on also generates savings for mining companies when the time comes to fulfill their mine closure and rehabilitation obligations. Furthermore, by supporting community efforts to build resilience to climate change, mining companies have the opportunity to meaningfully contribute to project-affected communities.

Attention to climate change considerations that entail higher expenditures by mining investors at the initial stages of the operation of a mine also tend to reduce the tax revenues from mining for host governments in the short term. However, for governments, too, the long-term benefits outweigh the initial revenue reductions. As long as governments put strong progressive fiscal regimes in place,¹⁵ they will be able to reap the upside from a climate-aware, low-carbon mining sector that will be more profitable than a business-as-usual, carbon-intensive mining sector in the medium to long term.

2 Climate-Related Provisions in Investor–State Contracts

Even as awareness of the mining sector’s positive and negative contributions to climate change has increased, countries have not included robust climate provisions in the mining contracts analyzed. The absence of robust climate provisions may be because the sector’s role in climate change mitigation and adaptation is regulated by laws rather than contracts. Where it is not, mineral-rich governments may seek to include climate-related provisions in investor–state contracts, including those concluded based on model mining development agreements (MMDAs). For example, investor–state mining contracts can include specific provisions to promote sustainable, climate-friendly mining practices, regulating the most critical climate-related impacts and contributions of mining projects. The following sections highlight six categories of provisions that may be included. These categories fall under climate change mitigation (requirements to minimize the use of fossil fuels, integrate the use of low-carbon energy sources, minimize deforestation, and restore forest cover) and adaptation (requirements to conduct climate risk and community vulnerability assessments, reduce water use, and design climate-resilient tailings dams and closure plans).

In addition, international standards can be incorporated into investor–state contracts to regulate certain aspects of investor behavior. For instance, ten of the reviewed contracts incorporate the International Finance Corporation’s (IFC) Performance Standards.¹⁶ While robust climate-related international standards do not yet exist to regulate mining projects, we expect existing standards to be updated or new ones developed given the global decarbonization agenda.

2.1 Climate Change Mitigation

2.1.1 Energy Sources

Mining operations account for 2–11% of global energy consumption.¹⁷ The sector’s energy consumption is largely fossil fuel-based; renewables have constituted less than 10% of total energy consumption since 1971.¹⁸ As demand for minerals increases and ore grades decline, the mining sector’s energy needs are projected to increase by more than a third by 2035.¹⁹

Governments have an opportunity to require that mining companies fulfill their increased energy needs through renewable sources, but our review found no evidence of this practice in any of the contracts reviewed. Six of the contracts reviewed include provisions that explicitly permit mining companies to build energy-related infrastructure, but none of these provisions required such infrastructure to produce clean energy.²⁰ Moreover, four of the contracts provide custom duty exemptions on fossil fuels.²¹ Financial incentives, including fossil fuel subsidies, often lock in the sector’s reliance on fossil fuels. Compared to diesel, renewables have relatively high upfront capital costs but are competitive on a non-subsidized basis. Although diesel plants have much higher operating costs, generous subsidies make fossil fuels an artificially attractive energy source; in addition, mining companies are often exempt from taxes on fuels used for off-road operations and energy generation.²² Requiring use of renewable energy sources through contracts is one way to recalibrate incentives and support increased renewable power integration. To do this, governments may consider the following:

- Require companies to demonstrate in the mining plan that their designs are energy efficient and integrate renewable energy to the extent practicable.
- Require environmental impact assessments to include the modeling of GHG emissions, including from deforestation over the life of the mine (see the deforestation section below).
- Require companies to develop both a business-as-usual model, showing the trajectory that GHG emissions would follow in absence of any measures to reduce them, and a model showing how much emissions need to be reduced for the mine to achieve carbon neutrality in line with a 1.5°C trajectory.
- Require environmental management plans to include all necessary measures over the life of the mine to achieve carbon neutrality in line with a 1.5°C trajectory. These measures may include the use of renewables-based electricity or green hydrogen in lieu of fossil fuels in mining operations, energy efficiency improvements, deployment of energy

storage solutions, and even carbon capture and storage in case of heavy downstream processes.²³

- Require companies to measure and disclose GHG emissions in accordance with accepted standards (e.g. the GHG Protocol²⁴).
- Require mines to electrify surrounding communities using renewable power. This approach can be taken at a low marginal cost to the company while also fulfilling the important development objective of extending electricity to energy-poor communities.
- Do not include clauses that provide fossil fuel subsidies (e.g. through customs duty exemptions) in future contracts.

2.1.2 Deforestation

About half of active mines operate in forest landscapes.²⁵ Of these, more than half are located in low-income or lower middle-income countries.²⁶ Mining operations can result in significant deforestation as companies clear forests to build mines and surrounding infrastructure. Mining accounts for about 7% of total forest loss across Africa, Asia, and Latin America, and is associated with a decline in the quality and quantity of ecosystem services.²⁷ Mining-driven deforestation is likely to increase: in recent years, twenty or more new mines in forest landscapes have been commissioned annually, compared to four to ten during the 1980s.²⁸

Ongoing deforestation has significant implications for climate change. Forests store vast amounts of carbon; when they are cleared or burned, their stored carbon is released into the atmosphere. Forestry and other land use activities have historically accounted for about a third of anthropogenic CO₂ emissions,²⁹ and between 2007–2016 close to 23% of total anthropogenic GHG emissions derive from these activities.³⁰ Reductions to forest cover directly affect local surface temperatures and can affect temperature and rainfall in regions hundreds of kilometers away.³¹ Additionally, deforestation can accelerate soil erosion by up to 1,000 times, leading to an increased risk of landslides and flooding in certain regions.³²

A third of contracts reviewed are silent on deforestation.³³ This is not surprising as deforestation is typically handled in legislation, including in our sample of countries. It

is notable, however, that some contracts appear to allow unlimited forest conversion.³⁴ Others require prior authorization before cutting or logging protected forests.³⁵ Two contracts require reforestation or revegetation of land at the end of operations, where suitable.³⁶

