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Abbreviations and Acronyms

BCRG	Central Bank of the Republic of Guinea
CBAM	Carbon Border Adjustment Mechanism
CCDR	Climate Change Development Report
CEM	Country Economic Memorandum
CMIP	Coupled Model Inter-comparison Projects
CPSD	Country Private Sector Diagnostic
DSA	Debt Sustainability Analysis
FAO	Food and Agriculture Organization
FDI	Foreign direct investment
FER	Road maintenance fund
EX	Foreign exchange
GDP	Gross Domestic Product
GHG	Greenhouse gas emissions
IMF	International Monetary Fund
IPCC	Inter-Governmental Panel on Climate Change
NDC	Nationally Determined Contribution
ND-GAIN	Notre Dame Global Adaptation Initiative
PER	Public Expenditure Review
PNE	National Water Policy
REER	Real effective exchange rate
RGI	Resource Governance Index
TFP	Total factor productivity
USR	Unified Social Registry

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ES.

EXECUTIVE SUMMARY

This is the first annual edition of Guinea Economic Update. This annual report presents an overview of Guinea's evolving macroeconomic position, followed by a detailed exploration of a specific topic. The first chapter of this first edition presents recent economic developments, macroeconomic outlook and risks. The second chapter discusses the importance of agriculture for structural transformation and climate proofing Guinea's economy. It also includes measures that could help the Guinean Government foster agriculture growth that has increased productivity, is more inclusive, is more resilient to climate change risks, while also contributing less to climate change.

Macroeconomic and Poverty Developments and Outlook

Growth accelerated in 2023 bolstered by strong mining sector performance. GDP growth accelerated to 7.1 percent in 2023 (compared to 3.7 in 2022) with bauxite production surging by 22 percent and gold by 10 percent driven by both artisanal operators and formal sector companies. On the demand side, an investment surge (private and public) fueled growth. Inflation slowed to 9.3 percent (y-o-y) at end-2023 from 11.6 percent at end-2022, supported by stable transportation costs and prudent fiscal and monetary policies.

Yet Guinea's mining sector has weak linkages to the domestic economy, hence not contributing much to job creation or poverty reduction. Overall, Guinea has experienced notable economic expansion since 2016, primarily fueled by its mining exports but also a surge in industrial fishing. However, the mining sector's weak integration with non-mining sectors, the mining sector's capital intensity, and the economic challenges posed by Dutch-disease dynamics together hinder job creation and broader economic benefits. Additionally, the global economic disruptions caused by the COVID-19 pandemic and the conflict following the onset of Russia's war in Ukraine further constrained job creation and poverty reduction efforts. Hence, Guinea's growth has had marginal impact on reducing poverty, given a lower decline in the poverty rate compared to per capita GDP growth.

Fiscal management has delivered low deficits, while resource mobilization and management in mining remain a challenge. Over the past decade, Guinea has generally maintained cautious fiscal management, contributing to macroeconomic stability. From 2016 to 2023, the government renewed its commitment to sound macroeconomic governance, which resulted in a reduction of the fiscal deficit to an average of 1.4 percent annually during this period. Nonetheless, there is potential for optimizing expenditure allocation to further stimulate economic growth. On the revenues side, tax revenues have been relatively low, averaging 12.7 percent of GDP from 2016

to 2023. This subdued performance is mostly linked to the mining sector, with the average tax revenue from the sector decreasing from 2.6 percent of GDP in the 2010-2015 period to 2.1 percent in 2016-2023. Guinea's capacity to collect mining revenues is constrained by multiple factors including a range of tax exemptions, transfer pricing (non-market-price-based transactions between affiliated companies that lower company profits in Guinea), a deficiency in technical capacity to monitor the quality and quantity of mined products that are produced and exported, and the fiscal administration's ability to effectively scrutinize the financial statements of large multinational companies.

Guinea remains at moderate risk of debt distress, with some space to absorb shocks. The April 2024 IMF-World Bank Debt Sustainability Analysis (DSA) concluded that Guinea remains at moderate risk of debt distress, with some space to absorb shocks—unchanged from the previous DSA (December 2022). After declining in recent years, helped by prudent fiscal and monetary policies and restrained central bank fiscal financing, public debt as a share of GDP increased slightly at end-2023, reflecting an increase in domestic debt due to higher issuance of government securities to finance public infrastructure investment. This recent trend is worrisome, and care should be taken to avoid further debt increases.

External sector and exchange rate management has yielded a stable currency, slightly easing inflation, amid continued appreciation of the real effective exchange rate. Changes in Guinea's current account balance are almost totally explained by mining-related exports and FDI-related imports and investment. The current account deficit remains high with an annual average of 10.6 percent in 2016-2023. Export growth, mainly bauxite and gold, has been robust in recent years but imports also increased due to FDI in the mining sector. The external sector's performance from 2016 to 2023, along with the application of a foreign exchange (FX) intervention rule, has contributed to stabilizing the nominal exchange rate and slightly easing inflation. Nonetheless, the real effective exchange rate has steadily appreciated since 2016 and persists, posing significant challenge for competitiveness of non-mining sector products.

Mining is expected to continue to drive Guinea's economic growth while non-mining sectors, affected in 2024 by the mid-December 2023 fuel depot explosion, recover thereafter. Growth is expected to slow to 4.9 percent in 2024 (2.4 percent per capita) partly due to the impact of the December 2023 fuel depot explosion on the non-mining sector. Growth is then expected to accelerate to an average of 6.3 percent in 2025-2026 (excluding Simandou mine exports anticipated by end-2025), driven mainly by a surge in mining-related FDI. Inflation would decelerate to 8.8 percent in 2024 and 8.1 percent on average in 2025-26, due to easing supply constraints and improving road-network conditions, facilitating food distribution. Prudent monetary policy including minimal fiscal financing would also contribute to easing inflation pressures. The fiscal deficit is projected to widen to 2.7 percent of GDP due to increased capital expenditures but decrease to 2.1 percent in 2025-2026 consistent with prudent fiscal policies. The current account deficit is forecast to remain high due to increased FDI-related imports. Risks are tilted to the downside as uncertainties in the political transition ahead of the presidential elections could slow implementation of reforms, potentially reducing private investment. On the upside, Simandou exports are anticipated by end 2025, and mining-related FDI inflows could increase, reflecting planned new projects.

