Overview

The Untapped Economic Potential of Sub-Saharan Africa’s Oil, Gas, and Mineral Resources

Africa is blessed with significant wealth in natural resources. The continent is home to an abundance of resources, including diamonds, gold, oil, natural gas, uranium, platinum, copper, cobalt, iron, bauxite, and silver, among others. Minerals, oil, and gas account for a third or more of exports from most countries in Sub-Saharan Africa and can reach similar shares of government revenues. The majority of countries in Sub-Saharan Africa (26 out of the 48 countries in the region defined by the World Bank) are now categorized as resource rich according to the International Monetary Fund definition (IMF 2012), with more on the path to reaching this status given recent discoveries.

Despite large and growing reserves, converting subsoil wealth into sustainable prosperity has met with limited success. During the last commodity price boom, lasting from about 2004 to 2014, resource-rich countries saw economic growth accelerate, rising by an average of 1 percentage point compared with earlier years. This was, however, short-lived, with growth rates slowing with falling commodity prices from 2015—on average, 2.5 percentage points lower than during the boom. The boom years were a golden decade of rising revenues and new investments, but this prosperity proved precarious and dependent on high commodity prices. Few African countries shifted away from resource-driven economies during this period. Since the decline in commodity prices in 2014, resource-rich Africa has grown more slowly than the region’s average growth rate, a finding consistent with the “resource curse” hypothesis.

The legacy of the previous boom and bust was one of missed opportunity, where significant resource revenues were generally not converted into sustainable, diversified prosperity. This poor growth record is matched by disappointing
progress on poverty reduction. By 2030, more than 80 percent of the world’s poor will be found in the Africa region, and almost 75 percent of the world’s poor will be located in resource-rich countries. Taken together, 62 percent of the world’s poor will be found in Sub-Saharan African resource-rich countries. Poverty eradication is therefore becoming a disproportionately resource-rich country and Africa region problem.

Sub-Saharan Africa’s natural resource wealth nonetheless holds significant untapped economic potential. About one third of Sub-Saharan Africa’s total stock of wealth is held in various forms of natural capital, including nonrenewable petroleum and mineral deposits (World Bank 2021). In petroleum, Sub-Saharan Africa has seen more major discoveries since 2000 than any other region of the world, accounting for 50 percent of all giant discoveries in the 2010s. Before the boom period there were 14 petroleum-producing countries (7 major and 7 minor producers). After the boom period, the number of petroleum producers increased to 22 (10 major and 12 minor producers).

Nevertheless, many mining and petroleum projects remain undeveloped. Some languish after years of investment delays and complications, while many more deposits have yet to see firm investment commitments. Buoyant commodity prices, if sustained, could be a major opportunity for new projects and thus for new sources of government revenues.

Harnessing natural resource wealth to drive economic transformation is central to Africa’s economic future. Subsoil assets such as metals, minerals, oil, and gas remain key sources of government revenues, export earnings, and development potential across the majority of countries in the Africa region (AfDB 2018). Resource revenues remain a key source of government financing, and in the majority of Sub-Saharan African countries resources dominate large shares of the economy. Between 2004 and 2014, natural resource revenues accounted for about 26 percent of total government revenues in Africa and 30 percent of government revenues in resource-rich countries in Africa (UNU-WIDER 2022).

The extractive sector is well placed to support the economic recovery phase that the Africa region now faces. COVID-19 (coronavirus) and the associated debt challenges in many African countries highlighted the need to mobilize increased domestic revenues. To achieve national development goals, as well as Agenda 2030, it will be essential for resource-rich countries to find ways to avoid the pitfalls of the last boom-and-bust cycle, and to effectively harness resources for sustainable and inclusive development.

Several key megatrends will shape the coming decades and resource-rich countries’ ability to benefit from commodity exports. This period will require resilience, not just to commodity price cycles, but to other external shocks and structural changes.
Managing the low-carbon transition. Over time, global decarbonization may lead to significant declines in demand for Africa’s oil, gas, and coal resources. The timing and scale remain uncertain, however. Meanwhile, there may be a marked increase in the demand for minerals required for the clean energy transition, such as lithium, cobalt, copper, platinum, and manganese, many of which are found in abundance across Africa.

A just transition for Africa will depend on the countries’ harnessing the economic benefits from oil, gas, and mineral resources while also preparing their economies for a postpetroleum future. Economic transformation and diversification, alongside significant progress on poverty alleviation, is the best path to achieving this development vision.

Mechanization and the digital transformation. Increasingly widespread automation and digitalization, both in the extractive sector and throughout parts of the value chain, pose new challenges but also opportunities for job creation and value addition. Although this automation and digitalization will likely lead to productivity gains, it could also lead to rising capital intensity and lower job creation. Countries may need to reconsider how best to derive benefits from the sector, particularly in the context of high population growth.

Mitigation of environmental degradation, which has run rampant amid accelerating deforestation. As new exploration for extractives continues, forested regions may come under additional pressure from economic activity. Furthermore, a low-carbon transition away from fossil fuels may dampen Dutch disease effects in petroleum-exporting forested countries, increasing pressure on the forest from expanding traded sectors such as commercial agriculture.

Managing broader structural challenges that are an inherent part of extraction, notably addressing depletion and obsolescence risks, mitigating human capital distortions, and minimizing Dutch disease. Resource-rich countries are becoming increasingly numerous in the region, and this trend will continue at least in the short term. Thus, core poverty-alleviation and growth challenges will center on countries’ ability to manage the complications posed by extractives, particularly as they affect productivity and growth in nonextractive sectors of the economy. This is a hurdle for the majority of countries in Sub-Saharan Africa.

Four main policy messages emerge from the findings in this report. Governments must grapple with these challenges, drawing insights from both the successes and failures of resource-rich countries around the world.

First, harness the full value of resources for development. This means taxing the sector effectively to capture a greater share of rents without deterring sufficient investment. It also implies investing these revenues into the economy to accumulate productive capital in the form of infrastructure, an educated workforce, and a healthy, productive environment including land, water, and forests. Doing so will help ensure that growth rates are robust and will help countries avoid the resource curse. Capturing a greater share of resource rents also implies
reducing any implicit subsidy to production and thereby lowering global emissions. This is particularly important when taxing fossil fuels: capturing more revenues for government ensures a double dividend for both development and the climate.

Second, manage expectations to ensure fiscal sustainability. Avoiding the 
source curse, where countries can find themselves in debt distress or facing low growth even before production of resources begins, means tempering the pressure to borrow and spend ahead of revenues. Discoveries have been found to unleash powerful forces that can shape policy but leave countries exposed if they are not prepared for declining prices. This risk is especially true where global decarbonization may imply both declining fossil fuel prices in the future and higher variation in all kinds of natural resource prices because of mismatched supply and demand.

Third, embrace megatrends such as regional integration, the low-carbon transition, and mechanization and digitalization in the resource sector, as opportunities to break with the past. These megatrends explored in this report offer new horizons for Africa’s resource-rich economies. How the next two decades evolve will largely be a function of whether policy makers are able to navigate these trends effectively, while learning the lessons of the past. New trends mean new winners and new losers. They therefore put a premium on policy decisions that can find new ways to leverage resource wealth. This includes embracing regional integration to eliminate tariff and nontariff barriers in favor of building new regional value chains and country specialization, rather than doubling down on nationally defined local content and beneficiation. It also includes making the investment environment more responsive to ensure countries can capture market share for metals, minerals, and even fossil fuels such as natural gas, that may experience more demand during the low-carbon transition. It may also mean leveraging gradual mechanization and automation of the resource sector to improve productivity, while investing in a skilled and educated workforce that is not dependent on some of the lower-skilled jobs that may be displaced.

Change brings challenge, but there is reason to be optimistic that many of these trends can work in favor of Africa’s resource-rich economies.

Fourth, navigate a development path consistent with the pressures of Dutch disease. This means that conventional export-led diversification may prove challenging while resources make up a major share of the economy. Instead, countries should seek to invest in assets rather than in traded sectors. Wealth accounting can help guide these choices. This strategy calls for investing in assets that can be useful to many sectors of the economy—such as power, transport, educated workers, and a sustainable environment. Dutch disease also implies that forests may be protected as long as resource exports remain high. Accelerating global decarbonization may therefore endanger tropical forests in Sub-Saharan Africa as declining fossil fuel demand weakens Dutch disease, and the agriculture sector
may become increasingly competitive. Policy makers in Africa should be mindful of, and prepare to mitigate, the so-called Amazonian disease, in which declining export value of petroleum may lead to more deforestation (Cust, Harding, and Rivera-Ballesteros, forthcoming). This implies that the global low-carbon transition may have unanticipated consequences and challenges.

Finding 1: Resource Abundance in Africa is Increasing, Not Declining
Today there are markedly more resource-rich countries in Sub-Saharan Africa than there were at the turn of the twenty-first century, and the number is trending even higher because of new discoveries every year. By one definition (IMF 2012), the number of resource-rich countries rose from 18 out of 48 before the boom to 26 out of 48 countries during and after the boom. Map O.1 shows the countries categorized as resource rich, which is a majority of Sub-Saharan African countries. This trend was caused by a combination of new discoveries, new production, and rising resource prices pushing up levels of resource abundance. Figure O.1 illustrates how multiple discoveries in the past four decades have more than doubled the existing oil and gas reserves in the region. (Most giant oil and gas fields have been discovered offshore, while metal and mineral deposits have been discovered throughout the continent; see map O.2 for oil and gas and map O.3 for metals and minerals.) In the opposite direction, limited success in diversifying their economies away from resource dependence resulted in few countries exiting this grouping. If the same IMF condition is applied to regions using aggregated values, Sub-Saharan Africa and the Middle East and North Africa would be considered the world’s two resource-rich regions (figure O.2).

A high level of resource abundance often translates into significant revenues for government to manage. Governments are designated as the custodians of subsoil wealth on behalf of citizens, and therefore a significant portion of the proceeds from resource extraction must accrue to government on this basis. Some countries in Sub-Saharan Africa have received as much as 80 percent of their revenues from natural resource extraction. The regional average is one of the highest in the world, reaching almost 30 percent of government revenues from resources during the 2004–14 commodity price boom. Resources also constitute a significant share of exports in Sub-Saharan Africa, exceeding 50 percent of export value during the last boom (figure O.2). In both cases the region ranks second in the world behind the Middle East and North Africa.

Finding 2: Climate Change Will Shift the Sub-Saharan African Resource Paradigm
As the world moves away from fossil fuels, abiding by the commitments it made under the Paris Agreement, the subsoil wealth of African economies may be
at risk. Estimates suggest that 80 percent of proven fossil fuel reserves must remain under the ground to meet targets (Bos and Gupta 2019). On the other hand, the transition from fossil fuels to clean energy is likely to create demand for 3 billion tons of minerals and metals needed to deploy solar, wind, and geothermal energy by 2050 (World Bank 2020a). This low-carbon energy transition will increase demand for many of the resources found in abundance across the region. Lithium, cobalt, and vanadium, for example, are critical for energy storage, and copper, indium, selenium, and neodymium are essential for the production of wind and solar power generators.