Restricting forest conversion through contract terms is particularly necessary in the absence of robust legislation that regulates the use of forested land.³⁷ To do this, governments may consider requiring mining companies to account for direct, indirect, and induced impacts on forests at every stage of the operations, including in the mining plan, the environmental impact assessment (EIA), and the environmental management plan (EMP), as well as systematically applying the mitigation hierarchy through the life of the mine.³⁸

- The mining plan, for example, should require companies to collect data to establish a baseline³⁹ and provide the government with an accurate, third-party verified survey of forested land within the concession area.
- Under the EMP, companies could be required to formally report their forest conversion activities and conduct internal audits to demonstrate that they are achieving no net loss or net gain.⁴⁰
- In cases where the contract area includes areas that should remain permanently forested (due to zoning errors, for example), the contract should also specify that these areas must remain permanently forested and provide clear penalties for violations.
- Additionally, a requirement of complete or partial reforestation should be included as part of the closure plan.⁴¹

2.2 Climate Change Adaptation

2.2.1 Climate Risk Assessment and Community Vulnerability Assessment

Climate change adaptation in a mining context refers to how mining companies can incorporate climate considerations into mining processes, practices, and structures to mitigate climate-related risks.⁴² It relates to the company's "ability to adapt to changes, anticipate what might happen next, and absorb weather and climate-related shocks when they happen."⁴³ Importantly, climate change adaptation also refers to the role of mining

companies in strengthening the resilience of mining-affected communities to climate-related impacts.

Climate change poses risks to the mining sector and mining-affected communities with the increased frequency and intensity of severe weather events that affect mining operations both directly—in terms of mine closures, damage to infrastructure, access to water, and more dangerous working conditions—and indirectly, when their supply chains are similarly impacted. At the same time, integrating climate adaptation strategies into the lifecycle of a mining project can improve mine performance and efficiency, thereby reducing costs and even increasing revenues, including for the government through tax revenues.

Climate change can exacerbate vulnerabilities in host communities where droughts, floods, increasing temperatures, and natural disasters lead to a loss of livelihood, food shortages, crop failures, the spread of diseases, and worsening social conditions.⁴⁴ The presence of a mine can also negatively impact community resilience. Engaging with mining-affected communities to build their resilience to the impacts of climate change is fundamentally important for mining companies to maintain their social license and meet public expectations regarding corporate responsibility.

A climate adaptation strategy will ensure that mining-related assets are better able to withstand more frequent and severe climate events (see, for example, the Tailings Dams section below). It will also help to mitigate the project's impact on the surrounding environment and community, including water supply (see the Water section below), during the life of the mine and/or post-closure (see the Closure Plans section below). A climate adaptation strategy is most effective where mining companies integrate climate change considerations into their own corporate strategies and then make investment, construction, and operational decisions based on best practices of global climate change models tailored to local, site-specific conditions.⁴⁵

None of the contracts reviewed includes provisions that relate to climate adaptation strategies.

Mining contracts should expressly require mines to comply with the national adaptation plans (NAPs) and climate adaptation guidelines when such instruments have been developed by the host country.⁴⁶

Moreover, in the context of the EIA and EMP, mining companies should be required to assess climate risks and impacts and develop management plans to address them. In the same way that contracts often prescribe the contents of an EIA and EMP, they could similarly define what a climate risk assessment and related management plan entail. The climate risk assessment exercise entails defining critical thresholds and then assessing when and where critical thresholds could be exceeded triggering intolerable risks. Such thresholds could be “the available freeboard of a tailings dam, a maximum safe working temperature for personnel”⁴⁷ or the maximum length of a drought period for local communities. The threshold should be anticipated as being exceeded with growing probability and intensity as time passes. The data on probability, frequency, and magnitude of extreme weather events should rely on changes to the weather across short (12 hours), medium (5 days), and longer (annual trends) terms.⁴⁸ Moreover, the climate risk assessment should also cover incremental changes in climate conditions as these can affect the mining design and impact the surrounding environment on a cumulative basis. Lastly, the assessment should be conducted as if no adaptation measures were in place to apprehend maximum risk.⁴⁹

The identified risks and site-specific mitigation strategies in the EIAs should also inform EMPs used to assess and monitor mining operations. In the mining development plan, mining companies should demonstrate the integration of the result of the climate risk assessment into the decisions on where to locate mining assets and in the design of mining-related infrastructure. Risk mitigation strategies should be constantly revised to reflect the latest predictions.⁵⁰ Emergency preparedness plans should also be put in place, reviewed, and updated to reflect best practices with respect to climate-related risks.

Mining companies are also well placed to assist by engaging early on with communities to improve their resilience to climate-related risks. This could include helping to develop emergency planning practices and supporting communities to develop and implement climate change adaptation plans.⁵¹ In this regard, community development requirements contained in law or in community development agreements (CDAs) could require companies to contribute to community climate change adaptation strategies if communities deem it appropriate. For example, mining companies

could provide financial support and training to local communities for the communities to run a vulnerability assessment on their livelihood resources, develop adaptation measures, and to identify where the company could support communities' resilience.⁵² These areas can be related to infrastructure, agriculture, water, health, and biodiversity, as well as emergency preparedness.

2.2.2 Water Use

Access to a stable water supply is crucial to mining operations. Water is required to suppress dust, process ore, cool and wash mining equipment, and manage tailings; without water, a mine cannot operate. Hard rock mining, in particular, involves a significant amount of water to separate and purify minerals. As mining operations expand to meet the mineral needs of the clean energy transition, the water footprint of the mining sector will increase.

The six largest mining companies operate 70% of their mining projects in water-stressed regions.⁵³ Water is already a source of conflict between mining companies and local communities, particularly when mines operate upstream of communities that rely on the same water source.⁵⁴ More frequent droughts due to climate change could lead to severe water shortages and more frequent flooding during the rainy season. This could inundate mines, cause more closures, leach harmful chemicals into the environment, and destabilize infrastructure such that mines may collapse.