Reversing competitiveness losses is necessary, though not sufficient, for spurring non-mining sector development and, thereby, job creation and inclusive growth. It requires maintaining fiscal-debt stability, enhancing domestic revenue mobilization and management, and prioritizing productivity-enhancing measures that expand access to infrastructure services (electricity, quality roads and digital telecommunication) and human capital services (social protection, health, and education) and linking climate change to development objectives.

The Importance of Agriculture for Structural Transformation and Climate Proofing Guinea's Economy

Natural resource management is central to guinea's long-term development. Guinea has abundant natural resources, a growing population, and privileged geographic location, with significant untapped potential for inclusive wealth creation. However, climate change—notably rising temperatures and increased rainfall variability—negatively impact Guinea's wealth creation potential, amplifying the risks to sustainable growth and weakening resilience to climate-induced shocks. Guinea is the 24th most vulnerable country and the 148th most ready country according to the ND-GAIN Country Index ranking. When linking climate change and growth from the lens of the Changing Wealth of Nations framework, effective resource management emerges as vital for enabling inclusive and sustainable growth. Agriculture (i.e., crop production, livestock, and fisheries) can play a key role as springboard for structural transformation but needs climate proofing. This is also critical to foster resilience to the Dutch Disease dynamics that are typical of extractives-led economic growth, and thereby to enable diversification.

Agriculture holds enormous potential for inclusive growth, while being central to climate proofing Guinea's economy. Agriculture (including livestock, aquaculture and forestry) contributes 27.8 percent to national GDP and employs 53 percent of the population. Key climate change variables—rising temperatures, decreased rainfall, increased rainfall variability and rise in sea levels—directly impact productivity of agriculture and livelihoods of most Guineans. At the same time, Guinea's overall emissions are low, less than 0.01 percent of global emission in 2019, yet they are generated primarily from agriculture, livestock, and aquaculture (52 percent) and land use and forestry (30 percent).

The latest model developed by the Inter-Governmental Panel on Climate Change (IPCC) finds that Guinea will experience large changes in average temperature, rainfall, and sea level rise, with significant impact on agriculture. Periods of high heat will be more intense in the northern and northwestern areas of the country. Average annual rainfall would fall, comprising a delayed rainy season that is shorter and more intense. More frequent intense storms would heighten the risk of flooding and landslides, impacting agriculture productivity, market accessibility, hydrogeneration capacity, and road asset quality. Sea level is projected to rise, inundating coastal marshlands and communities.

Without appropriate measures, agricultural productivity could decline over the long term, by as much as 25 percent, negatively impacting inclusive growth and food security. A recent study on West African countries attributes approximately 40 percent of the variation in cropland productivity to the combined effect of rainfall, land surface temperature and solar radiation, suggesting large benefits to productivity growth if climate change risks are reduced.

Guinea's agriculture must transform from subsistence modes of production, to intensive, productivity-driven practices to boost competitiveness, climate resilience and food security. Subsistence characterizes around 90 percent of agricultural activities, with the remaining 10 percent being commercially-oriented production. Low connectivity to markets is a factor driving higher inflation, in part due to resulting higher food costs in consumption baskets, that Guinea experiences relative to its neighbors and that hamper faster reductions in poverty. Dutch-disease dynamics that also make imported food more attractive than domestic produce, further hinder investments needed for more productive agriculture and agro-processing sectors.

Guinea published its Nationally Determined Contribution (NDC) in 2021 and has started to establish the building blocks for participating in climate and carbon finance. A total budget of US\$13.8 billion is indicated as being needed until 2030 to achieve its emissions reductions targets. To achieve the country's objective of net-zero pathway by 2050, specific greenhouse gas emissions (GHG) net reduction targets for agriculture compared to the reference scenario will be set in 2024. Measures will include identifying sustainable, low-carbon practices for rice cultivation, management of livestock residues and savannah burning. Alternative carbon free pumping systems (electricity, solar and wind energy) will supplant land and carbon-intensive practices currently in place in most rural locales. For adaptation, the priority actions that Guinea has identified for adaptation include the development and implementation of a National Water Policy (PNE) action plan; the design and enforcement of measures to protect, conserve and manage ecosystems; strengthening of the coastal zone's resilience; and supporting rural communities to adapt to climate impacts.

The NDC is yet to specify how resources would be mobilized, financed, allocated or how damages per sector are estimated. Guinea published an NDC Investment and Partnership Plan, drawing on investments planned under the national and local authority budgets and designed to mobilize financing from external partners and the private sector. Yet in the NDC Investment and Partnership Plan, published subsequent to the NDC (2021), a preliminary minimum budget of US\$1 billion is indicated, leaving a financing gap of around US\$11.6 billion.

Policy actions that could help the Guinean authorities foster agriculture growth that is inclusive, more resilient to climate change risks, while also contributing less to climate change include: prioritize policy reforms and investments in the most vulnerable sectors; rethink agricultural input subsidies (mainly water and fertilizer use) to support the adoption of climate-resilient agricultural production practices and approaches to reduce post-harvest losses; rehabilitate and upgrade and make irrigation infrastructure; invest in water mobilization infrastructure; establish mechanisms to facilitate transforming agriculture and food systems from subsistence to market oriented; invest in sustainable forestry practices, such as reforestation and afforestation; and upgrade road and power assets to climate-resilient design standards.