On a promising note, research on trade elasticity shows that Sub-Saharan African hydrocarbon producers face lower demand import elasticity compared
with the rest of the world, which implies that hydrocarbons have the potential to remain an important source of export revenues over the short to medium term. However, because global oil and gas demand may begin to decline permanently as the global energy transition progresses, Sub-Saharan African hydrocarbon-producing countries will need to adapt to new market conditions and anticipate the challenges ahead. For the moment, however, they still have some time to manage an orderly transition away from fossil fuels and use revenues to spur economic diversification.

On the other hand, the same evidence points to limited historical supply elasticity among African minerals producers, implying that African economies
Finding 3: Significant Untapped Potential Remains
Africa’s natural resource wealth remains an important part of its economic recovery given its deep reserves and untapped investment potential. Approximately one-third of Africa’s stock of wealth is held in various forms of natural capital, including nonrenewable petroleum and mineral deposits (World Bank 2021). Furthermore, resource rents are estimated to account for 9 percent of resource-rich Africa’s GDP (World Bank 2021). However, this figure exceeds...
Although still relatively underexplored, the African continent already hosts a large proportion of the world’s mineral resources. These minerals include, besides precious platinum group elements (59 percent of total world resources) and diamonds (48 percent), a dominant position in ferroalloy metals such as cobalt (75 percent), manganese (68 percent), graphite (59 percent), and undeveloped resources of lithium (Guj et al., forthcoming). These endowments place Africa at the center of the clean energy transition, given that resources such as cobalt, manganese, graphite, and lithium are central to clean energy technology.

Current production levels still lag in a number of African countries, despite their having some of the world’s largest resource endowments. For example, graphite, which is one of the most important components of lithium batteries, is relatively underexploited in several Sub-Saharan African countries.
Figure O.2  Average Nonrenewable Resource Exports as a Share of Total Merchandise Exports and Average Resource Revenues as a Share of Total Government Revenues, by Region

a. Fossil fuel and metals and minerals as a share of total merchandise exports, 2004–14 average

<table>
<thead>
<tr>
<th>Region</th>
<th>% of merchandise exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle East and North Africa</td>
<td>68.3</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>52.5</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>27.3</td>
</tr>
<tr>
<td>South Asia</td>
<td>18.2</td>
</tr>
<tr>
<td>North America</td>
<td>14.9</td>
</tr>
<tr>
<td>Europe and Central Asia</td>
<td>13.8</td>
</tr>
<tr>
<td>East Asia and Pacific</td>
<td>9.4</td>
</tr>
</tbody>
</table>

b. Resource revenues as a share of total government revenues, 2004–14 average

<table>
<thead>
<tr>
<th>Region</th>
<th>% of total government revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle East and North Africa</td>
<td>54.0</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>29.6</td>
</tr>
<tr>
<td>East Asia and Pacific</td>
<td>25.9</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>14.2</td>
</tr>
<tr>
<td>Europe and Central Asia</td>
<td>5.5</td>
</tr>
<tr>
<td>South Asia</td>
<td>0.0</td>
</tr>
<tr>
<td>North America</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Source: Cust, Rivera-Ballesteros, and Zeufack 2022.

Note: Panel a shows the 2004–14 average of fossil fuels, metals, and minerals exports as a share of each region’s total merchandise exports. Panel b shows the 2004–14 average of natural resource revenues as a share of total government revenues. This share is calculated as the 2004–14 average of the sum of natural resource revenues of all countries with nonmissing data for each region, divided by the region’s sum of total government revenues (resource plus nonresource revenues). The dashed blue line in each panel denotes the International Monetary Fund criteria for resource richness (natural resource revenue or exports at least 20 percent of total fiscal revenue or exports, respectively) applied to the boom period.
particularly Tanzania. Despite having the fifth-largest reserves in the world, Tanzania was ranked twenty-first in global graphite production in 2018. In comparison, India (with half of Tanzania’s reserves) and Norway (with 30 times smaller reserves) are ranked sixth and eighth in production, respectively.

The region’s abundant mineral deposits also offer significant exploration opportunities. Sub-Saharan African countries are still relatively unexplored compared with other regions of the world (McKinsey 2013). In 2017, the total number of active mineral exploration sites in Africa was estimated at 282, approximately half the number of sites as in Australia and Canada, despite the region having more than triple the surface area.

A driving factor behind the disproportionately low number of active mines is the level of exploration expenditures in Sub-Saharan Africa. Despite being the most profitable region in exploration terms, with the value of discoveries as a ratio of exploration costs of about 0.8, Sub-Saharan African countries’ mining exploration spending between 2007 and 2016 was lower than that in any other region (Schodde 2017). Sub-Saharan Africa’s ratio of 0.8 is significantly higher than Australia’s (0.5), Canada’s (0.6), or Latin America’s (0.3). Although Africa has rich endowments, between 2009 and 2018, it only attracted 14 percent of the world’s total exploration expenditure (US$10 billion of US$140 billion spent in the world).

Globally, exploration expenditures declined substantially after the last commodity boom. Exploration expenditure declined by 58 percent, from US$34.9 billion in 2012 to US$11.2 billion in 2016 (Schodde 2019). This decline largely resulted from heightened uncertainty within the commodities sector. The outlook for exploration investment in the medium term is more positive, given that commodity prices have increased significantly because of new infrastructure programs in countries such as China and the United States coupled with momentum from the clean energy transition.

Oil has accounted for more than 30 percent of total wealth in Sub-Saharan African resource-rich countries, including Chad, the Republic of Congo, and Gabon; however, this is still significantly less than in some resource-rich comparators outside Africa, where average oil wealth can exceed 50 percent (World Bank 2021). There are both major producers, defined as those that produce an average of more than 100,000 barrels per day, and minor producers, those that average less than 100,000 barrels per day of production. Before the boom period there were 14 petroleum-producing countries (7 major and 7 minor producers) in Africa. After the boom period, the number of petroleum producers increased to 22 (10 major and 12 minor producers). Figure O.3 shows that during the 2004–14 commodity boom the largest share of giant petroleum discoveries was concentrated in Sub-Saharan Africa, which led to an increase in petroleum production in the region.
Major new discoveries of oil and gas have the potential to transform many Sub-Saharan African economies; however, not all discoveries move quickly into production. Research points to three challenges countries have faced (Mihalyi and Scurfield 2021). First, discoveries did not always proceed to generate production and national wealth. So far, only 8 out of 12 countries that found large oil and gas deposits have had finds that have proved to be commercially viable. The initial finds in the other four countries—Guinea-Bissau, Liberia, São Tomé and Príncipe, and Sierra Leone—turned out to be dry wells or of low value and were abandoned. Second, the time from discovery to effective production and exploitation has been longer than expected. The initial forecast of the discovery-to-exploitation process was estimated to be 6.2 years for the 12 Sub-Saharan African countries, reevaluated to 11 years, on average. For example, oil fields (Block 1, Block 2, and Block 3) in Uganda are now projected to be exploited between 15 and 17 years after discovery, a significant increase over the 3 to 5 years in initial forecasts. Third, there is a major shortcoming in mobilization of forecasted revenue. In the 3 Sub-Saharan African countries that reached production, receipts collected were 63 percent lower than initially projected.
Policy Recommendations

Policy makers have significant new opportunities to harness the untapped resource potential in Africa. By supporting clear and consistent approaches to sector policies, they can promote new investment to capture upside potential from new discoveries and exploration.

First, capture the full value of resource rents, subject to fiscal terms that attract investment and are robust to changing conditions. World Bank estimates put the rental value at 2.6 times the level of government revenues, on average, with wider variations in specific countries. This implies not only that citizens are missing out on significant untapped revenues consistent with the same levels of investment, but also that a significant subsidy is provided to production. This is bad for both countries and, in the case of subsidizing petroleum extraction, the climate. Capturing the full value of fossil fuel extraction will move closer toward imposing the true social cost of petroleum extraction, thus helping reduce global emissions.

In practice some combination of royalties and taxes on profits, or equivalent nontax instruments, can be used to ensure maximum and efficient rent capture for the government and its citizens. Countries should avoid and minimize tax incentives and design fiscal terms that can feasibly be administered and monitored, avoiding unnecessary complexity. Making fiscal terms robust to changing conditions, such as price cycles, also reduces the need, and pressure, to revise them frequently in response to external factors.

Second, set clear and consistent fiscal and social agreements in law, rather than negotiating them contract by contract, to help create policy stability, thereby promoting investment. For example, in 2020, 72 percent of mining firms surveyed through the Fraser Institute stated that uncertainty regarding the administration, interpretation, and enforcement of existing regulations was a mild deterrent, strong deterrent, or a reason that they would not pursue investment in South Africa (Yunis and Aliakbari 2020).

Third, develop policies that help ensure firms internalize their social and sustainability costs from exploration to mine and well closure. A primary reason that governments develop policies that can be perceived as punishing resource companies is because of the substantial negative externalities resource firms generate, historically and at present, including pollution, health consequences for workers and communities, infrastructure damage, and irreversible land damage. These costs should ideally be covered by the firms that profit from resource exploration. However, these costs should be built into legislation and the agreements that firms and governments enter into so that there is also policy clarity and stability, as discussed in the previous recommendation.

Fourth, strengthen the governance and transparency of the sector. Various governance frameworks have been developed that provide useful benchmarks for policy makers to measure themselves against. Adoption of frameworks such
as the Natural Resource Charter and the Extractive Industries Transparency Initiative (EITI) can help countries enhance disclosure and policy practices. The EITI standard requires information along the extractive value chain, including extraction, rent transfer, and how it benefits the public. Widespread adoption of the EITI, as well as accompanying standards such as routine contract disclosure, can reduce information asymmetry and help develop a mechanism to promote trust and collaboration. Other norms can be pursued that promote competition and transparency, such as budget transparency, debt transparency, competitive license allocation processes, open procurement, and reforms to the governance of national resource companies.

The Legacy and Lessons from Africa’s Commodity Price Boom and Bust

The experiences of different economies during Africa’s last commodity price boom-and-bust cycle can yield insights relevant to today’s policy makers. Rising commodity prices once again put Africa’s resource wealth at the center of economic decisions, and how these choices are made will determine the outcomes for a generation of Africans.

The previous commodity price boom from 2004 to 2014 was a huge economic opportunity for African countries abundant in oil, gas, and minerals. During this period, government revenues swelled and economic growth also rose considerably. Resource-rich countries saw, on average, economic growth during the boom years that was almost 1 percentage point higher than before the boom, driven by resource exports and increased government revenues (figure O.4). However, even during these bountiful times, economic development was largely confined to the resource sector. Once GDP growth contribution from the expanding resource sector is subtracted, overall economic performance was not significantly higher than in the rest of Africa.

The legacy of the boom was that countries squandered the opportunity, and therefore were poorly prepared for the drop in commodity prices. Many had failed to save and invest a sufficient proportion of resource revenues to grow national wealth via the accumulation of offsetting assets during the boom. As a consequence, the bust period saw collapsing growth and a reversal of economic gains made during the boom. Several resource-rich countries even entered debt crises after 2014. During this bust period (2015–20) there was also a more general pattern of resource-rich countries experiencing slumps in GDP growth, with rates falling below those of the rest of Africa (figure O.4).