Yet, out of the contracts reviewed that include water-related provisions, most do not limit the amount of water mining companies may use or require that mining companies treat the water they use before discharging it.⁵⁵ Like with deforestation, this is not surprising because water rights are usually established by legislation, including in our sample.

In the absence of robust laws that regulate water use, governments should expressly condition the grant of water rights to mining companies on stringent obligations regarding water use efficiency.⁵⁶ For example, in drafting the mining plan, companies should be required to demonstrate that they are using the most water-efficient designs, including planning for zero water waste and prioritizing water reuse over the request for water rights.⁵⁷ Additionally, the contract should include a penalty for water overuse or release of non-treated waste water and

a grievance mechanism for downstream communities whose water rights are impacted.

The contract should include obligations for the mine to create shared-use opportunities when developing a water solution for the mine to increase nearby communities' access to water.⁵⁸

The contract should also reserve the government's ability to alter water allocation to mining operations based on fluctuations in the amount of available water and the number of users reliant on the water source. Adjustments of this nature are statutorily authorized in South Africa, and other states could draw on these water use laws in drafting contract terms.⁵⁹ Relatedly, the EIA should contain requirements to periodically assess the climate impacts on the mining region's aquifer and adjust the mine's water use rights accordingly.

2.2.3 Tailings Dams

Tailings are a common byproduct of mineral extraction and are typically stored as a slurry in dammed reservoirs. The properties of tailings vary according to the size and structure of the mined rock and the chemicals used in mineral processing. Tailings may range from highly toxic to relatively harmless, though most are acidic and contain high salt concentrations. As the mining sector expands and ore grades fall, tailings waste is set to increase.⁶⁰

The stability of tailings storage facilities largely depends on consistent land and weather conditions. Global warming-related changes in precipitation patterns and ambient temperature will affect soil moisture and ground temperature, weakening tailings structures. Under hot and arid conditions, for example, water evaporation will concentrate tailings, accelerate acid mine drainage, and lead to widespread environmental contamination. In wetter climates, heavy rainfall may cause tailings dams to overflow or collapse.

When tailings dams fail, they may release millions of liters of toxic waste into the environment, resulting in water pollution, widespread destruction, and loss of life. Although the total number of tailings dam failures is declining, the risk of catastrophic tailings dam failures has been increasing since 1990.⁶¹ After 2000, the catastrophic failure rate has been about five or six serious failures every year.⁶² Approximately 25% of worldwide tailings

dam failures are the result of extreme weather events. This may increase as the effects of climate change become more acute.⁶³

The risk of tailings dam failure can be greatly reduced by requiring mining companies to justify their tailings dam design. However, none of the contracts reviewed included detailed provisions on tailings dams. Provisions appearing in eight of the contracts reviewed are limited to an obligation on the mining company to “secure and reinforce all water dams, tailings or excavation ponds to prevent collapse,”⁶⁴ or to ensure “all dams, whether for water, debris or waste, [are] safe to resist collapse.”⁶⁵

Upstream dams (in particular when they are immediately upstream of communities) should be explicitly banned by the contract and tailings storage should use the best available technology, including filtered tailings or dry stack.⁶⁶ The contract should require that the mining plan demonstrate that the tailings dam follows the latest global safety standards, such as the Safety First Guidelines for Responsible Mine Tailings Management,⁶⁷ and that ongoing maintenance and remediation activities will be conducted. Furthermore, in the EIA, companies should model the risk of tailings dam failure due to climate-related risks like flooding and heavy rainfall, making sure to assess all possible scenarios of mode of failure, their probabilities, the severity of the impact on local communities, and the corresponding costs. The EMP should include the obligation to demonstrate that the tailings dam is adequately monitored for failure risk, with the goal of achieving zero tailings dam failures. Further, the EMP should provide for both internal and external inspection systems, with the external inspection system involving technologies like satellite-based remote sensing, public disclosure of the inspection results, and a participatory monitoring role for local communities.

2.2.4 Closure Plans

Mining is a long-term but temporary use of land. As mining operations wind down, the site is rehabilitated according to the mine closure plan. Some governments require this plan to be submitted before mining begins, as it often influences how companies choose to construct the mine. Over the decades-long life of a mine and the decades post-closure, environmental conditions may change drastically. To ensure that the rehabilitated mine site remains stable

over time, mine closure criteria should be designed through a climate change risk management lens, where the magnitude of the risk depends on the likelihood of a particular climate event and the consequences of that event.⁶⁸ For instance, insufficient water and high temperatures make it harder to re-establish the previous vegetation in rehabilitation efforts and there may be a need for drought-resistant vegetation, which could increase closure cost; ‘bio-mining’ and the growth of fibrous plants on old tailings dams to extract minerals could also help address the risk of tailings dam failure post-closure.

Early assessment of likely and unlikely climate risks enables companies to devise resilient, robust closure plans. This framework allows companies to assess whether a risk that is unlikely to occur in the short term is, in fact, highly likely to occur in the long term and evaluate how to best prevent it. Importantly, the closure plan is meant to be iterative; each successive version represents a more efficient solution.

More than half of the contracts analyzed—notably those concluded by Guinea and Mozambique—include provisions that require the mining company to plan in advance for the closure of the mine⁶⁹ and the environmental rehabilitation of the mine site.⁷⁰ For example, two contracts from Mozambique⁷¹ require mining companies to comply with closure and rehabilitation obligations in mining and environmental laws and regulations, and in the project’s EMPs, and to develop and periodically update a mine closure plan:

Obligations in the rehabilitation and closure phase. The Mining Concessionaire must, in relation to its Mining Concession in the Contract Area, comply with all the rehabilitation and closure obligations described in the Mining Law, in the Environmental Regulation for the Mining Activity, and in the Environmental Management Plan and Environmental Management Program approved pursuant to that regulation and this Contract.⁷²

The Mine Concessionaire must develop and update periodically, every five years, as part of the Environmental Management Program, and in consultation with the beneficiary community and the local authority, a Mine Closure Program, which prepares the beneficiary community for the

eventual closure of the Mining Operations. Such a program must be articulated with the Local Development Agreement [...].⁷³

However, none of the contracts requires the concessionaire to integrate climate risks into the development of the closure plans.