Table ES: Summary of policy options

Policy options	Priority
1. Domestic revenue mobilization and public finance management	
Fully implement the bauxite reference price regulation, including recovery of any residual taxes owed each year by bauxite companies that do not comply.	Short term
Pursue recovery of the shortfall in tax payments due, as indicated in the audit of the large enterprises' 2021 financial statements.	Short term
Undertake audits of the financial statements of the large enterprises for 2022, 2023, and when available 2024, to identify and recover any shortfalls in tax payments due.	Short to medium-term
Expand the capability of digital tax registration, tax declarations and payments.	Short to medium-term
With Simandou exports anticipated to start by end-2025, accelerate the reflection on mechanisms to assess and monitor fiscal payment obligations of the companies.	Short term
2. Macro-fiscal stability and debt sustainability	
Pursue annual fiscal surplus and monetary policies that target reductions in inflation.	Short to medium-term
Create a stabilization account at the central bank with clear fiscal rules for allocating the funds for investments and/or countercyclical investment spending when needed.	Short term
Maximize the concessionality of new debt; strengthen debt management capacity by implementing crucial reforms from the 2024 organizational audit of the debt management agency.	Short to medium-term
Enhance public investment management by adopting a decree that formalizes an improved public investment management process, covering all stages of the project cycle.	Short term
3. Access to infrastructure services	
Enhance the financial viability of the electricity and water sectors by ensuring that cost-recovery tariffs (including a low social tariff for the poor and vulnerable) are charged.	Short term
Improve the quality and quantity of the road network by rationalizing the mandates of key sector institutions, updating the mandate of the Road maintenance fund (FER) and by increasing the portion of fuel levy that the government currently allocates to the FER.	Short term
4. Expand human capital	
Improve spending prioritization and use part of the savings from reduced energy and water subsidies to increase investments in education, health, and social protection.	Short to medium-term
Strengthen the unified social registry data management and procedures for social program access by adopting a revised decree for the Unified Social Registry.	Short term
5. Climate-proof Guinea's economy including through sustainable management of natural resources	
Link efforts to structurally transform and diversify the economy to the impact of and capacity to adapt to climate change.	Short to medium-term
Prioritize policy reforms and investments in the sectors most vulnerable to climate change, namely agriculture, forestry, transport, trade, and industry.	Short term
Rethink agricultural input subsidies (mainly water and fertilizer use) to support the adoption of climate-resilient agricultural production practices and approaches to reduce post-harvest losses.	Short term
Rehabilitate and upgrade and develop irrigation infrastructure and make it more resilient to climate change to reduce system losses and expand irrigation infrastructure.	Short to medium-term
Invest in water mobilization infrastructure including hydraulic, irrigation and drainage work at communal level.	Short to medium-term
Establish mechanisms to facilitate transforming agriculture and food systems from subsistence to market oriented, while moving towards food security, as an urgent priority.	Short to medium-term
Invest in sustainable forestry practices, such as reforestation and afforestation to help reduce encroachment of agriculture on the forest and enable absorption of carbon.	Short to medium-term
Upgrade road and power assets to climate-resilient design standards.	Medium to long term



Chapter I.

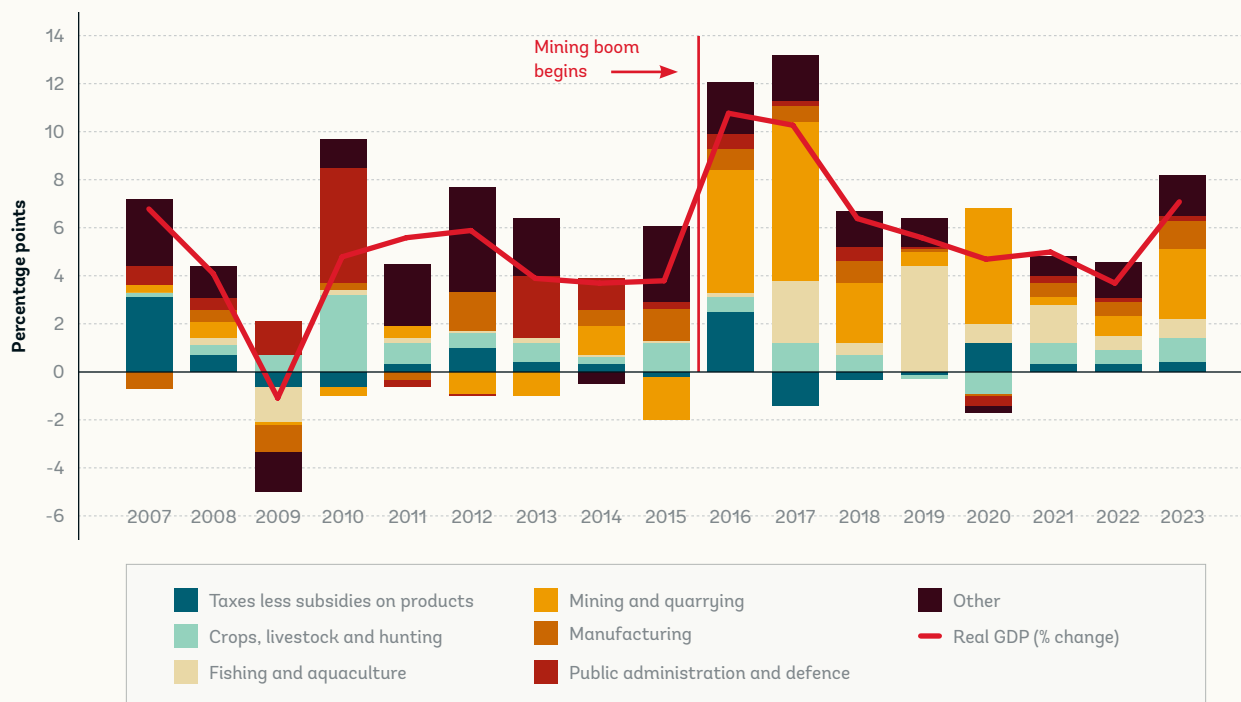
MACROECONOMIC AND POVERTY DEVELOPMENTS AND OUTLOOK

1.1. Guinea has shown resilience in the face of multiple crises, helped by a mining boom presenting its own macroeconomic challenges.

1. **Growth accelerated from 3.7 percent in 2022 to 7.1 percent in 2023 (4.6 percent per capita terms) bolstered by strong mining sector performance.** Bauxite production surged by 22 percent, and gold exports by 10 percent attributable to both artisanal operators and formal sector companies. On the demand side, an investment surge (private and public) fueled growth. Overall, Guinea has experienced notable economic expansion since 2016, primarily fueled by its mining exports but also fishing sector. From 2016 to 2023, the nation's economy grew at an average rate of 6.7 percent, or 3.8 percent on a per capita basis, with significant contributions from the mining and fishing¹ sectors (Figure 1).