The boom itself created a set of major public policy challenges. First, high prices meant significant revenues would accrue to government, which, in turn, implied that “big government” in some form was hard to avoid.
Government, as the constitutionally designated resource owners, had to attempt to capture the full value of resources on behalf of citizens while also efficiently managing state-owned resource companies and production shares. Second, government had to maximize these revenues from the sector in a way that was also consistent with inward investment into the sector, for example, to take advantage of the geologic potential and new discoveries being made. Third, they had to ensure those revenues were put to good use, fulfilling urgent development needs and longer-term investment goals for sustaining prosperity. Finally, they needed to ensure the economy was protected from the harmful effects of resource dependence, ranging across hazards such as Dutch disease (Corden and Neary 1982), price and revenue volatility, corruption, conflict, and profligacy.

Chapter 2 finds that there was a broad failure to translate the boom into broader-based economic prosperity via investment in other parts of the economy. The starkest evidence for an unsustainable and narrow economic boom was seen in the slump in growth rates following the fall in commodity prices. In the postboom period, annual GDP per capita growth in resource-rich countries was, on average, 2.5 percentage points lower than during the boom, and 1.5 percentage points lower than in non-resource-rich countries in the region (Cust, Rivera-Ballesteros, and Zeufack 2022).

Despite the disappointments of the previous boom, making use of resource wealth effectively remains central to the development trajectories of most
of Africa. The rise in revenues and growth was sizable during the boom, and harnessing these revenues effectively can determine whether nonresource growth increases, and whether poverty levels fall. With commodity prices now rising, the economic fate of resource-rich countries may once again depend on how governments respond to this opportunity.

**Finding 4: Economic Growth Collapsed Once Commodity Prices Fell**

Although resource-rich countries in Sub-Saharan Africa outpaced their non-resource-rich Sub-Saharan African counterparts in average growth per capita during the boom, it was the non-resource-rich counterparts that sustained modestly positive growth in the years following the boom. Almost by definition, an increase in demand and prices for a country’s commodities will lead to a surge in resource sector GDP. During the boom, resource-rich countries in Sub-Saharan Africa also experienced some growth beyond the extractive industry, owing partially to development in backward and forward linkages, including construction, transport and logistics, and services. In fact, nonresource GDP growth rates exceeded 3 percent per year during the boom, but this rate was not significantly higher than the levels in non-resource-rich Africa.

However, a crucial question for countries trying to avoid the so-called resource curse is whether they can sustain higher rates of growth across the cycle in commodity prices. In other words, can they enable the nonresource economy to achieve a higher growth path, sustaining it into the bust and beyond. Research for this report shows that resource-rich countries have performed suboptimally. Although resource-rich countries grew modestly faster than the rest of the region during the boom, growth following the boom was far lower. Further, the slump was not limited to the resource sector; nonresource sector GDP growth slumped concurrently. This outcome could be partially due to the overdependence of other sectors on the resource sector, implying that a strategy based on economic linkages alone may expose the country to additional risk, as opposed to a strategy that promotes economic diversification.

This picture of economic concentration and dependence on natural resources is clearly found in wealth accounts as well. Higher commodity prices during the boom increased rents and raised the overall level of wealth across human capital, natural capital, and produced capital. The Changing Wealth of Nations report (World Bank 2021) finds additional evidence that resource-rich African countries did not use this boost in natural wealth to invest in other assets during the boom. Therefore, wealth plummeted when the boom ended. Wealth per capita, which was declining before the boom in many resource-rich African countries, had an outstanding annual growth rate during the boom—but fell back to negative growth when the boom ended. In comparison, on average, non-resource-rich African countries started and followed similar wealth growth rates before and during the boom, but were spared declining wealth as a result of less resource
dependence and more diversified economies. Declining wealth per capita in some resource-rich African countries points to a fundamentally unsustainable economic trajectory, where eventually GDP will be affected by a depleting asset base unless countries can raise the rate of investment into their economies.

**Finding 5: Poverty Concentration in Resource-Rich Sub-Saharan Africa Has Drastically Increased, a Trend Likely to Continue, and Inequality Remains Persistent**

Despite the increase in revenue that resulted from the boom, extreme poverty is increasingly concentrated among resource-rich Sub-Saharan African countries (figure O.5). As a result of the backsliding since the fall in commodity prices beginning in 2015 and the COVID-19 pandemic, poverty has been rising again in resource-rich countries. By 2030, more than 80 percent of the world’s poor are forecasted to live in the Sub-Saharan Africa region, and almost 75 percent of the poor in Sub-Saharan Africa will be located in resource-rich countries (Cust, Rivera-Ballesteros, and Zeufack 2022). In absolute terms, by 2030 the poverty headcount in resource-rich Africa is projected to rise to about 379 million, while the count in non-resource-rich Africa is set to fall to below 120 million (figure O.6). Taken together, a staggering 62 percent of the world’s poor are projected to be found in Sub-Saharan African resource-rich

**Figure O.5**  Global Historical and Projected Poverty Headcount, 1995–2030

![Graph showing global historical and projected poverty headcount, 1995–2030](source: Calculations based on data from Lakner et al. (2021) and other staff estimates. Note: The projected poverty headcount at US$1.90 a day reflects the impact of COVID-19 (coronavirus). The figure uses 2011 international prices. Data after 2020 corresponds to projected estimates. RR = resource rich; SSA = Sub-Saharan Africa.)
Inequality also remains pervasive in resource-rich countries. Even the government revenue bonanza from the commodity price boom was not sufficient to reduce inequality in almost half of resource-rich Africa. In fact, most resource-rich countries for which Gini data are available (10 out of 18), including Mozambique, Tanzania, and Zambia, saw worsening inequality by 2014 compared with 2003, measured by an increase in their Gini coefficients. Mechanization can contribute to this worsening inequality, as the returns on the increasingly capital-intensive process accrue to capital rather than to labor. However, some resource-rich countries did manage to improve equality, including Botswana and Uganda (figure O.7). For instance, from its independence to the boom period, Botswana succeeded in converting its natural resource rents for use in enrolling the population 25 years old and older in secondary schooling. These successful public policies to convert resource endowments...
into human capital may partly explain the positive dynamics in poverty and inequality alleviation during the boom period. The failure to reduce inequality was similar to non-resource-rich economies that did not enjoy the same surge in growth and revenues during this period.

**Finding 6: There Has Been a Failure to Achieve Economic Diversification**

Headline economic performance during the boom was strong but proved unsustainable. This result reflects the overall dominance of the resource sector as a driver of growth, but also implies a failure to translate the boom into broader-based economic prosperity. The starkest evidence for an unsustainable and narrow economic boom was seen in the slump in growth rates following the fall in commodity prices. In the postboom period, annual GDP per capita growth in resource-rich countries was, on average, 2.5 percentage points lower than during the boom, and 1.5 percentage points lower than in non-resource-rich countries in the region (Cust, Rivera-Ballesteros, and Zeufack 2022).
Policy makers sought to capitalize on the boom to translate investment and revenues into broader economic transformation, including boosting the growth of manufacturing exports and other nonresource sectors of the economy. This economic diversification agenda, with a focus on export diversification, was a popular economic objective during this period. However, there was little change in the overall sectoral composition of exports of resource-rich economies beyond a boost in the resource sector and a squeezing of agricultural exports.

**Economic Concentration: Limited Growth in Nonresource Sectors**
Evidence shows that 11 of 23 resource-rich countries in Sub-Saharan Africa saw increasing economic concentration. Countries such as Chad, the Democratic Republic of Congo, and Zambia saw higher ratios of resource GDP to non-resource GDP by the end of the boom. In contrast, Botswana, Nigeria, and 10 other resource-rich countries managed to reduce economic concentration. For example, in Botswana, manufacturing’s contribution to GDP increased from 6 percent in 2004 to 8 percent in 2014.

**Export Concentration: The Boom Drove Increased Export Concentration**
A key tenet driving economic sustainability from resource wealth is to use the opportunity created by a boom to promote a more diversified economy. Although many countries actively pursued diversification strategies during their respective resource booms, the record of success is poor. The majority of resource-rich Sub-Saharan African countries (14 of 24 included in the export diversification index) saw increased export concentration (Cust, Rivera-Ballesteros, and Zeufack 2022). For example, Chad and Sudan saw increased export concentration, while Tanzania and Uganda were able to diversify exports. This rising export concentration in the resource sector is not unique to Africa. First modeled by Corden and Neary (1982), the phenomenon has become popularized as the Dutch disease.

**Asset Concentration: What Happened to the Wealth of Nations?**
The process of resource extraction has a first-order effect of reducing a country’s overall wealth by depleting the stock of nonrenewable, finite natural capital. However, countries may use the proceeds from this depletion to accumulate other forms of capital, such as building physical infrastructure, or investing in human capital via improvements in education and the health care of citizens. Meanwhile, the stock of natural capital can also increase because of rising prices applied to the remaining resource base, or new discoveries, some occurring as part of the discovery-by-extracting process.

During the boom decade, the total wealth stocks in resource-rich countries in Africa generally increased; that is, including price effects, the total value of a nation’s stock of human wealth, productive capital, and natural assets rose. The total wealth stocks during this period rose by an average of US$4,000 per person for Sub-Saharan Africa. Countries such as Botswana and Namibia
added more than US$20,000 per person to their total national wealth during this period (Cust, Rivera-Ballesteros, and Zeufack 2022). Still, additional wealth per capita does not necessarily translate into improved inequality; despite its national wealth gains, Namibia’s income inequality remains the second worst in the world.

One of the key determinants of sustainable natural resource management is the accumulation of assets to replace a depleting asset. Known as Hartwick’s rule (Hartwick 1977), this principle states that economic sustainability rests on replacing a nonrenewable natural asset with an alternative productive asset to offset depletion. This alternative asset can take the form of physical capital, financial capital, or human capital.

A useful metric with which to evaluate how well a country is accumulating these offsetting assets is the rate of adjusted net savings, calculated and published by the World Bank. Resource-rich countries face the risk of negative rates of adjusted net savings given the high levels of asset depletion associated with resource extraction. The implied rate of capital accumulation rises with the rate and value of the depleting asset; put another way, these countries need to save and invest proportionately more because their revenues are coming from asset depletion.

Unfortunately, during the boom the relationship between resource wealth, measured as rents as a share in GDP, and the rate of adjusted net savings failed to be positive, and in some cases was negative, particularly among fossil-fuel-rich countries. This is shown in figure O.8. In Africa, many countries with the most depletion (proxied by rents) saw low and negative rates of net saving, meaning they were running down the overall stock of assets in the country, and instead consuming a large share of this value. Such a pattern means countries brought forward consumption at the expense of future GDP, effectively reducing the available assets for future generations.

Analysis in World Bank (2019) shows that the largest reasons for negative adjusted net savings in the Southern Africa region is not depletion but depreciation. As mining becomes more capital-intensive, it absorbs a large part of national savings for investment to offset depreciation. And the more capital that is invested, the more assets are depreciated and the more savings are needed for investment to maintain the assets. However, that higher level of investment had not been forthcoming. Instead, many countries consumed the boom.