Contracts should require closure plans to be submitted at the beginning of the project at the time of the EIA submission⁷⁴ and describe how the mining company intends to avoid or mitigate the environmental impacts associated with closure, as well as how it plans to rehabilitate the mine site. Rehabilitation strategies should reflect an understanding of the changing relationship between the ecosystem and the climate. The contract should include a requirement to model the long-term sustainability of rehabilitation projects and set climate-responsive targets.

Additionally, the closure plan should include a section on the expected cost of mine closure that takes into account climate-related risks and provides a clear mechanism to ensure that the company meets the financial obligations associated with closure. Finally, the closure plan should require the company to actively monitor the mine site for a period of time post-closure and the company should remain liable for related negative environmental impacts that occur within several years of closure.

3 Conclusion

The investor–state contracts reviewed, concluded by five fragile states in Africa (Chad, the Democratic Republic of Congo, Guinea, Mozambique, and Sierra Leone), largely do not regulate the mining sector’s contribution to climate change mitigation or the climate-related impacts of the sector. In some cases, this may be because there are relevant laws that apply. In other cases, where robust laws do not exist, contracts with permissive provisions stand to worsen the climate-related impacts of the project on the environment and communities. It is timely for governments to review and update mining legal frameworks—including domestic laws, investor–state contracts, CDAs, and MMDAs—to both increase climate resilience and align the contributions of the mining sector with sustainable development objectives.

Endnotes

- 1 The authors are grateful to Hind Al Aissi's for her research support during her time serving as a research assistant with the Columbia Center on Sustainable Investment; the authors also thank Solina Kennedy for her support in developing the key points during her time as a Program Associate with the Columbia Center on Sustainable Investment.
- 2 Valérie Masson-Delmotte, Panmao Zhai, Hans-Otto Pörtner, Debra Roberts, Jim Skea, Priyadarshi R. Shukla, Anna Pirani, Wilfran Moufouma-Okia, Clotilde Péan, Roz Pidcock, Sarah Connors, J. B. Robin Matthews, Yang Chen, Xiao Zhou, Melissa I. Gomis, Elisabeth Lonnoy, Tom Maycock, Melinda Tignor, and Tim Waterfield, *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty* (Intergovernmental Panel on Climate Change [IPCC], 2018), 12, https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf.
- 3 Kirsten Hund, Daniele La Porta, Thao P. Fabregas, Tim Laing, and John Drexhage, *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition* (Washington, DC: The World Bank, 2020), 11, <http://pubdocs.worldbank.org/en/961711588875536384/Minerals-for-Climate-Action-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf>; see also Perrine Toledano, Martin Dietrich Brauch, Solina Kennedy, and Howard Mann, *Don't Throw Caution to the Wind: In the Green Energy Transition, Not All Critical Minerals Will Be Goldmines* (New York, NY: Columbia Center on Sustainable Investment [CCSI], 2020), <https://ccsi.columbia.edu/content/dont-throw-caution-wind-green-energy-transition-not-all-critical-minerals-will-be-goldmines>.
- 4 Lindsay Delevingne, Will Glazener, Liesbet Grégoir, and Kimberly Henderson, *Climate Risk and Decarbonization: What Every Mining CEO Needs to Know* (McKinsey & Company, January 2020), <https://www.mckinsey.com/~media/McKinsey/Business%20Functions/Sustainability/Our%20Insights/Climate%20risk%20and%20decarbonization%20What%20every%20mining%20CEO%20needs%20to%20know/Climate-risk-and-decarbonization-What-every-mining-CEO-needs-to-know.pdf>.
- 5 Hund et al., *Minerals for Climate Action*, 16.
- 6 See e.g. Clarice Wambua, “The Kenya Climate Change Act 2016: Emerging Lessons from a Pioneer Law,” *Carbon & Climate Law Review* 13, no. 4 (2019), 257–269, <https://cclr.lexion.eu/article/CCLR/2019/4/6>.
- 7 République de Guinée, Loi No. L/2019/0034/AN, 4 juillet 2019, portant Code de l'Environnement, Articles 143-147 <https://meef-guinee.org/wp-content/uploads/2020/11/Code-de-l-Environnement-du-04-juillet-2019-1.pdf>.
- 8 Climate change mitigation and adaptation considerations may be embedded in climate, environmental, mining, energy, and forestry laws, among others.
- 9 The African Legal Support Facility (ALSF) considered the following countries to be fragile states in 2019: Burundi, Central African Republic, Chad, Comoros, the Democratic Republic of Congo (DRC), Djibouti, Eritrea, Gambia, Guinea, Guinea-Bissau, Liberia, Madagascar, Mali, Mozambique, Niger, Sierra Leone, Somalia, South Sudan, Sudan, Togo, and Zimbabwe. We searched for mining concession agreements signed after December 12, 2015 from this list of countries on ResourceContracts.org, and found relevant contracts from Chad (2) <https://resourcecontracts.org/contract/ocds-591adf-2147513270/view#/pdf> and <https://resourcecontracts.org/contract/ocds-591adf-0619233735/view#/pdf>; DRC (4) <https://resourcecontracts.org/contract/ocds-591adf-9496348211/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-7240337747/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-7044589106/view#/pdf>, and <https://resourcecontracts.org/contract/ocds-591adf-5604925962/view#/pdf>; Guinea (11) <https://resourcecontracts.org/contract/ocds-591adf-7227443979/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-8055683009/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-2095504636/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-2995983040/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-5699672631/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-3622819596/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-0842187625/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-9306677863/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-8002546923/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-1880406409/view#/pdf>, <https://resourcecontracts.org/contract/ocds-591adf-2707180369/view#/pdf>; Mozambique (2) <https://resourcecontracts.org/contract/ocds-591adf-3253769280/view#/pdf> and <https://resourcecontracts.org/contract/ocds-591adf-1233175911/view#/pdf>; and Sierra Leone (2) <https://resourcecontracts.org/contract/ocds-591adf-9176507089/view#/pdf> and <https://resourcecontracts.org/contract/ocds-591adf-4376389326/view#/pdf>. The two agreements from Chad are exploitation permits rather than concession agreements.
- 10 ResourceContracts.org is the largest online repository of publicly available oil, gas, and mining contracts. The site currently holds almost 2500 extractives contracts and associated documents. “ResourceContracts.org - Search Contracts,” Resource Contracts (website), Natural Resource Governance Institute (NRGI), CCSI, World Bank Group, and Open Oil, <https://www.resourcecontracts.org/contracts>.