1. Fishing growth stemmed from larger industrial operations near Conakry, rather than traditional artisanal fishing operations.

Figure 1: Guinea's mining sector helped weather multiple shocks over the past years



Source: Guinea National Accounts and World Bank staff calculations.

Note: Other comprises: Services excluding public admin and defense; Industry excluding mining and manufacturing; Forestry and logging subsector of agriculture.

2. **Guinea's growth has had marginal impact on reducing poverty**, given a lower decline in the poverty rate compared to per capita GDP growth (average 2.7 percent annually). During 2019-2023, the international poverty rate measured at \$2.15 per day, averaged 10.6 percent and fell 3.3 percentage points, implying a poverty elasticity of -0.25.² The mining industry's weak integration with non-mining sectors, the mining sector's capital intensity, the economic challenges posed by Dutch-disease dynamics (Box 1), weak spending efficiency, low productivity, and widespread gender gaps all hinder job creation and broader economic benefits. Additionally, the global economic disruptions caused by the COVID-19 pandemic and the conflict following the onset of Russia's war in Ukraine further constrained job creation and poverty reduction efforts during 2020-21.

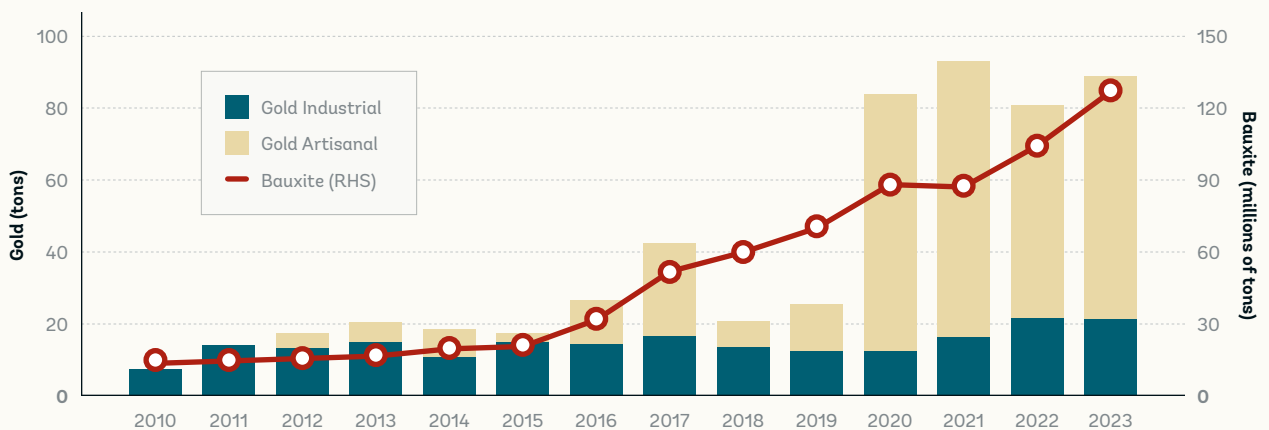
3. **The industrial sector's contribution to Guinea's GDP growth saw a significant increase, largely driven by mining.** The industrial sector annual contribution to growth rose from 0.4 percentage points to 3.2 percentage points during the period from 2016 to 2023. This change was overwhelmingly driven by the mining sector, which accounted for 96 percent of the variation. By comparison, contributions of manufacturing and construction sectors to overall growth were minimal. The mining sector was primarily led by the bauxite and gold sub-sectors (Figure 2). Bauxite production surged from approximately 20 million tons in 2014 and 2015 to nearly 130 million

2. A 1 percentage point increase in per capita growth yielded a 0.25 percent point decline in poverty. Previous calculation of Guinea's poverty elasticity to growth for the period 2014-18 was -0.46, lower than the regional average of -0.63.

tons by 2023. Gold production also increased sharply between 2015 and 2023, largely due to artisanal mining, particularly in the past four years. Since 2013, the updated Guinea Mining Code strengthened the legal framework for the mining sector. The Resource Governance Index (RGI), which evaluates the clarity of legal frameworks and the transparency of data disclosure regarding natural resources, assessed Guinea's framework in 2021 as being "satisfactory" (an overall composite score of 62 percent), a significant improvement compared to the 2017 assessment of "poor" (composite score of 38 percent).³

4. Guinea's mining sector is weakly linked to the domestic economy, hence not contributing much to job creation. This is a typical characteristic of extractives sectors in all but the most advanced diversified economies, and is highlighted by the negligible impact that mining growth has on the expansion of other subsectors. On the demand side, the relationship between mining and exports is evident as mining products represent 90 percent of monthly exports; however, government consumption is the only component that shows a significant and negative correlation with mining growth, with an elasticity of approximately -0.6, which is statistically significant at the 8 percent confidence level.⁴ This could be indicative of a relatively lower efficiency in revenue collection from the mining sector compared to other sectors of the economy. It could also reflect a mining tax code that yields low fiscal revenues at least in early years of the mining boom, or a weak fiscal capacity for adequate oversight of company financial statements and associated tax obligations. It might also reflect a strategic choice to utilize mining revenues for purposes other than current government expenditure. The likelihood of the former explanation is supported by the observed decrease in government revenue as a proportion of GDP during periods when mining is the predominant driver of economic growth. Additionally, the elasticity of government capital spending with respect to the growth of mining is nearly zero.

Figure 2: The mining sector comprises informal and formal operations



Source: National Institute of Statistics and World Bank staff calculations.