Investments in human and physical capital can improve adjusted net savings and reduce both poverty and inequality amid mechanization. Mining has become an increasingly capital-intensive process, and thus, the majority of returns accrue to capital. Investments in human capital, particularly education and skills, and physical capital, particularly infrastructure, can create an enabling environment for more diversified industries and create a more productive and healthier workforce.
Finding 7: Good Governance Remains a Key Factor in Determining Economic Outcomes

The boom gave resource-rich countries the opportunity to mobilize economic resources to build better institutions that could secure revenue savings to protect them from price shocks given commodity market volatility. However, evidence shows that those countries missed this opportunity and instead, some indicators of institutional quality tumbled. A comparison of Worldwide Governance Indicator dimensions between resource-rich and non-resource-rich African countries shows that, on average, the latter performed much better than their resource-rich peers. The data show that perceptions of voice and accountability and rule of law declined during and after the boom in resource-rich countries. Meanwhile, the other four dimensions (control of corruption, government effectiveness, regulatory quality, and political stability) made limited progress in resource-rich African countries compared with non-resource-rich ones (figure O.9). The largest difference between the two groups resides in the perception of control of corruption.

Within resource-rich countries some countries performed worse than others. In some mineral-rich countries, including the Central African Republic,
Figure O.9 Indexed Worldwide Governance Indicators: Period Averages for Resource-Rich and Non-Resource-Rich African Countries

a. Voice and accountability

b. Control of corruption

c. Government effectiveness

d. Regulatory quality

e. Rule of law

f. Political stability and absence of violence/terrorism

Source: Calculations based on Kaufmann, Kraay, and Mastruzzi 2010.
where minerals have exacerbated rent-seeking behaviors, the six governance dimensions dropped. At the same time, there are mineral- and oil-rich countries that have slightly improved their good governance measures. For example, although starting from a low base, Angola, Liberia, and Sierra Leone have lifted their six dimensions since the end of the boom, led by better political stability and absence of violence, and improved voice and accountability. On the other hand, countries such as Botswana and Ghana have consistently performed well.

**Presource Curse**

The “presource curse” hypothesis, first documented in Africa during the recent resource boom, highlights the risks faced by countries with recent major resource discoveries (Cust and Mihalyi 2017). This research finds that some countries with major discoveries have experienced “expectations booms” followed by growth disappointments. Figure O.10 illustrates that growth in countries with weaker institutions had worse outcomes compared with IMF growth forecasts after a giant hydrocarbon discovery. Meanwhile, access to Eurobond markets for many Sub-Saharan African countries has created new opportunities to issue sovereign debt at commercial rates and leverage resource wealth to do so. Combined with

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**Figure O.10 Short-Term Growth Impact of Giant Hydrocarbon Discoveries**

(a. In all countries with discoveries)

(b. In countries with stronger institutions)

c. In countries with weaker institutions

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*Note:* IMF = International Monetary Fund.
commodity price uncertainty as well as project delays, such borrowing can increase the risk of debt unsustainability (Ruzzante and Sobrinho 2022), particularly if investment is not efficiently allocated to boost growth.

The hypothesis of overoptimistic expectations for citizens has been tested for hydrocarbon discoveries in 35 Sub-Saharan African countries between 2002 and 2015. Using Afrobarometer data surveys, Cust and Mensah (2020) use a difference-in-differences strategy and provide evidence of a 1- to 12-month post-discovery overoptimism by citizens regarding macroeconomic conditions and improvements to standards of living (figure O.11), especially when the degree of democratization is low, suggesting that enhanced political institutions and better administration could help manage expectations. More precisely, Mihalyi and Scurfield (2021) examine what actions governments might take to reduce the risk of delay and failure, helping governments to live up to citizen expectations. They indicate that (a) reforms to licensing and company selection processes for

![Figure O.11](image-url)
extracting resources could help improve development prospects of discoveries, (b) reforms to regulatory norms and negotiation processes could help reduce delays to operationalization, and (c) reforms to tax mobilization and incentives related to discoveries might be key to ensuring fiscal sustainability and state-financing capacity in a resource-rich context.

The past commodity boom together with unfulfilled expectations has heightened pressures around resource nationalism and protectionist policies. Some countries have experienced political pressure for contract renegotiation or the ratcheting up of fiscal terms. Others have experienced delayed and halted projects, creating uncertainty about when or if production will begin. Evidence from the 2004–14 boom shows that some countries may have missed the opportunity to convert their resource wealth into productive assets, while others failed to use the proceeds well.

Managing Macroeconomic Risks
Although the bust phase following a period of higher sustained commodity prices has obvious downsides for resource-rich countries, even the boom period can introduce serious macroeconomic risks into the economy if not managed carefully. For example, during a boom, government and private sector economic choices can be distorted, leading to misallocation or worse. Examples of distortions include the effect of Dutch disease, where resource exports can cause a contraction of traded sectors such as manufacturing. Booms can also lead to an increase in government revenues, resulting in spending that might crowd out the private sector, or distort the labor market, such as through increased salaries for government officials (Cust and Balde, forthcoming; Devarajan et al. 2013). This report finds that Dutch disease (Corden and Neary 1982) can also impact the forest by crowding out agriculture, and human capital by tilting spending to resource and government sectors. This carries additional risks for resource exporters.

New research suggests that in resource-rich countries, optimal fiscal policy depends on the exchange rate regime, where an optimal fiscal policy would be procyclical if the country has a floating exchange rate. Mendes and Pennings (2020) suggest that, contrary to the standard policy advice of saving during price windfalls and spending during price busts, the optimal fiscal policy will depend on whether a country has a floating or fixed exchange rate regime.

However, resource exuberance can also drive increased borrowing and spending that can lead to growth disappointments and, in some cases, macro-fiscal crises (the presource curse, discussed earlier). Commodity cycles can also drive unsustainable procyclical fiscal policy, which can create challenges due to increasing macroeconomic volatility, depress investment in real and human capital, hamper growth, and harm the poor (Manasse 2006; Serven 1998; World Bank 2001). In extreme cases, procyclicality can encourage additional government borrowing and indebtedness during the boom–bust cycle. Some governments borrow during the boom, on top of the increased resource revenues they
are receiving. Also, countries may choose to collateralize debt against their resources, either in the form of guaranteed future revenue streams or in-kind deals in which the creditor is repaid in barrels of oil or tons of minerals. This type of activity led to a rise in public debt in resource-rich countries, especially in oil-rich countries, when the commodity boom ended (figure O.12).

During the 2004–14 boom period, governments saw large increases in their fiscal space, derived in part from the receipts from resource taxation. For example, at least eight Sub-Saharan African countries obtained revenues from natural resources equating to, on average, more than 10 percent of their GDP during the boom—a significant fraction by both regional and global standards (Cust, Rivera-Ballesteros, and Zeufack 2022). Many chose to use this time to undertake significant expansions of public service provision, such as educational enrollment, as well as increased infrastructure investment. For example, according to the IMF’s Investment and Capital Stock Dataset, public investment in physical assets, including economic infrastructure, such as roads and airports, and social infrastructure, such as hospitals and schools, rose from roughly an average of US$200 per capita during the preboom period (1998–2003), to an average of more than US$435 per capita during the boom, and US$270 after the boom in resource-rich countries in Africa.

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**Figure O.12** General Government Gross Debt in Sub-Saharan Africa, by Type of Resource Endowment, 2007, 2013, and 2018

Source: Calderon and Zeufack 2020.
Similarly, annual spending on health services rose from 4.6 percent of GDP to 4.9 percent, on average, and expenditure on education rose from an average of 2.8 percent of GDP before the boom to 3.5 percent of GDP after the boom (Cust, Rivera-Ballesteros, and Zeufack 2022).

**The Hidden Risks of Resource-Backed Loans**

Rising debt and record-high commodity prices are tempting many developing countries to pledge their natural resources to secure the financing they so urgently need. However, evidence on resource-backed loans calls for caution and points to hidden risks (Rivetti 2021). Research recently analyzed a sample of 30 resource-backed loans extended to central governments and state-owned enterprises (SOEs) in Sub-Saharan Africa from 2004 to 2018—totaling US$46.5 billion, or nearly a tenth of the continent’s new borrowing during this period. Despite the size of the loans, little information was available on their terms (Mihalyi et al. 2022).

Resource-backed loans are not necessarily cheaper than unsecured loans. Chad, for example, restructured its loan with Glencore in 2015, but was still paying an all-in cost of more than 8 percent on its fully collateralized loan before restructuring it again in 2018. First, the borrower taking on a resource-backed loan usually has limited market access or limited funding sources. Second, given the complexity of these transactions, borrowers may not fully understand the implications of contract terms when negotiating them. These risks are compounded by the lack of transparency and government accountability.

The region is facing severe debt risks. The largest SOEs are often in the resource sector and carry debt of macroeconomic significance in several countries in the region. Many oil sector SOEs are looking to grow their upstream activities via state resources, generally in the form of additional borrowing. However, these are risky bets in light of the energy transition megatrend and uncertainty about future demand for fossil fuels. Many governments are also looking to borrow for petroleum processing, storage, transportation, and marketing and local value addition in mining. Unfortunately, much of the SOE debt, like resource-backed sovereign lending, is opaque and likely on cost terms. There is, however, some progress toward a culture of greater debt transparency in Sub-Saharan Africa and globally.

**Policy Recommendations**

The policy toolkit for managing natural resource wealth must account for lessons from recent country experience, as well as be equipped to face emerging megatrends. The resource sector still holds great potential. New discoveries, promising geology, and positive demand projections for minerals and metals all point to a key role for resources in the next two decades. However, the legacy of the previous boom and bust suggests that countries need to focus more heavily
on sustainable use and transformation of resource wealth to ensure this opportunity is not squandered.

**Beware the presource curse.** Countries need to be mindful of policies that are consistent with managing expectations and ensuring fiscal sustainability. Avoiding the presource curse, where countries can find themselves in debt distress or facing low growth even before production of resources begins, means tempering the pressure to borrow and spend ahead of revenues. Discoveries have been found to unleash powerful forces that can shape policy but leave countries exposed if they are not prepared for declining prices. This is especially true where global decarbonization may imply both declining fossil fuel prices in the future and higher variation in all kinds of natural resource prices because of mismatched supply and demand. Getting it wrong carries a heavy price, where debt distress and sharp resource-induced recessions can cause more economic reversal than the positive value of the boom.

**Improve the economic sustainability of the economy using revenues from the resource sector.** To move from negative to positive adjusted net savings, governments need to invest in human capital, including education and health; produced capital, particularly infrastructure; and natural capital such as forests, cropland, and nature-based tourism. Revenues generated from the mining and petroleum sectors can be used to finance these forms of capital.

**Shift policy considerations from exploitation to asset stewardship.** Sustainable use of natural resources requires that overall national wealth rise, including stocks of natural capital, to safeguard the prosperity of future generations as well as the environment. A positive adjusted net savings is one step toward this goal, but mitigating the harmful impact of resource extraction on the environment and agriculture will also help ensure that overall levels of natural capital are rising, not falling, in resource-rich African countries. Furthermore, a shift to accounting for revenues from depleting natural assets as an asset rather than an income stream can help ensure they are invested in the future, not earmarked for recurrent consumption. Managing resource wealth for the future will require new consideration of the sustainability of public finances and economic growth. Wealth accounting provides means for policy makers to look beyond GDP, and to consider the wealth portfolio, asset diversification, and sustainable development driven by resource wealth.