- 11 Boko, M., I. Niang, A. Nyong, C. Vogel, A. Githeko, M. Medany, B. Osman-Elasha, R. Tabo and P. Yanda, 2007: Africa. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge UK, 433-467
Edem E. Selormey and Carolyn Logan, “African Nations are among those Most Vulnerable to Climate Change. A New Survey Suggests they are also the Least Prepared,” *The Washington Post*, September 23, 2019, <https://www.washingtonpost.com/politics/2019/09/23/african-nations-are-among-those-most-vulnerable-climate-change-new-survey-suggests-they-are-also-least-prepared/>.
- 12 Hund et al., *Minerals for Climate Action*.
- 13 Nicolas Maennling and Perrine Toledano, *The Renewable Power of the Mine: Accelerating Renewable Energy Integration* (New York: CCSI, December 2018), 78, <https://ccsi.columbia.edu/content/renewable-power-mine>.
- 14 Maennling and Toledano, *The Renewable Power of the Mine*, 17.
- 15 Progressive fiscal regimes enable countries’ share in project profits to rise with the increase in project profitability.
- 16 IFC Performance Standards (2012), https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/Performance-Standards, Climate is mentioned in Performance Standard 1 and 4 in particular.
- 17 Hund et al., *Minerals for Climate Action*, 18.
- 18 Maennling and Toledano, *The Renewable Power of the Mine*, 17.
- 19 Maennling and Toledano, *The Renewable Power of the Mine*, 18.
- 20 Raffinerie Alumine, Winning Consortium Alumina PTE.LTD, Winning Consortium Alumina Guinea S.A, Convention pour Construction et Exploitation, 2018, <https://resourcecontracts.org/contract/ocds-591adf-2995983040/view#/pdf>; Santou, Guinea Evergreen Mining Intelligence SA, TBEA Co Ltd, Concession Agreement, 2017, <https://resourcecontracts.org/contract/ocds-591adf-0842187625/view#/pdf>; Boke-Telimele, Société de Développement des Mines Internationales du Henan SA, Compagnie de Développement des Mines Internationales Henan Chine Guinée, Convention de base amendée et consolidée, 2018, <https://resourcecontracts.org/contract/ocds-591adf-9306677863/view#/pdf>; SAG, Societe Aurifere de Guinee, Golden Shamrock, Anglogold Ashanti, Amendment, 2016, <https://resourcecontracts.org/contract/ocds-591adf-2707180369/view#/pdf>; SL Mining Limited, Concession, 2017, <https://resourcecontracts.org/contract/ocds-591adf-9176507089/view#/pdf>; SierraMin Bauxite Limited, Concession, 2017, <https://resourcecontracts.org/contract/ocds-591adf-4376389326/view#/pdf>.
- 21 Three Guinea contracts: Chalco Guinea Company S.A, Société Portuaire, Chalco Hong Kong Limited, Annexes convention minière, 2018, <https://resourcecontracts.org/contract/ocds-591adf-5699672631/view#/pdf>; Santou II-Houda, Société Minière de Boké, Concession Agreement, 2018, <https://resourcecontracts.org/contract/ocds-591adf-8055683009/view#/pdf>; and Compagnie de Développement des Mines Internationales Henan, La Société de Développement des Mines Internationales du Henan, CDM, Exploitation License, 2018, <https://resourcecontracts.org/contract/ocds-591adf-9306677863/view#/pdf>; one Sierra Leone contract: SierraMin Bauxite Limited, Concession, 2017, <https://resourcecontracts.org/contract/ocds-591adf-4376389326/view#/pdf>.
- 22 Maennling and Toledano, *The Renewable Power of the Mine*, 13.
- 23 DeBeers proposes a carbon neutrality strategy by 2030. Martin Creamer, “De Beers Adopts Strategy to Meet Carbon-Neutral Ambition,” *Creamer Media’s Mining Weekly* (January 29, 2021), https://www.miningweekly.com/article/de-beers-adopting-reduce-replace-recover-approach-to-2030-carbon-neutral-ambition-2021-01-29/rep_id:3650.
- 24 “Greenhouse Gas Protocol,” Greenhouse Gas Protocol (website), World Resources Institute, WBCSD, <http://www.ghgprotocol.org>.
- 25 Nicky Jenner, Pippa Howard, Estelle Levin-Nally, Blanca Racionero Gómez, Håkan Tarras-Wahlberg, Sally Johnson, Kirsten Hund, Laura Ivers, and Charlotte Ampaire, *Making Mining “Forest-Smart”: Executive Summary* (Washington, DC: The World Bank, 2019), 32, https://www.profor.info/sites/profor.info/files/Forest%20Smart%20Mining%20Executive%20Summary-fv_0.pdf.
- 26 Jenner et al., *Ming Mining “Forest-Smart,”* 32.
- 27 Jenner et al., *Ming Mining “Forest-Smart,”* 18. Hosonuma, N., M. Herold, V. De Sy, R. S. De Fries, M. Brockhaus, L. Verchot, A. Angelsen, and E. Romijn. 2012. “An Assessment of Deforestation and Forest Degradation Drivers in Developing Countries.” *Environmental Research Letters*.
- 28 Jenner et al., *Ming Mining “Forest-Smart,”* 37.
- 29 Pete Smith, Mercedes Bustamante, Helal Ahammad, Harry Clark, Hongmin Dong, Elnour A. Elsiddig, Helmut Haberl, Richard Harper, Joanna House, Mostafa Jafari, Omar Masera, Cheikh Mbow, Nijavalli H. Ravindranath, Charles W. Rice, Carmenza Robledo Abad, Anna Romanovskaya, Frank Sperling, and Francesco N. Tubiello, “Agriculture, Forestry, and Other Land Use (AFOLU),” *Climate Change 2014: Mitigation of Climate Change* (Cambridge and New York: Cambridge University Press, 2014), 825, https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf.