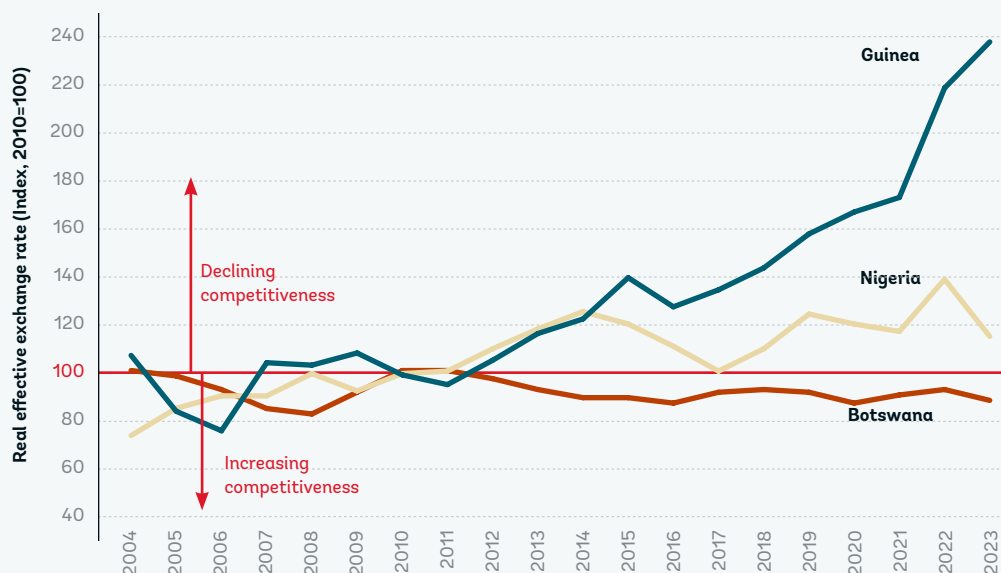
- Natural Resource Governance Institute RGI assessment for Guinea—<https://resourcegovernanceindex.org/country-profiles/GIN/mining?years=2021>. The RGI composite score comprises three subcomponents: (i) Value realization (licensing, taxation, local impact, State owned Enterprises); (ii) Revenue management (budgeting and revenue sharing); and (iii) Enabling environment (including political stability, rule of law). Of the three, the greatest scope for improvement lies with Enabling environment with a score of 35 percent compared with 80 percent and 71 percent for the first two subcomponents, respectively.
- This result emanates from a simple linear regression used (LINEST function in Excel) to calculate the growth elasticities of sector value added (VA) to VA growth of network sectors.

BOX 1: Dutch disease dynamics pose significant challenge to inclusive growth in Guinea

A key challenge to more inclusive growth in Guinea is that the real effective exchange rate (REER) has appreciated rapidly, constraining the competitiveness of non-mining sectors that would create jobs (Figure 3). Non-mining exports have declined in absolute terms since 2016, suggestive of ‘Dutch disease’, whereby REER appreciation makes Guinean non-mining exports more expensive and hence less competitive (World Bank 2024c). Under current conditions, Guinea’s diversification prospects are in a few mining sub-sectors only (World Bank 2024c). Diversification within mining such as transforming bauxite to alumina, if feasible, has limitations for inclusive growth given that mining sub-sectors are capital intensive and the few jobs created require high-skilled labor currently scarce in Guinea.

Dutch-disease dynamics also fuel inflationary pressures that eroded the potential poverty-reduction benefits of agriculture growth for the rural population. This is one of two impact channels of Dutch-disease dynamics—the “spending effect”—characterized by increased spending and inflation due to higher real incomes from the export boom. The “spending effect” raises demand for non-booming tradable goods and services (such as rice and other agricultural products), and non-tradable goods and services, which results in increases in prices of only the non-tradable goods and services (since, per the original Corden-Neary model, tradable goods prices are exogenous, hence determined by international supply and demand). The spending effect also increases output of non-tradable goods/services, imports of non-booming tradable goods (e.g., imports of rice, in Guinea’s case), and the wage rate relative to the price of tradables. Furthermore, the spending effect increases productivity in the non-tradable goods sector, consistent with Balassa-Samuelson effect (Balassa, 1964; Samuelson, 1964). The second impact channel—the “resource movement effect”—where labor moves to the booming tradable sector (mining) from the non-booming tradables sector and non-tradables sector, tends to be less prominent in non-advanced non-diversified countries. In Guinea’s case, the presence of artisanal gold mining (in effect, a booming tradable sector) requiring lower skills than industrial mining, has drawn some labor from agriculture to artisanal mining between 2000-11 and 2011-2018, the years for which the data are available (World Bank 2024c).

Figure 3: Steady appreciation of Guinea’s real effective exchange rate erodes competitiveness of non-mining sectors, but boosting productivity of physical and human capital, would counteract the competitiveness losses



Source: International Monetary Fund, Real Effective Exchange Rate as Based on Consumer Price Index for Guinea [GINEREERIX], retrieved on May 24, 2024 from FRED, Federal Reserve Bank of St. Louis, <https://fred.stlouisfed.org/series/GINEREERIX>.
Note: Real Effective Exchange Rate as based on respective country’s Consumer Price Index, Annual, Not Seasonally Adjusted.

5. Agriculture's contribution to GDP growth increased from 0.9 percentage points to 2 percentage points in 2016-2023, mainly due to growth in the fishing sector (1.2 percentage points). The fisheries and aquaculture share in GDP increased from an annual average of 5 percent in 2007-2015 to an annual average of 10 percent of GDP in 2016-2023, due mainly to industrial fishing (exported to Korea) rather than traditional artisanal activities. According to the Food and Agriculture Organization (FAO) statistics, in 2022 Guinea exported approximately US\$73 million worth of fish products and is a net exporter of fishing products. The sector holds considerable potential for contributing to the country's economic diversification.