**Increase disclosure of resource-backed loans to improve value for money and protect countries.** It is imperative that the details of resource-backed loans be made public. Some governments have begun to take important steps in that direction (Maslen and Aslan 2022). The Democratic Republic of Congo, for example, has published contracts involving resource-backed loans between its state-owned mining companies and a consortium of Chinese companies and with a large commodity trader. To encourage more progress, countries should put in place legal requirements for disclosure of loan contracts.
Unlocking the Mining Sector’s Economic Potential through Regional Integration and the African Continental Free Trade Area

The African Continental Free Trade Area (AfCFTA) brings together 54 African countries with a total population of more than 1 billion people and a combined GDP of more than US$3.4 trillion (World Bank 2020b). If successfully implemented, it will enable countries to deepen their linkages to regional and global value chains.

The rise of regional and global value chains, in which the production process is disaggregated into specialized components, has opened a window of opportunity for developing countries to join the global market even where their contribution is only via individual parts of the production process. This division of labor allows countries to engage in specialized tasks within the value chain without having to cost-competitively produce the entire value chain. Free trade agreements are crucial to making regional and global value chains profitable because they allow the various production components to come together without added tariffs along the way. Regional clustering and specialization can further unlock economies of scale by pooling resources, skills, and expertise beyond often-small national markets.

Currently, only 16 percent of international trade by African countries is traded between African countries. The AfCFTA established the world’s largest free trade zone and has the potential to unlock an estimated US$3.2 trillion in intra-Africa trade. On January 1, 2021, the AfCFTA became operational.

The AfCFTA offers an unprecedented opportunity to develop the mine-to-market value chain within the continent. The mining sector is well-positioned to have a demonstration effect. The AfCFTA unlocks the potential to promote mineral value addition and beneficiation on the continent, which increases sectoral productivity and the overall value of exports. The value chain—from the manufacturing of intermediate inputs such as machinery (backward linkages), to the actual extraction of minerals, through to the processing phase (forward linkages)—can rarely be accomplished by a single country because of skills, infrastructure, and capital constraints, among others. Although many countries have prioritized local beneficiation, few have the capacity to wholly undertake it domestically. If implemented effectively, the AfCFTA would allow various countries within the continent to specialize in a select part of the value chain and move them free of tariffs between participating countries, enabling the entire value chain to come together competitively within Africa.

However, many of the policy measures in the extractive sector limit opportunities for regional trade and integration. Progress on the AfCFTA and a
move toward greater regional trade will require governments to be proactive in bringing resource sector restrictions in line with regional approaches. Examples include widespread adoption of local content policies (LCPs) and export restrictions that favor the domestic market over the African Union market. Similarly, tariff and nontariff barriers make it hard for regional clusters to develop and break into global value chains.

Chapter 3 of the report identifies key tariff, nontariff, and policy barriers that are undermining the development of Africa's comparative advantage. It brings together data, a review of recent legislation, and national and firm-level case studies to provide an understanding of the depth of these barriers and how they are inhibiting linkage development, which hampers job creation, export-led growth, and increased participation in global value chains. It also provides a prioritized list of short- and long-term recommendations to mitigate barriers to stimulate intracontinental value chain development.

**Finding 8: Tariff Barriers in the Extractive Sector Impede Implementation of the AfCFTA**

As countries seek to increase their benefits from the mining sector amid mounting fiscal pressure and high levels of unemployment, many have turned to mineral-based industrialization strategies that include an increase in tariffs or that are at odds with a single-market approach. The AfCFTA’s Schedule of Tariff Concessions includes the following:

- Elimination of tariffs on 90 percent of goods over a 5-year period, starting in 2020 (10 years for least developed countries, or LDCs).
- An additional 7 percent of tariff lines are deemed “sensitive.” Tariffs on these goods will be eliminated over a 10-year period (13 years for LDCs).
- The remaining 3 percent of tariff lines can be excluded from liberalization, but the value of these goods cannot exceed 10 percent of total intra-Africa imports.

Hesitancy in reducing tariffs can often be due to fears of loss of domestic revenue but may overlook the upside benefits. An analysis by the United Nations Conference on Trade and Development (UNCTAD) using the Global Trade Analysis Project computable general equilibrium model shows that if all tariffs are fully eliminated in the AfCFTA, the tariff revenue loss will amount to US$4.1 billion, equivalent to 9.1 percent of current revenue. But the upside is substantial. Long-term simulations show significant welfare gains of US$16.1 billion (after deducting the US$4.1 billion in tariff revenue losses); GDP is expected to grow by 0.97 percent; and total employment will increase by 1.2 percent. Intra-Africa trade is forecasted to grow by 33 percent, and the continent’s total trade deficit would be cut by half. Employment in the mining
sector would remain stagnant because production is capital-intensive, and additiona
production will not affect employment levels. But employment in every other sector of
the economy is forecast to grow, with manufacturing experiencing the largest amount of
growth (figure O.13). This expected growth of employment in manufacturing is aligned
with the AfCFTA’s goal of structural transformation and industrialization (Saygili,
Peters, and Knebe 2018). The growth of some sectors, such as machinery, mineral
products, petroleum and coal, and metals, is reflective of the development of backward
and forward linkages with the mining sector.

Regional harmonization efforts have been undermined by national policies. Burkina
Faso, Côte d’Ivoire, Guinea, and Mali provide one example. Although export levies
were harmonized at 3 percent among the four countries, implementation has not been
even. On paper, there is no reason for exporters to choose a shipping base on the basis
of a more advantageous tax jurisdiction, given that they all should be the same. However,
Mali’s system has left a large loophole: the 3 percent is only applied to the first 50
kilograms of gold per month (Martin and Helbig de Balzac 2017); after that, the remain-
ing weight is exported tax free. Thus, a significant amount of gold originating in each
of these countries is being exported via Mali. The attempt at regional harmonization
has given way to increased challenges and tension between countries, as well as a heightened
risk of smuggling (Martin and Helbig de Balzac 2017).

**Figure O.13** Africa’s GDP-Weighted Employment Growth, by Subsector, Full Free Trade
Agreement Long-Term Scenario

Finding 9: Nontariff Barriers Are Adversely Affecting the Competitiveness of Regional Mining Value Chains

Nontariff barriers (NTBs) remain a key roadblock to actualizing the benefits of the AfCFTA. NTBs are restrictive regulations and procedures, other than tariffs, that increase the difficulty and cost of importing and exporting products. Research by UNCTAD shows that NTBs are at least three times as restrictive as standard customs duties and suggests that African countries would increase GDP by US$20 billion by tackling these NTBs at a continental level. Although article 4 of the AfCFTA Agreement states that “The State Parties shall progressively eliminate tariffs and non-tariff barriers to trade in goods,” research published by Fitch Ratings in 2021 suggests that the removal of NTBs under the AfCFTA is likely to lag behind the agreement’s ambitions, limiting its impact. It notes, “The impact of the East African Community customs union, for example, has been limited by a lack of integration and removal of non-tariff barriers, despite its 15-year history” (Fitch Ratings 2021).

Transport and energy deficiencies are key NTBs that inhibit resource-based industrialization. To capture the magnitude of these challenges, consider that shipping a container from China to Beira, Mozambique, costs US$2,000, but transporting that same container from Beira to Malawi, a distance of 500 kilometers inland, costs US$5,000. Access to electricity remains scarce and unreliable, making the cost of doing business high. In Malawi, where the container has gone, 61 percent of households are not connected to an electric grid.

Transportation and logistics costs in Sub-Saharan African countries are disproportionately high compared with other developing countries, and undermine intraregional trade. Africa’s landmass is larger than the sum of China, Europe, India, and the continental United States, but its 82,000-kilometer rail network is marginally larger than the sum of France and Germany’s. Much of its rail infrastructure has been poorly maintained and 16 percent is entirely nonoperational. In 2016, Africa’s share in global ton-kilometers of rail freight was just 2 percent. Ports are unable to meet demand; on average, cargo waits nearly three weeks in Sub-Saharan Africa, which is more than in Asia, Europe, and Latin America, where it can take less than a week. Handling costs are 50 percent higher than in other parts of the world. The majority (80–90 percent) of freight is transported by road, but road density is one of the lowest in the world, at 27 kilometers of road per 10,000 people. Just 28 percent of the continent’s 2.8 million kilometers of road are paved. An analysis conducted by the IMF in 2019 shows that bringing the quality of Sub-Saharan Africa’s infrastructure up to the global average would increase continental trade by 7 percent (IMF 2019). Transportation costs have not improved significantly over time. Between 2005 and 2014, the difference between transport costs in Africa and other regions has increased, reaching twice as much as in developed economies.
High transport and logistics costs result from a range of factors, including poorly developed and undermaintained physical infrastructure, lack of regional and international transport connectivity, inefficient logistics services, mutual distrust among operators, cartels of transport providers, freight-sharing schemes, and poor access to shipping services. There is also a particularly extreme lack of infrastructure in Central Africa, which, by extension, is a key barrier to connectivity between North, East, West, and Southern Africa.

Landlocked countries face a particularly large disadvantage. According to the latest EITI reporting (2020), the extractive sector accounts for 77 percent of exports in Zambia. However, over time, the cost profile of the average Zambian mine has worsened because of aging mines, high transport costs, and new taxes, leading to a loss of profitability. Transport costs have added 40 percent to the cost of the product because accessing ports—including Beira, Dar es Salaam, Durban, Lobito, and Walvis Bay—is challenging. Further exacerbating infrastructure challenges, landlocked countries are also burdened by fuel price increases.

Mining, as an energy-intensive sector, requires 24-hour, steady, baseload power. The mining sector is the biggest user of energy in most countries. For example, in South Africa, the mining sector consumes approximately 30 percent of the country’s annual power generation for both mining and smelting activities. For health and safety, access, and production reasons, mines must have guaranteed access to power.

The mining sector is often reliant on state-owned utility companies and may face poor-quality generation, transmission, and distribution infrastructure (Cudennec and Kiwelu 2021). Sub-Saharan Africa’s Doing Business score for getting electricity is the lowest in the world—50.4 on a 100-point scale, compared with 85.9 in Organisation for Economic Co-operation and Development (OECD) high-income countries, 75.1 in East Asia and Pacific, and 71.7 in Latin America and the Caribbean. The cost of electricity in Africa is the highest of any region in the world—more than 3.5 times as much as the next highest, South Asia; more than five times higher than in East Asia and Pacific; and more than 7 times higher than in Latin America and in the Middle East and North Africa.