- 30 IPCC, *Climate Change and Land: Summary for Policymakers* (2020), 4, https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf.
- 31 IPCC, *Climate Change and Land*, 12.
- 32 “Soil Erosion Must Be Stopped ‘to Save Our Future,’ Says UN Agriculture Agency,” *UN News*, December 5, 2019, <https://news.un.org/en/story/2019/12/1052831>.
- 33 Chalco Guinea Company S.A, Société Portuaire, Chalco Hong Kong Limited, Convention Minière, 2018, <https://resourcecontracts.org/contract/ocds-591adf-5699672631/view#/pdf>; Fria, Bauxite Kimbo S.A.U, Bauxite Kimbo Limited, Concession Agreement, 2018, <https://resourcecontracts.org/contract/ocds-591adf-3622819596/view#/pdf>; Twigg Exploration and Mining, Concession, 2018, <https://resourcecontracts.org/contract/ocds-591adf-3253769280/view#/pdf>; Capitol Resources, Concession, 2017, <https://resourcecontracts.org/contract/ocds-591adf-1233175911/view#/pdf>.
- 34 See for e.g. Fria, Bauxite Kimbo S.A.U, Bauxite Kimbo Limited, Concession Agreement, 2018 <https://resourcecontracts.org/contract/ocds-591adf-3622819596/view#/pdf>.
- 35 La Société des Bauxites de Guinée, SBG Bauxite and Alumina N.V., Concession, 2018, <https://resourcecontracts.org/contract/ocds-591adf-7227443979/view#/pdf>; Bel Air Mining, Alufer Mining, Alufer Mining Limited, Concession, 2016, <https://resourcecontracts.org/contract/ocds-591adf-8002546923/view#/pdf>; Trik, Société des Mines de Mandiana, Avocet Mining, Managem, Concession, 2016, <https://resourcecontracts.org/contract/ocds-591adf-1880406409/view#/pdf>; SAG, Societe Aurifere de Guinee, Golden Shamrock, AngloGold Ashanti, Amendment, 2016, <https://resourcecontracts.org/contract/ocds-591adf-2707180369/view#/pdf>; SL Mining Limited, Concession, 2017, <https://resourcecontracts.org/contract/ocds-591adf-9176507089/view#/pdf>.
- 36 SierraMin Bauxite Limited, Concession, 2017, <https://resourcecontracts.org/contract/ocds-591adf-4376389326/view#/pdf>; Boke-Telimele, Société de Développement des Mines Internationales du Henan SA, Compagnie de Développement des Mines Internationales Henan Chine Guinée, Convention de base amendée et consolidée, 2018, <https://resourcecontracts.org/contract/ocds-591adf-9306677863/view#/pdf>.
- 37 Legislation of the relevant countries was not reviewed, and it is possible that relevant laws include forest-related obligations that would apply to mining companies operating in the relevant country.
- 38 New York Declaration on Forests, *Progress on the New York Declaration on Forests: Goal 3 Assessment* (New York Declaration on Forests, Sept. 2019), 3, <https://forestdeclaration.org/images/uploads/resource/2019NYDFGoal3.pdf>; Jenner et al., *Making Mining “Forest-Smart”*; Siân Bradley, *Mining’s Impacts on Forests: Aligning Policy and Finance for Climate and Biodiversity Goals* (Chatham House, October 14, 2020), <https://www.chathamhouse.org/2020/10/minings-impacts-forests/2-minings-impacts-forests>.
- 39 Jenner et al., *Making Mining “Forest-Smart,”* 94.
- 40 New York Declaration on Forests, *Progress on the New York Declaration on Forests: Goal 3 Assessment*, 3; Jenner et al., *Making Mining “Forest-Smart,”* 94.
- 41 Bradley, *Mining’s Impacts on Forests*.
- 42 Verónica Martínez, Aidan Davy, Duncan Robertson, Anna Haworth, Robin Hamaker-Taylor and Richenda Connell, *Adapting to Climate Change. Building Resilience in the Mining and Metals Industry* (International Council on Mining and Metals [ICMM], 2019), https://www.icmm.com/website/publications/pdfs/environmental-stewardship/2019/guidance_changing-climate.pdf; Barry Smit, Olga Pilifosova, I. Burton, B. Challenger, S. Huq, R.J.T. Klein, G. Yohe, N. Adger, T. Downing, E. Harvey, M. Parry, M. Skinner, J. Smith, and J. Wandel, *Adaptation to Climate Change in the Context of Sustainable Development and Equity* (IPCC, 2018), <https://www.ipcc.ch/site/assets/uploads/2018/03/wg2TARchap18.pdf>.
- 43 Martínez et al., *Adapting to Climate Change*.
- 44 Julia Nelson and Ryan Schuchard, *Adapting to Climate Change: A Guide for the Mining Industry* (Business for Social Responsibility [BSR], September 12, 2011), https://www.bsr.org/reports/BSR_Climate_Adaptation_Issue_Brief_Mining.pdf.
- 45 Nelson and Schuchard, *Adapting to Climate Change*.
- 46 “National Adaptation Plans,” United Nations Environment Programme [UNEP] (website), UNEP, <https://www.unenvironment.org/explore-topics/climate-change/what-we-do/climate-adaptation/national-adaptation-plans>.
- 47 Martínez et al., *Adapting to Climate Change*.
- 48 Leah Mason and Damien Giurco, *Climate Change Adaptation for Australian Minerals Industry Professionals* (National Climate Change Adaptation Research Facility, 2013), <https://nccarf.edu.au/climate-change-adaptation-australian-minerals-industry-professionals>.
- 49 Martínez et al., *Adapting to Climate Change*.
- 50 For more information on mitigation strategies for water and tailings dam, see section below.
- 51 Steven R. Wilson, Carmen Lacambra, Dominic Molloy, Juan Lacambra, Isabel Leroux, Leena Klossner, Maria Talari, Margarita Cabrera, Svante Persson, Tom Downing, Erica Downing, Ben Smith, Mark Abkowitz, Lauren A. Burnhill, Linda Johnson-Bell, Laurel Colles, Blue Dachshund Oy, Rebekka Grohn, Sanna Turunen, et al., *Private Markets for Climate Resilience: Global Report* (Inter-