6. While the contribution to growth of the agriculture subsector comprising crops, livestock, and hunting increased, its potential to contribute to inclusive and sustainable growth remains to be fully tapped. The contribution to growth of this agriculture subsector (crops, livestock, and hunting) has diminished slightly, decreasing from 0.9 percentage points during 2007-2015 to 0.7 percentage points during 2016-2023 (Figure 4). Despite this reduction, its share in the Gross Domestic Product (GDP) has increased, from an annual average of 10.2 percent during the period from 2007 to 2015, to an annual average of 13.1 percent in the subsequent period from 2016 to 2023, supporting the increase in the share of the overall agricultural sector in GDP (Figure 5). The subsector holds considerable untapped potential for inclusive and sustainable growth that is resilient to climate change effects (discussed in chapter 2). Currently, it is predominantly characterized by subsistence agriculture, which is associated with low productivity levels. The sector's contributions to exports are minimal, and its elasticity in

Figure 4: Agriculture subsector contributions to GDP growth

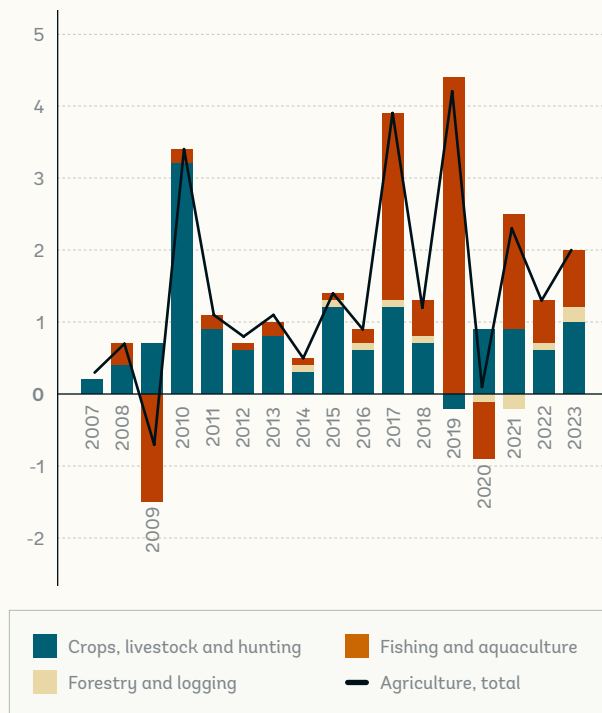
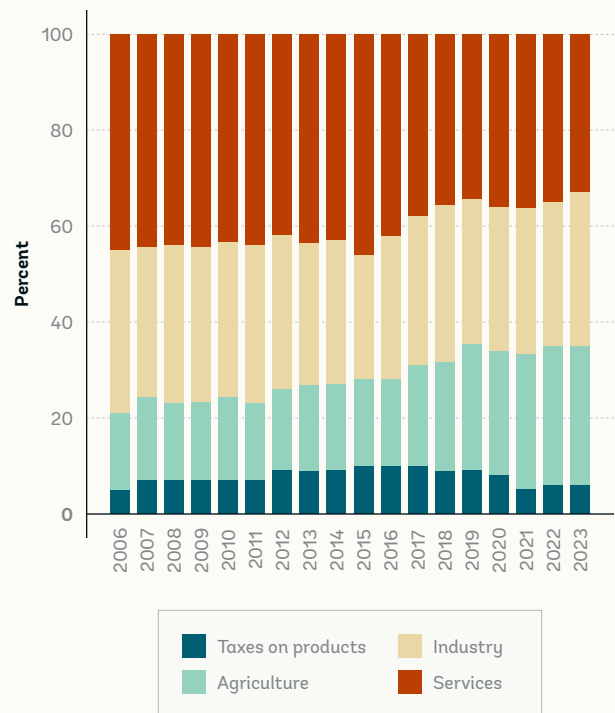


Figure 5: Evolution of GDP composition by aggregate sectors



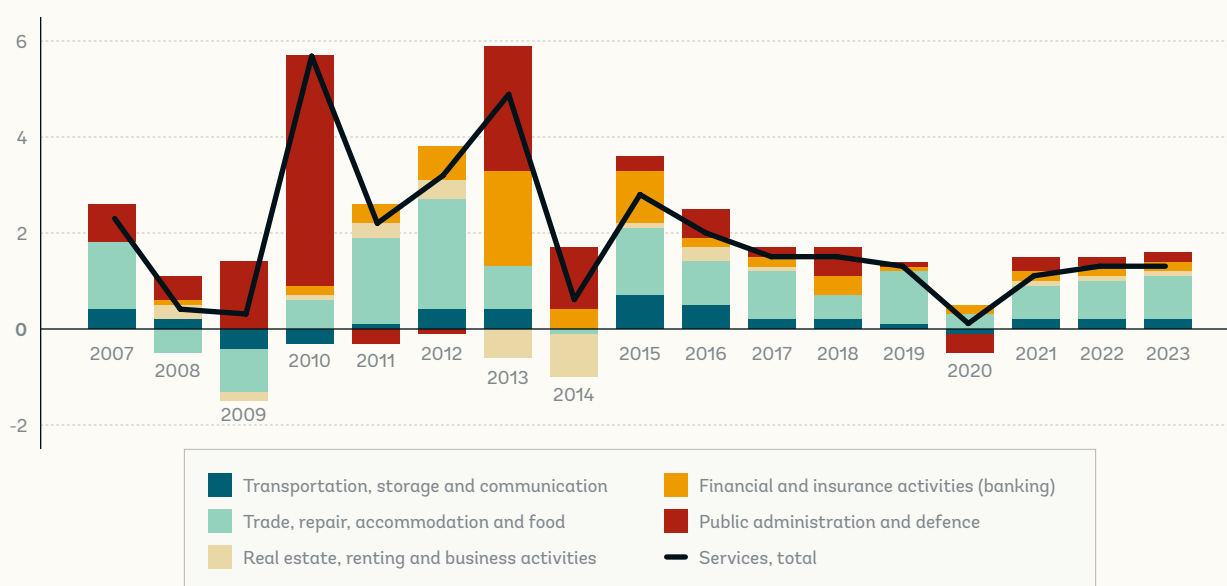
Source: Guinea National Accounts and World Bank staff calculations.

relation to the growth of domestic manufacturing (i.e., agro-processing) is weak. Nonetheless, there is potential for transformative development within the subsector through links to agro-processing and the cultivation of cash crops; but this depends on policies that (i) address Dutch-disease dynamics to render the macroeconomic framework conducive to non-mining sector growth, and (ii) strengthen the ecosystem for co-development of agriculture and agro-processing sub-sectors.