Improving access to, and the cost of, electricity infrastructure can strengthen linkage development. Affordable and reliable energy is critical for developing a comparative advantage in manufacturing inputs or processing ores. Power outages can lead to equipment damage, production downtimes, and processing delays and make it difficult to meet deadlines required by export customers. Steep increases in energy costs can have a considerable impact on the ability of mines to remain open.
Finding 10: Policy Impediments Show Countries Are Still “Speaking Continentally” but “Thinking Nationally”

Many Sub-Saharan African countries have implemented policies, such as export bans and local content targets, to support broader socioeconomic goals. These policies seek to increase domestic value addition, create jobs, generate revenue for the government, or facilitate diversified growth. Though these policies are well-intended, experience continentally and globally suggests that they have often failed to deliver on their goals. These policies can also undermine the development of competitive regional value chains. This summary explores the use of export restrictions, LCPs, local employment restrictions, tariffs, and NTBs and discusses how they are affecting the implementation of the AfCFTA. Mitigating policy impediments can help strengthen the implementation of a regional approach that brings together comparative advantages and increases continental value addition.

Export Restrictions

Since 2009, the number and extent of export restrictions on raw commodities in Sub-Saharan Africa has increased. The OECD global database includes 79 countries that export raw minerals and metals. All but one of the 19 Sub-Saharan African countries included in the database had some type of restriction on exporting raw minerals and metals in 2020. Map O.4 shows the types of export restrictions by country. All of these countries used multiple export restrictions, but when looking at the most restrictive measure, eight had export bans, eight charged export taxes, and two had nonautomatic licensing. Over time, a number of countries have implemented stricter export restrictions. In aggregate, the number of countries imposing export restrictions on raw minerals and metals in Sub-Saharan Africa varied between 17 and 19 since 2009, but there was a deepening in the severity of the restrictions. In 2009, 26.3 percent of countries used export bans compared with 42.1 percent in 2020.

Sub-Saharan African countries have often used primary commodity export bans to support domestic economic development goals. Although many Sub-Saharan African countries have significant mineral and metal deposits, processing capacity remains limited because of insufficient infrastructure, skills shortages, and a lack of adequate financial, technical, and human capital. Nevertheless, countries have used export restrictions to stimulate the development of forward linkages and increase domestic value addition.

Local Content Policies and Job Creation

LCPs are designed to enable countries to maximize domestic benefits from foreign direct investment by expanding local participation. As mining becomes increasingly capital-intensive, larger returns tend to accrue to capital. Given the constraints many Sub-Saharan African countries face, mining largely relies on foreign capital and foreign skills, which means that much of the income
generated will accrue to foreigners rather than to the country owning the natural resources. Thus, policy makers view LCPs as an important avenue for widening the distribution of benefits generated by the mining sector.

The objective of local direct employment policies is to increase the quantity and quality of local employment in mining operations. If successful, they can create new local jobs, grow and develop the skills of the national workforce, and advance efforts to improve gender equality and social inclusion. One of the key challenges to achieving successful outcomes is a shortage of skilled labor. To address this issue, many countries have implemented training requirements for mining companies to increase the supply of skilled labor. There are two types of local employment policies.
• Regulatory approaches, which typically result in prescriptive, “stick”-based policies, are generally mandatory and rely on strong compliance mechanisms and include the following:
  ❍ Mandated local employment percentages, often different for different types of jobs
  ❍ Requirements to conduct training of locals or support training facilities
  ❍ Required succession, or localization, plans
  ❍ Visa restrictions on foreign workers
  ❍ Mandated employment of indigenous people, women, or disadvantaged groups

• Facilitative approaches, which typically result in incentives-based “carrot” policies, offer support and incentives for the development and employment of local workers and include the following:
  ❍ Preferences in the awarding of mining contracts
  ❍ Nonbinding requirements to hire locals (for example, “to the extent possible”)
  ❍ Fiscal incentives for local hiring

The African Mining Legislation Atlas (AMLA) is a platform that aims to promote transparency, accessibility, and comparison of Africa’s mining laws; facilitate the preparation, revision, and implementation of mining laws; provide a living database that will catalyze research and policy debates on legal and regulatory issues; and promote the development of local legal expertise and mining laws. It can help to assess policies relating to (a) employment and training and (b) procurement of local goods and services.

A small handful of countries have no LCP focusing on employment and training, but the majority have between 1 and 4. There are some clear outliers: Gabon has 7, Chad has 8, Kenya and Tanzania have 9 each, and Zambia tops the list with 12. There is a wide array of employment and training LCPs. Some countries have more investor-friendly approaches, while others heavily favor domestic workers.

When it comes to local procurement, the vast majority of countries have very facilitative approaches, generally suggesting that local goods and services be procured if available. Only a few countries have more than two LCPs relating to local procurement. Similar to the employment and training category of LCPs, Kenya with 7, Tanzania with 7, and Zambia with 10 had the most, and five countries had explicit quotas.
Policy Recommendations

Job Creation
Identify new ways to harness employment against the backdrop of mechanization. Governments need to step in to improve educational outcomes for communities around mines and develop a strong foundation in math and the sciences to ensure students are better prepared for a technology-intensive world. Mining firms could provide apprenticeships to students to train them for high-skill jobs that the mining sector requires in the context of the fourth industrial revolution.

Foster skills development programs for diversified economic activities and to develop local suppliers. A suitably skilled workforce needs to be developed for other industries that absorb high amounts of low-skilled labor, and local suppliers need to be trained to enhance a domestic mining technology and service market.

Tariffs
Short term: Reconsider plans to implement or increase tariffs. Under the AfCFTA, members must phase out 90 percent of tariff lines over the next 5–10 years, while another 7 percent, deemed to be sensitive, will get some additional time. Three percent will be allowed to be placed on an exclusion list. More than 80 percent of countries have already submitted their tariff reduction schedules. As a first point of implementation, this means that no new tariffs should be erected.

Medium term: Undertake regional harmonization of mining taxes and royalties. Tax harmonization has three components: an equalization of tax rates, a common definition of national tax bases, and uniform application of agreed-on rules (Mansour and Rota-Graziosi 2013). The lack of a harmonized tax policy can undermine regional integration, even with the establishment of a customs union, a common market, and a monetary union (IMF 2015). Harmonized tax rates remove tax distortions and prevent competition for capital. Tax competition can foment a race to the bottom, which does not benefit any country given the reduction in tax revenue. Harmonizing tariffs and royalties requires rigid implementation, including coordination and surveillance. A powerful first step would be the creation of a common floor rate.

Implementation of harmonized tariffs and regulations requires data and strong institutions that have coordination and enforcement capabilities. Establishing and regularly updating an online tax database that provides comprehensive data on national tax structures can be useful for understanding disparities. It would also offer a source of accountability because it publicly identifies countries that are deviating from regional efforts. This database should be complemented by financing and building the capacity of a regional institution that can provide training to national governments, coordinate forums and meetings to ensure continued dialogue, and enforce harmonization policies.
Challenges exist with such regional institutions. For example, the West African Economic and Monetary Union had not provided its regional institution with the requisite resources to effectively carry out surveillance (IMF 2016).

**Nontariff Barriers**

**Short term:** Undertake a mapping of key regional trade patterns to identify areas for strengthening infrastructure, including road, rail, and port. A mapping can identify infrastructure that has the highest potential for unlocking regional trade. Namibia has the potential to be a gateway for the AfCFTA, opening trade over land from Southern Africa to the rest of the continent, while also having a port that enables access to the EU and US markets. Though the World Economic Forum has called Namibia’s roads the best in Africa, most bulk commodities move by rail. More than 50 percent of the railway lines that state-owned railway company TransNamib currently operate on do not meet the minimum Southern African Development Community (SADC)–stipulated standard of 18.5 tons per axle load. TransNamib’s revenue generated from bulk commodities equates to about 93 percent of its revenue, which includes revenue from transporting Zambia’s commodities. TransNamib has a demonstrated interest in moving bulk commodities by rail between Angola, Botswana, Zambia, and Zimbabwe.

Create a policy landscape that is amenable to private renewable energy generation, and enable firms to export to meet regional needs. In 2021, the South African government announced that businesses would be allowed to generate power of up to 100 megawatts each without a license, a significant increase from the 1-megawatt limit. Mining firms could also buy electricity from other companies that produce a surplus. South African mining companies now have 3,900 megawatts of renewable energy projects in the pipeline. To put this into perspective, 100 megawatts could power two large mines in South Africa. This move drastically alleviates pressure on Eskom, the country’s state-owned electricity utility, while ensuring that energy is no longer a bottleneck for the mining sector. In the longer term, creating a policy environment that lets mining firms export renewable energy to other countries can alleviate regional constraints.

**Medium term:** Work toward mitigating policies that increase transport and logistics costs. Road transportation costs are high because restrictions arising from cabotage policies and the Third Country Rule forbid backhaul cargo in some countries. Cabotage is defined as the transportation of goods or passengers between two places within the same country by a transport operator from another country. The SADC Infrastructure Directorate has been discussing gradually eliminating the Third Country Rule, as recommended in the SADC Protocol on Transport, Communications and Meteorology, Article 5.3.

Establish a coordinated approach to planning and financing regional infrastructure. An example is the ASEAN Infrastructure Fund (AIF), which is
a dedicated fund established by the 10 member states of the Association of Southeast Asian Nations (ASEAN) and the Asian Development Bank (ADB) to address the ASEAN region’s infrastructure development needs by mobilizing regional savings, including foreign exchange reserves. The AIF is an integral part of ASEAN’s efforts to strengthen regional connectivity, and all projects are cofinanced by the AIF and the ADB.

Policy Impediments

Export restrictions—Short-term opportunities: Shift away from export restrictions; consider politically feasible alternatives or transitional arrangements, such as progressively tiered export restrictions. Although Mali did not fully implement the harmonized mining tax code of the four West African countries, it does use a tiered system to bring it into closer alignment: the 3 percent export tax is only applied to the first 50 kilograms of gold per month; after that, the remaining weight is exported tax free. A tiered system of export restrictions, which can include taxes and bans, in which a base amount is restriction free, and then progressively increases, can alleviate the bottleneck for intraregional trade. Over time, the threshold for the tiers could increase (or decrease in the opposite case), moving toward a fully free trade area that is not inhibited by export policy constraints. However, any deviation from a uniform approach should take into account the complexities of monitoring and enforcement, as well as inadvertent incentives for cross-border leakages.

Shifting from a national approach to local equity participation to a regional approach: Develop a regulatory framework for (sub)regional equity. Currently, countries have policies that require local equity. For example, Kenya’s new Mining Act makes the granting of every mining license conditional on local equity of at least 35 percent in respect of mineral rights, and in Namibia, all applications for a mining license must have 15 percent local owners. In countries where capital is limited, these local ownership policies can serve as a deterrent to investment. Expanding local equity to a regional level can facilitate the emergence of medium-size regional mining firms that have the capital to invest and sufficient interest in investing in various African jurisdictions. A regional equity requirement would also enable these African firms to benefit from skills and technology transfer from large multinationals, such as Rio Tinto, Glencore, BHP, and Anglo American. This regional equity may best be achieved first at the level of the subregion, via regional economic communities. Rapid implementation of the AfCFTA may facilitate technology transfer at the African Union level.

Local equity typically requires a developed regional capital market. Such an equity market implies freer and regionalized movement of capital and the provision of investment services within a region. It also means that investors can invest or raise capital in other countries, as well as from domestic markets, with confidence that they will engage with similar regulations, information, trading systems, settlement systems, accounting standards, and governance standards.
throughout the region (Khatiwada 2014). As a first action, strengthening the presence of regional financial institutions is critical and may even be needed before consideration of local equity participation.