- American Development Bank and Nordic Development Fund, 2020), 31–33, 45–48, <https://publications.iadb.org/publications/english/document/Private-Markets-for-Climate-Resilience-Global-Report.pdf>.
- 52 ICMM, *Rio Tinto Minera Peru: La Granja Project* (ICMM, July 7, 2016), http://icmm.uat.byng.uk.net/website/case-studies/2016_la-granja-case-study.pdf.
- 53 Hund et al., *Minerals for Climate Action*, 13.
- 54 Tony Andrews, Bernarda Elizalde, Philippe Le Billon, Chang Hoon Oh, David Reyes, and Ian Thomson, *The Rise in Conflict Associated with Mining Operations: What Lies Beneath?* (Canadian International Resources and Development Institute, April 2017), <https://ciridi.ca/wp-content/uploads/2017/06/Conflict-Full-Layout-060817.pdf>.
- 55 See SierraMin Bauxite Limited, Concession, 2017, <https://resourcecontracts.org/contract/ocds-591adf-4376389326/view#/pdf>: “The Company shall have the following rights incident to Mining Operations: (i) Either within or outside the Mining Area, to dig, widen and deepen channels in rivers, streams and watercourses as may be necessary to permit or facilitate water flow or barge access to or from the washing plant or the private ship loading facilities operated by the Company. (ii) Within or outside the Mining Area, to use the water from any natural water course and to return the same together with washing spoils to the river, stream or water course, provided that, in so doing, the Company shall not discharge or permit to be discharged any poisonous or noxious matter not present in the intake water, and (y) to fell trees subject to the provisions of the Mines and Minerals Act, and otherwise clear the land to be mined.”
- 56 NRGi’s Measuring Environmental and Social Impacts Tool Explorer contains examples of several tools, frameworks and standards for measuring and monitoring water use in mining projects. See Nicola Woodroffe and Tim Grice, *Beyond Revenues: Measuring and Valuing Environmental and Social Impacts in Extractive Sector Governance* (National Resource Governance Institute, September 4, 2019), <https://resourcegovernance.org/analysis-tools/publications/beyond-revenues-measuring-environmental-social-impacts>.
- 57 Perrine Toledano and Clara Roorda, “Leveraging Mining Investments in Water Infrastructure for Broad Economic Development: Models, Opportunities and Challenges,” *CCSI Policy Paper* (CCSI, March 2014), <https://ccsi.columbia.edu/sites/default/files/content/docs/our%20focus/CCSI-Policy-Paper-Leveraging-Mining-Related-Water-Infrastructure-for-Development-March-20141.pdf>.
- 58 Toledano and Roorda, “Leveraging Mining Investments in Water Infrastructure.”
- 59 Toledano and Roorda, “Leveraging Mining Investments in Water Infrastructure.”
- 60 In an effort to improve transparency, in January 2020, GRID-Arendal launched the Global Tailings Portal, the first database of tailings dams and other storage facilities; the database contains information on nearly 1,900 tailings storage facilities (“Global Tailings Portal,” Global Tailings Portal (website), <https://tailing.grida.no>).
- 61 Lindsay N. Bowker and David M. Chambers, *The Risk, Public Liability, and Economics of Tailings Storage Facility Failures* (Stonington, ME and Bozeman, MT: Bowker Associates Science & Research in the Public Interest and Center for Science in Public Participation, 2015), 1, <https://files.dnr.state.mn.us/input/environmentalreview/polymet/request/exhibit3.pdf>.
- 62 John R. Owen, D. Kemp, E. Lebre, K. Svobodova, and G. Perez Murillo, “Catastrophic Tailings Dam Failures and Disaster Risk Disclosure,” *International Journal of Disaster Risk Reduction* 42 (2020), 2, <https://www.sciencedirect.com/science/article/pii/S2212420919306648>.
- 63 Mayte T. Rico, G. Benito, A. R. Salgueiro, A. Diez-Herrero, and H. G. Pereira, “Reported Tailings Dam Failures: A Review of the European Incidents in the Worldwide Context,” *Journal of Hazardous Materials* 152, no. 2 (April 1, 2008), 848, https://www.sciencedirect.com/science/article/pii/S0304389407010837?casa_token=JAUINcLEsDIAAAAA:1cK09JM6lyW9uFpOtC0u8Pu5QZtPTwpSVm4AGzlbsK7gkiLUorFwM9Rk0RkEpGQOIKkMLrUK#.
- 64 La Société des Bauxites de Guinée, SBG Bauxite and Alumina N.V., Concession, 2018, Art. 11.4.4(d), <https://resourcecontracts.org/contract/ocds-591adf-7227443979/view#/pdf>; Chalco Guinea Company S.A, Société Portuaire, Chalco Hong Kong Limited, Convention Minière, 2018, Art. 28.1.3(B)(5), <https://resourcecontracts.org/contract/ocds-591adf-5699672631/view#/pdf>; Fria, Bauxite Kimbo S.A.U, Bauxite Kimbo Limited, Concession Agreement, 2018, Art. 29.4(E)(d), <https://resourcecontracts.org/contract/ocds-591adf-3622819596/view#/pdf>; Santou, Guinea Evergreen Mining Intelligence SA, TBEA Co Ltd, Concession Agreement, 2017, Art. 26.1.3(B)(5), <https://resourcecontracts.org/contract/ocds-591adf-0842187625/view#/pdf>; Bel Air Mining, Alufer Mining, Alufer Mining Limited, Concession, 2016, Art. 29.4.5(B)(4), <https://resourcecontracts.org/contract/ocds-591adf-8002546923/view#/pdf>; Trik, Société des Mines de Mandiana, Avocet Mining, Managem, Concession, 2016, Art. 31.4.5(iv), <https://resourcecontracts.org/contract/ocds-591adf-1880406409/view#/pdf>.
- 65 Capitol Resources, Concession, 2017, Art. 9.4.2(d), <https://resourcecontracts.org/contract/ocds-591adf-1233175911/view#/pdf>; Twigg Exploration and Mining, Concession, 2018, Art. 9.4.2(d), <https://resourcecontracts.org/contract/ocds-591adf-3253769280/view#/pdf>.
- 66 Franks, D.M., Stringer, M., Torres-Cruz, L.A. et al., *Tailings facility disclosures reveal stability risks*. *Scientific Reports* 11, 5353 (2021). <https://doi.org/10.1038/s41598-021-84897-0>