7. The services sector, which has been predominant in the economy, has experienced a reduction in contribution to growth, declining from 2.5 percentage points during the period of 2007-2015 to 1.3 percentage point in the period of 2016-2023. This downward trend is evident for most service sub-sectors, with each seeing a decrease in their contribution to GDP growth (Figure 5). Furthermore, the overall share of service sectors in GDP has witnessed a significant drop, from 44 percent in the earlier period to 33 percent in the latter. The sub-sectors that have been especially impacted include trade, repair, accommodation, and food services, as well as real estate, renting, and business activities, all of which have seen their shares decline more steeply than others. The services sector is dominated by informal operations which typically have low labor productivity.

8. Cross sub-sector growth elasticities, which examine the responsiveness of a sector's growth to changes in another sector, show the central role played by network sectors as enablers of growth and transformation. The transportation, storage, and communication sectors are seen to have substantial influence on other critical areas of the economy. Specifically, growth of the transportation, storage, and communication sector has notable positive effects on growth of the manufacturing sector, the trade, repair, accommodation, and food services sector, and the financial and insurance activities sector (including banking). Yet contribution of Guinea's network sectors to GDP growth has been stagnant in recent years (Figure 6), hence worrisome as regards diversification objectives.

Figure 6: Services sub-sectors contribution to GDP growth



Source: Guinea national accounts and World Bank staff calculations.

9. **Value added from competitive network industries are particularly high in manufacturing and financial services.** The manufacturing sector shows a growth elasticity of 0.64, suggesting that a 1 percent increase in the growth of the transportation, storage, and communication sector could, on average, lead to a 0.64 percent increase in the growth of the manufacturing sector.⁵ Similarly, the trade, repair, accommodation, and food services sector exhibit a growth elasticity of 0.36, indicating a somewhat less, though still meaningful, positive relationship with the growth of the transportation sector. The most pronounced impact is seen in the financial and insurance activities sector, with a growth elasticity of 1.69. This implies that the sector's growth is highly sensitive to changes in the transportation, storage, and communication sector, with a 1 percent increase in the latter potentially resulting in a 1.69 percent increase in the financial sector's growth.

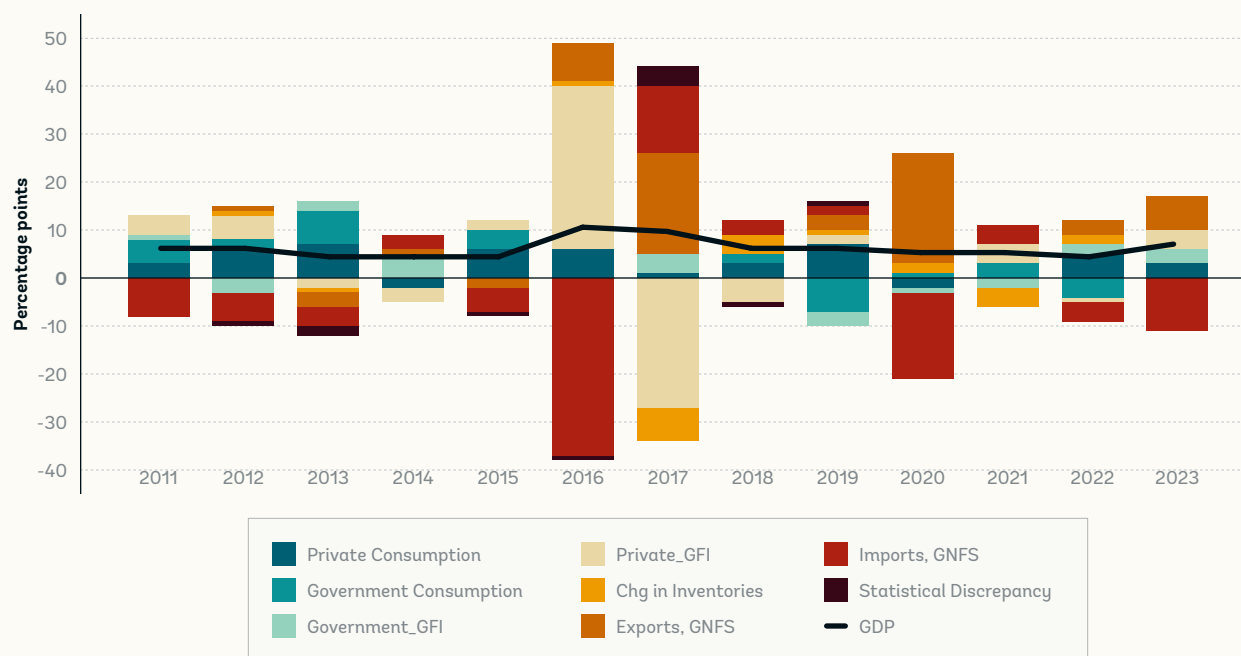
10. **These interconnections suggest that growth of transportation infrastructure and communication could have a multiplicative effect on the economy,** consistent with the literature on network sectors.⁶ It cannot only enhance economic integration through improved trade capabilities but also by fostering economic diversification, particularly in the manufacturing sector. The link between transportation and communication growth and financial sector development, although less direct, is nonetheless vital. It may be indicative of the role that improved transportation infrastructure plays in facilitating financial transactions and services, which in turn can stimulate economic activity. In the context of Guinea, where the provision of credit to the private sector is notably low—often under 10 percent of GDP—the relationship between the transportation and communication sector and financial activities becomes even more significant. Enhancing transportation and communication infrastructure could spur increases in financial services (including access to credit), which are essential for private sector development and overall economic growth. This underscores the importance of strategic investments in transportation and communication as a catalyst for broader economic development in regions with underdeveloped financial markets.