Financial infrastructure is key for an effective regional capital market. Such infrastructure includes the development of links between national clearing and payment systems, the establishment of regional credit agencies, and benchmarks to enhance the liquidity of capital markets. Additionally, the 2008 global financial crisis showed that financial distress has a higher chance of being transmitted to other countries in areas that are financially integrated. This transmission can be managed with a strong framework for prudential regulation and strong supervision capabilities to ensure that risks stemming from financial integration are monitored and managed.

Export restrictions—Medium-term: Replace national export restrictions with regional restrictions. Stringent national export restrictions in Africa can make all countries involved worse off. Not only do they adversely affect domestic mining production, as described in chapter 3, where production in a Tanzanian gold mine fell to just 13 percent of preban levels, the restrictions also affect other sectors, including transportation and logistics, services, and construction. Export restrictions have direct adverse effects on other countries within the region. Zambia’s imposition of import and export taxes also affected the Democratic Republic of Congo, which exported copper to Zambia for processing, and made Zambian processing of Democratic Republic of Congo commodities largely commercially unviable. In the medium term, countries may be able to better utilize regional or continental export restrictions, meaning that restrictions are not imposed on exports to other countries within the regional economic community or African Union region, but are in effect on exports moved out of the region, consistent with the goals of the AfCFTA.

Replace LCPs with regional content policies. Many African countries have skills shortages and limited capacity to produce or access key inputs when working at a national level. Regional content policies can reduce the burden of ongoing constraints by enabling countries to access a larger pool of skilled labor and requisite inputs. Firms operating in the region can implement training programs and capacity-building for micro, small, and medium enterprises in parallel with regional sourcing.

Looking Ahead to Africa’s Resource Future

Finding 11: The Low-Carbon Transition Has Already Begun
Although fully phasing out global oil, gas, and coal markets is likely to take decades, the transition period poses significant, but uncertain, risks for fossil
fuel exporters in Africa. Those countries rich in carbon-based resources such as oil, gas, and coal face the looming prospect of the decarbonizing global economy, associated with falling demand for their resource exports. On the other hand, demand for metals and minerals could rise to supply the low-carbon economy. For those countries rich in certain metals and minerals, the prospects may be rosier (IEA 2021b). Countries such as the Democratic Republic of Congo, South Africa, and Zambia are already key players in the low-carbon transition, being major producers of copper, platinum, and cobalt, respectively. As demand continues to rise for a range of metals and minerals, new opportunities to expand production are emerging. Likewise, petroleum, particularly natural gas, may still have years of robust demand as richer nations seek ways to fully decarbonize. Gas may also play an important role in meeting the growing domestic energy needs of the African continent.

Fossil fuel exporters face the bulk of the risks. African countries rich in carbon-based resources such as oil, gas, and coal face the looming prospect of the decarbonizing global economy and the challenges of a just transition. Because of changing policies, consumer behavior, and technology trends, the demand for fossil fuels is expected to significantly decline over the next 10 to 30 years (figure O.14). Depending on supply trends, this decline could put permanent downward pressure on fossil fuel prices and threaten African countries’ ability to benefit from their carbon-based resource wealth; they run the risk of becoming stranded nations (Cust, Manley, and Cecchinato 2017).

**Figure O.14** Fossil Fuel Use, by Resource and Scenario, 2020, 2030, and 2050

![Graphs showing fossil fuel use](image)

*Source: Based on IEA 2021a.*

*Note: The stated policies scenario reflects current policy settings based on a sector-by-sector assessment and announced by governments. The announced pledges scenario assumes all climate commitments made by governments will be met in full and on time. The net zero scenario is based on the assumption that the global energy sector will achieve net zero CO2 emissions by 2050.*
Although the transition away from fossil fuels is widely anticipated, it is not yet clear how, or how quickly, such an outcome might occur. At their current trajectories, carbon-mitigation commitments made on a country-by-country basis under the Paris climate agreement would fall short of the 2-degree Celsius goal. Meanwhile, significant cost reductions in alternative energy technologies—such as solar and wind power—have begun to undercut the costs of generating power from oil, gas, and coal, thus leading to potential reductions in fossil fuel consumption at a global scale.

However, price signals from the oil and gas market still support development in Sub-Saharan Africa of many new assets. Despite lofty rhetoric from oil-importing countries, insufficient action to impose domestic carbon taxes or otherwise curb fossil fuel demand has been seen. For the citizens of Africa, the imperative is to be prepared for a range of futures, assuming both more drastic climate action and the curbing of fossil fuel demand, but also a more gradual phasing out of oil consumption at the global level. Policy choices today matter since they have a long horizon of impact, such as contract design for a 30-year mine or oil field. As such, policies can be configured to be robust to a range of futures and help optimize the development path given this uncertainty.

Carbon-rich nations are highly exposed to carbon risk. Like the private sector concern with “stranded assets,” countries could be left with undeveloped fossil fuel reserves, creating the risk of “stranded nations” (Cust, Manley, and Cecchinato 2017). There are self-interested reasons for governments to take these risks seriously. While little can be done to reduce the belowground risk contained in undeveloped and unextracted fossil fuels, many policy choices can increase or decrease the aboveground risk exposure. Examples explored in this report include how much state capital should be invested in nationally owned fossil fuel companies or sovereign wealth funds holding fossil fuel company stocks. Similarly, resource-rich countries often use resource revenues to invest in fuel subsidies or to build local technical skills in the petroleum sector. However, looking ahead, such policies may be increasingly suboptimal if they lock the economy into a carbon-intensive path.

Much more could also be done to invest in fiscal administration to capture a greater share of resource rents. Here the international community could play a supporting role to governments in the region. Failure to tax the petroleum sector fully serves as a form of production subsidy in addition to generating fewer government revenues. It is therefore against the interests of governments, citizens, and the global community alike.

Unlike fossil fuel resources, the demand for Africa’s minerals and metals is likely to be much more robust in future decades, and may even expand rapidly. In spite of the challenges, the medium- to long-term outlook for mineral exploration and mining on the African continent is positive. Renewed foreign direct investment in mineral exploration and development is likely to be boosted by the projected significant growth in demand for minerals for energy technology
(World Bank 2020b), fueled by the metal-intensive transition to green energy following the zero emissions by 2050 pledge by a majority of countries at the Glasgow Climate Change Conference in 2021. Indeed, the mineral demand projections under a 1.5- to 2-degree Celsius temperature constraint scenario represent highly significant increments above an already substantial projected increase in demand due to continuing growth in world population and its migration to urban areas, seeking ever-increasing living and environmental standards.

This favorable outlook for Africa’s mineral export opportunities attributable to the energy transition is well-evidenced. Research by Galeazzi, Steinbuks, and Cust (2020) also concludes that export of hydrocarbons may decline less rapidly than some predict during the transition and has the potential to remain a significant source of revenues over the short to medium term. Nonetheless, the study also concludes that the ability of African economies to benefit from rising demand for certain metals and minerals depends on the responsiveness of investment, and other regions may be able to expand supply more rapidly, dampening upward price effects and limiting the expansion of any African share of world supply. For example, the demand for and rising prices of cobalt could trigger Sub-Saharan Africa’s export value of this mineral, which by 2029 could exceed five times its current export value (figure O.15).

Finding 12: Mechanization and Digitization Will Have Profound Impacts on Productivity and Labor

The speed of digital technology adoption in the mining sector is accelerating. Four categories of technologies will play a crucial role in the digital transformation of mining and metals: automation, robotics, and operational hardware; a digitally enabled workforce; integrated enterprise, platforms, and ecosystems; and next-generation analytics and decision support. Firms are choosing to mechanize to maintain profitability amid supply and demand shocks (Baskaran 2021). Mechanization improves cost-competitiveness by increasing productivity (see figure O.16), but also reduces jobs. Levels of automation in the region vary. For example, in Southern Africa, Botswana and South Africa have a higher degree of mechanization, whereas Zambia and Zimbabwe still largely rely on labor-intensive mines.

Natural resource abundance, relative to the size of the economies, makes the mining, oil, and gas sectors a key contributor to foreign investment, export earnings, and government revenues. Historically, however, the mining sector’s contribution to employment creation has been small, and mechanization will squeeze it further. But expanding mechanization has contributed to a sharp increase in the number of women in the mining industry. In South Africa, 11,400 women were employed in the industry in 2002. By 2015, this number had increased to 53,000, and by 2019, to 56,691. This increase represents a
Figure O.15 Cobalt Exports from Sub-Saharan Africa

a. Sub-Saharan Africa’s share of cobalt trade

b. Cobalt price forecast

c. Estimated export value of SSA cobalt ores

Source: Galeazzi, Steinbuks, and Cust 2020.
Note: SSA = Sub-Saharan Africa.
397 percent jump between 2002 and 2018. In comparison, during the same period, national female labor force participation increased from 42.4 percent to 44.9 percent, an increase of 2.5 percentage points. In South Africa, women now account for 12 percent of the mining workforce; although a large improvement, this figure is still less than the global average of 17 percent. There are still labor-intensive underground platinum and gold mines in South Africa, which tend to have lower percentages of female employees.

**Finding 13: Environmental Degradation Is Accelerating**

During the boom years, carbon emissions soared and natural resource depletion increased significantly. Total carbon emissions in Sub-Saharan Africa at the end of the boom increased by 32 percent over the level in the preboom period, but emissions in the region’s resource-rich countries increased by 46 percent by the end of the boom, increasing from 172 million to 252 million tons of carbon dioxide. Depletion of natural resources increased dramatically. The depletion of natural resources in Sub-Saharan Africa increased by approximately 150 percent during the boom, and in the region’s resource-rich countries, depletion of natural resources increased on average by more than 190 percent. Total forest area also decreased by 2 percent, declining from an average forest cover of 6.9 million square kilometers in 2004 to 6.5 million square kilometers in 2014.

Nonetheless, Sub-Saharan African countries’ per capita contribution to global climate change remains the smallest of any region. Urgent domestic economic and energy needs also indicate that fossil fuel production and
consumption will have an important role in the coming years. However, African governments can take steps to leverage global decarbonization to accelerate the diversification of their economies, building resilience to external shocks, and anticipating the eventual decline in fossil fuel markets.

Other environmental challenges also present unique policy problems that governments may need new approaches to tackle.

Mining and petroleum projects can result in significant forest clearance or have spillovers that cause further forest loss. Cust et al. (forthcoming), for example, document the impact of mining in forested areas. Factors that seem to influence the scale of forest loss around resource extraction sites include the type of commodity and the form of extraction; for example, open-pit mines cause more clearance than shaft mining. Furthermore, road building in forested areas can account for much more subsequent forest loss than the project itself because it opens up access to new areas for farmers and loggers.