- 67 The Global Industry Standards on Tailings Management should be the standard to follow: Global Ratings Review, *Global Industry Standard on Tailings Management* (ICMM, UNEP, and Principles for Responsible Investment [PRI], August 2020), https://globaltailingsreview.org/wp-content/uploads/2020/08/global-industry-standard_EN.pdf. However, it is not robust enough to ensure safety. See e.g. Global Tailings Review, ICMM, and UNEP, *Scorecard: The Global Industry Standard On Tailings Management vs. Safety First Guidelines* (Global Ratings Review, ICMM, and UNEP, August 5, 2020), <https://bit.ly/38sQkbv>.
- 68 Andrew Baisley, Steven Pearce, and Mike O’Kane, *Climate Change and Mine Closure – A Practical Framework for Addressing Risk* (O’Kane Consultants Inc., 2017), 2, <http://www.okc-sk.com/new/wp-content/uploads/2017/03/Baisley-et-al-2016-Climate-change-and-mine-closure-IMWA-Conference.pdf>.
- 69 La Société des Bauxites de Guinée, SBG Bauxite and Alumina N.V., Concession, 2018, <https://resourcecontracts.org/contract/ocds-591adf-7227443979/view#/pdf>; Santou II-Houda, Société Minière de Boké, Concession Agreement, 2018, <https://resourcecontracts.org/contract/ocds-591adf-8055683009/view#/pdf>; Chalco Guinea Company S.A, Société Portuaire, Chalco Hong Kong Limited, Convention Minière, 2018, <https://resourcecontracts.org/contract/ocds-591adf-5699672631/view#/pdf>; Fria, Bauxite Kimbo S.A.U, Bauxite Kimbo Limited, Concession Agreement, 2018, <https://resourcecontracts.org/contract/ocds-591adf-3622819596/view#/pdf>; Santou, Guinea Evergreen Mining Intelligence SA, TBEA Co Ltd, Concession Agreement, 2017, <https://resourcecontracts.org/contract/ocds-591adf-0842187625/view#/pdf>; Boke-Telimele, Société de Développement des Mines Internationales du Henan SA, Compagnie de Développement des Mines Internationales Henan Chine Guinée, Convention de base amendée et consolidée, 2018, <https://resourcecontracts.org/contract/ocds-591adf-9306677863/view#/pdf>; Bel Air Mining, Alufer Mining, Alufer Mining Limited, Concession, 2016, <https://resourcecontracts.org/contract/ocds-591adf-8002546923/view#/pdf>; Trik, Société des Mines de Mandiana, Avocet Mining, Managem, Concession, 2016, <https://resourcecontracts.org/contract/ocds-591adf-1880406409/view#/pdf>; SAG, Societe Aurifere de Guinee, Golden Shamrock, AngloGold Ashanti, Amendment, 2016, <https://resourcecontracts.org/contract/ocds-591adf-2707180369/view#/pdf>; Twigg Exploration and Mining, Concession, 2018, <https://resourcecontracts.org/contract/ocds-591adf-3253769280/view#/pdf>; Capitol Resources, Concession, 2017, <https://resourcecontracts.org/contract/ocds-591adf-1233175911/view#/pdf>.
- 70 All of the contracts mentioned in the footnote above, as well as SL Mining Limited, Concession, 2017, <https://resourcecontracts.org/contract/ocds-591adf-9176507089/view#/pdf>; and SierraMin Bauxite Limited, Concession, 2017, <https://resourcecontracts.org/contract/ocds-591adf-4376389326/view#/pdf>.
- 71 Twigg Exploration and Mining, Concession, 2018, <https://resourcecontracts.org/contract/ocds-591adf-3253769280/view#/pdf>; Capitol Resources, Concession, 2017, <https://resourcecontracts.org/contract/ocds-591adf-1233175911/view#/pdf>.
- 72 Capitol Resources, Concession, 2017, Art. 9.1, <https://resourcecontracts.org/contract/ocds-591adf-1233175911/view#/pdf>.
- 73 Capitol Resources, Concession, 2017, Art. 9.4.3, <https://resourcecontracts.org/contract/ocds-591adf-1233175911/view#/pdf>.
- 74 Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development [IGF], Clémence Naré, Suzy H. Nikiéma, Marina Ruete, Kristi Disney Bruckner, Jenifer Hill, Jill Baker, Carolina Leseigneur Torres, and Luke Danielson, *IGF Guidance for Governments: Improving Legal Frameworks for Environmental and Social Impact Assessment and Management* (Winnipeg: IISD, June 2020), 31, <https://www.iisd.org/publications/igf-guidance-governments-esia>.



ccsi.columbia.edu

Columbia Center on
Sustainable Investment

Jerome Greene Hall
435 West 116th Street
New York, NY 10027
Phone: +1 (212) 854-1830
Email: ccsi@law.columbia.edu

The Columbia Center on Sustainable Investment is a leading applied research center and forum dedicated to the study, discussion and practice of sustainable international investment.