The link between resource extraction and forest loss is more complex than just the clearance that can occur around extraction sites. New research (Cust, Harding, and Rivera-Ballesteros, forthcoming) suggests that the amount of resource exports and consequently the degree of Dutch disease a country experiences can affect the amount of deforestation. Increased deforestation is driven by the impact on relative prices of resources and agricultural goods in countries where agricultural expansion may encroach on the forest. This mechanism, dubbed “Amazonian disease” by Cust, Harding, and Rivera-Ballesteros (forthcoming) because it was first measured in Brazil, suggests that falling oil exports or falling oil prices can increase the competitiveness of agriculture in the same country and thus increase the amount of forest loss, as seen, for example, in the period following falling oil prices beginning in 2015.

For a country such as Brazil, where agriculture often encroaches on the forest, an agricultural boom is associated with an uptick in deforestation. Meanwhile, as a major oil exporter, oil exports push up the real exchange rate, making agriculture less competitive than it would be otherwise when oil prices are low. Therefore, agricultural booms induced by falling oil prices or falling oil exports drive more deforestation unless policy intervenes.

The Amazonian disease has implications for African economies. First, major oil-exporting countries that also have abundant forests, such as Angola, Cameroon, and the Republic of Congo, currently may have less competitive agricultural sectors because of high oil exports than they might enjoy otherwise. As the world decarbonizes, demand and prices for fossil fuels such as oil are likely to decline over time. As oil exports decline in these countries, agricultural competitiveness is likely to rise. A boom in the agricultural sector in these countries could therefore drive a boom in deforestation unless policy is able to protect the forest. Put differently, the low-carbon transition could lessen Dutch disease in these countries, to be replaced instead by Amazonian disease. Instead
of the manufacturing sector losing out as with Dutch disease, it could instead be tropical forests that fall victim, as observed in Brazil.

Additionally, deforestation and destruction of biodiversity can adversely affect other economic sectors, notably tourism. Biodiversity is a driver of tourism: areas such as tropical forests and natural parks are reliant on preservation of natural capital to attract visitors.

Artisanal and small-scale mining also has a significant environmental footprint that is hard for policy makers to manage. Pollution of water and land degradation can have severe consequences for nearby agriculture and communities close to mining sites. The predominantly informal nature of artisanal and small-scale mining also makes it hard to encourage, monitor, or enforce basic environmental safeguards. Governments should therefore find ways to improve levels of formalization that are consistent with raising environmental standards, but also supporting the livelihoods of miners and their dependents.

Finding 14: Managing Structural Challenges Will Require New Policy Approaches

The future of African economic transformation depends on the ability to increase productivity and generate jobs and income, including in export-oriented sectors beyond commodity exports. However, achieving these increases under the condition of resource richness has proved to be challenging.

According to Ross (2019), out of 50 oil exporters examined for success in export diversification since 1998, only 8 had greater export diversification at the end of the period. Further, Ross (2019) finds evidence that 4 of the 8 successful countries had achieved this either because of resource depletion or economic sanctions placed on them from outside. This is a very daunting historic record for those African resource-exporting countries seeking to promote export diversification prior to resource exhaustion.

This challenge to diversifying the economy stems from a phenomenon known as Dutch disease, which can crowd out manufacturing sector growth, the agriculture sector, and also distort human capital accumulation, away from productive jobs and into the government sector.

There are three primary human capital distortions in resource-rich countries. First, the resource sector reallocates human capital away from some high-productivity sectors. Second, the distribution of human capital between men and women is more unequal in these nonrenewable-resource-rich countries compared with other countries. Third, human capital is skewed toward the public sector in resource-rich countries. These characteristics may contribute to, and be associated with, lower overall worker productivity arising from resource dependence.
Gender disparities are prevalent. Cust and Mandon (2021) find that resource-rich countries have a human capital distribution skewed toward men, including in Sub-Saharan Africa. Figure O.17 shows the distribution of human capital between males and females in emerging market resource-rich and non-resource-rich countries. The distribution is particularly unequal in Sub-Saharan Africa, where resource-rich countries have one of the worst male-female human capital imbalances. While female human capital averages 42 percent of total human capital in non-resource-rich Sub-Saharan Africa, the share declines to 28 percent in the resource-rich group.

**Policy Recommendations**

**Managing the Low-Carbon Transition**

Asset diversification is a strategy that fossil fuel–dependent countries can pursue to manage the risks of the low-carbon transition. Peszko et al. (2020) find that decarbonization policies initiated by fuel importers can unleash macroeconomic forces that encourage traditional export diversification of fuel exporters, by which they reduce reliance on export revenues from fossil fuel commodities and diversify into downstream, emission-intensive fossil fuel value chains. Such diversification represents a comfort zone for fossil fuel exporters, but it increases their exposure to multiple channels of low-carbon transition impacts, such as...
border carbon adjustments, disruptive technologies, and shifts in the preferences of consumers and investors. Asset diversification can be a long-term, sustainable alternative, but it is a challenging proposition because it requires discovery of new sources of comparative advantage and accumulation of unfamiliar produced assets and human capital, including new skills and capabilities.

Supporting the Transition to Automation

Given the expected decline in mining jobs resulting from mechanization, identifying new ways to increase employment opportunities is critical. The demographic dividend will translate into a sharp increase in the size of the workforce, and harnessing this workforce in and out of the mining sector will require strengthening the foundation of basic education.

Developing and implementing skills-development programs aligned with both mechanization and diversified economic activities to absorb the decline in labor demand resulting from mechanization is important. Although mechanization results in substantially higher productivity and revenue, it has a strong impact on local labor dynamics. In particular, it changes the type of labor demanded from low-skilled to high-skilled and leads to an overall decline in the amount of labor demanded. The shift to mechanization has required the development of a suitably skilled workforce for other industries and jobs that are positioned to absorb high amounts of low-skilled labor. The increased tax revenue resulting from higher mining productivity can be used to finance skills-development programs.

Mechanization also requires providing training to develop local suppliers. The majority of mechanized machinery used in Africa is imported from overseas, as is the labor to operate and repair the machinery. Therefore, providing local suppliers and servicers with the necessary training to take over these tasks is key to making domestic mining technology and service firms competitive with international counterparts. Given the skills shortage facing many mining communities, this local supply will require capacity-building in the areas of technical and business development. It will also need increased access to finance to support the development of linkages while widening the beneficiary base of the mining sector. Existing LCPs largely focus on direct employment quotas but less on skills development for the creation of indirect employment in linkage sectors. Shifting the focus of LCPs to the latter would help grow both the mining multiplier effect and productive linkages.

Overcoming the Dutch Disease

The underlying question when studying Dutch disease is how an appreciation of the real exchange rate from resource revenues might be managed and mitigated by the government. The conventional permanent income hypothesis is that a sustained increase in consumption can be supported by interest on accumulated foreign assets through foreign exchange reserves or a sovereign wealth
fund, as recommended by the IMF (2012) or the more restrictive formulation of this approach called the bird-in-hand strategy (Barnett and Ossowski 2003). However, as analyzed by van der Ploeg and Venables (2011), these approaches are not optimal for all resource-rich countries. This is especially the case for lower-income resource-rich countries, which are generally capital-scarce, and the return on domestic capital may be higher than that on foreign-invested capital. According to van der Ploeg and Venables (2011), capital scarcity implies a low capital-to-labor ratio, little public infrastructure, low wages and income, and a high domestic interest rate. In capital-scarce resource-rich countries, a temporary influx of foreign exchange, consecutive to a commodity price boom, a massive resource discovery, or increasing resource production, should typically be spent and invested domestically, not spent to accumulate foreign assets.

Countries should pursue policies that enable their capacity to invest domestically, that is, invest in investing. This investment policy allows for incremental increases in consumption for present generations as well as the use of savings for a combination of foreign debt reduction and the accumulation of domestic capital. First, the IMF (2012) policy paper argues that consumption should be skewed toward the present generation because of the relative poverty of the present generation compared with those in the far future. Second, savings should take the form of domestic capital accumulation to compensate for relative capital scarcity. This use of public spending is expected to boost private investment and accelerate growth of the nonresource sectors through (a) improving public infrastructure and the provision of public services such as electricity or the internet (domestic public investment), (b) lowering interest rates (foreign debt reduction), and (c) a process of “investing in investing.” This is where capital-scarce resource-rich countries can use public investment and related policies strategically to raise the overall absorptive capacity of the economy by flattening supply curves, and thus mitigate Dutch disease effects on the nontraded sectors.

Managing Structural Challenges and Preparing for the Next Boom-Bust Cycle
Policy makers in resource-rich countries may have more success working toward asset diversification rather than export diversification. Asset portfolio diversification is an important step toward sustained growth and is more feasible for resource-rich countries to achieve than traditional export diversification because of pressure from Dutch disease (Cust and Rivera-Ballesteros 2021a). The Changing Wealth of Nations 2021 report (World Bank 2021) suggests that targeting asset portfolio diversification—investing in the expansion of human and physical capital—instead of export diversification may be a successful policy for sustainable economic growth. This recommendation builds on earlier work (Gill et al. 2014; Peszko et al. 2020) exploring the benefits of portfolio diversification.
However, to achieve asset diversification, countries must successfully transform the proceeds from resource extraction into other kinds of productive assets. A successful policy for sustainable economic growth might target asset portfolio diversification over export diversification by reducing the share of natural capital in total wealth (Cust and Rivera-Ballesteros 2021b). This does not mean a decline in the dollar value of natural capital per capita; instead, it emphasizes increased investments in the expansion of human capital and other productive assets. Such investments can be financed from the proceeds of prudent resource management. Lederman and Maloney (2012, 13) argue that countries should focus not on growth- or diversification-promoting sectors but on policies that “raise the overall ability of a country to increase productivity and quality, and to move to more sophisticated tasks.”

Notes

1. Agenda 2030, or the 2030 Agenda for Sustainable Development, is a universal call to action to end poverty. It sets 17 goals, including protecting the environment and improving lives, to be achieved by 2030.
2. This report focuses on the World Bank Africa region, which is predominantly Sub-Saharan Africa, comprising 48 countries in total (https://data.worldbank.org/region/sub-saharan-africa). This group of countries is referred to as Sub-Saharan Africa throughout. The report follows the IMF definition of resource richness to distinguish between the groups of countries for analysis (IMF 2012) and to chart changing patterns of resource dependency. The IMF considers a country resource rich primarily if the resource share of exports or government revenues exceeds 20 percent.
3. Calculations based on World Bank and the ICTD/UNU-WIDER Government Revenue Dataset 2019, considering only Sub-Saharan African countries with nonmissing data.
4. These various challenges faced by government are described in documents such as the Natural Resource Charter, which highlights the various public policy choices that must be made along the decision chain, from exploration for resources through how to invest revenues from resources for sustainable and diversified development (Cust and Manley 2018).
5. According to World Bank staff estimates and Lakner et al. (2021), by 2030 there will be about 616 million poor in the world, 500 million poor in Africa (81 percent), 448 million in resource-rich countries (73 percent), and 379 million of them will be living in Sub-Saharan Africa (62 percent of the world’s poor or 85 percent of poor people living in resource-rich countries).
6. In countries with sectoral GDP data (Cust, Rivera-Ballesteros, and Zeufack 2022).
7. The getting electricity indicators measure the procedures, time, and cost required for a business to obtain a permanent electricity connection for a newly constructed warehouse. Additionally, the reliability of supply and transparency of
tariffs index measures supply reliability, transparency of tariffs, and the price of electricity.


References