11. **External demand for Guinea mining products has been a significant driver of growth since 2016.** The contribution of net exports to growth increased from -4.9 percentage points, on average, in 2011-2015 to 2.3 percentage points in 2016-2023. The increase is essentially due to exports (Figure 7), which contributed 8.1 percentage points to GDP growth on average in 2016-2023 (compared to -0.7 percentage points in 2011-2015). The contribution of imports declined by 1.6 percentage points, essentially due to FDI. The contribution of private consumption remained substantial but has nevertheless decreased from an annual average of 4.2 percentage points in 2011-2015 to 2.8 percentage points in 2016-2023. That is related to a decrease of the share in GDP of nominal income that goes to salary and households, because of the changing composition of GDP toward industrial mining. This effect has dominated the one related to an increase in real household income stemming from a decreasing inflation rate. In addition, even with large FDI inflows, the annual average contribution of private investment decreased slightly by 0.1 percentage points, from 1.4 percentage points in 2011-2015 to 1.3 percentage points in 2016-2023.

5. This result emanates from a simple linear regression used (LINEST function in Excel) to calculate the growth elasticities of sector value added (VA) to VA growth of network sectors.

6. Notably, the seminal paper by Evans and Schmalensee 2016, which also found that growth in network services induces higher economic benefits (i.e., higher productivity of physical and human capital) the more widely diffused the network service is throughout the economy. Thus, by expanding access of network services (electricity, telecommunications, and quality roads) to most Guineans, in urban and rural areas, Guinea enhances the prospect of spurring productivity growth rate to counteract the competitiveness losses from Dutch-disease (via appreciation of the REER) (Guinea CEM, FY24).

Figure 7: Contribution of demand components to GDP growth in percentage points



Source: Guinea National Accounts and World Bank staff calculations.

1.2. Fiscal management has delivered low deficits, yet resource mobilization and management in mining remain a challenge.

12. **Over the past decade, Guinea has generally maintained cautious fiscal management, contributing to macroeconomic stability.** Nonetheless, there is potential for optimizing expenditure allocation to further stimulate economic growth. Following significant fiscal tightening in 2011, the fiscal deficit increased until 2015, peaking at 6.9 percent of GDP due to a relaxation of fiscal discipline. From 2016 to 2023, the government renewed its commitment to sound macroeconomic governance, which resulted in a reduction of the fiscal deficit to an average of 1.4 percent annually during this period. This fiscal consolidation was sustained despite the economic disruptions caused by the COVID-19 pandemic and the geopolitical tensions from Russia's war in Ukraine, with fiscal deficits of 0.9 and 1.6 percent of GDP in 2022 and 2023, respectively.

13. **Fiscal policy is characterized by low expenditure levels relative to peers, particularly in capital investments.** This is due to difficulties in generating domestic revenue at anticipated levels. Over the period from 2016 to 2023, the country's spending was 16.1 percent of its GDP, significantly lower than that of its structural peers, whose average spending was 23.1 percent of GDP from 2016 to 2019, and its aspirational peers, whose spending averaged 28.4 percent of GDP during the same period.⁷ Guinea's public expenditure fell by approximately 4 percentage points of GDP per year on average between 2010-2015 and 2016-2023, with reductions occurring in both capital and current spending (Figure 8). Specifically, the expenditure on goods and services alone decreased

7. World Bank 2021. Guinea Public Expenditure Review 2021

by 2 percentage points of GDP (Figure 9). The PER noted that rigid expenditures, which are non-discretionary and difficult to reallocate, constituted 40.5 percent of the total public expenditure in 2019. The study also emphasized that the Central government's budgetary flexibility is primarily derived from public spending on goods and services, as well as capital expenditures funded by domestic sources, which are the least rigid expenditure categories.

Figure 8: Fiscal policy is characterized by low expenditure levels, particularly in capital investments

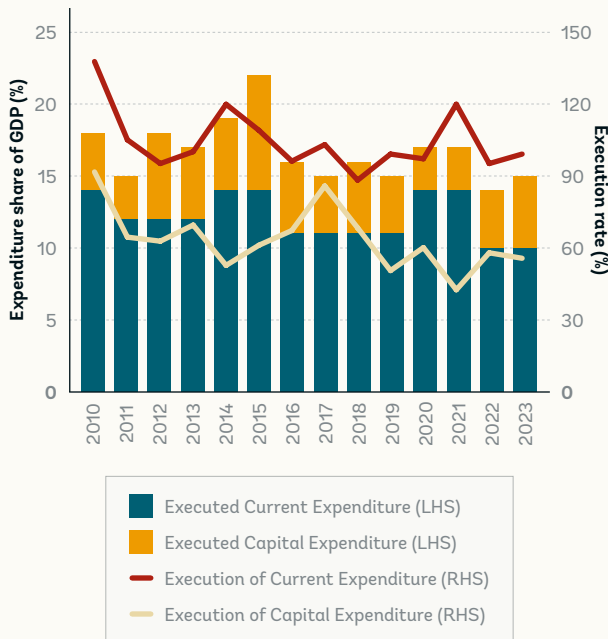
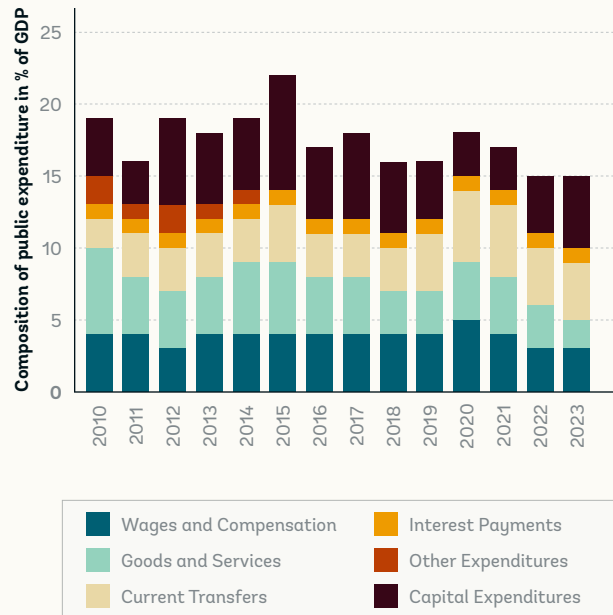


Figure 9: The biggest cuts in recent years were in capital expenditures and goods and services

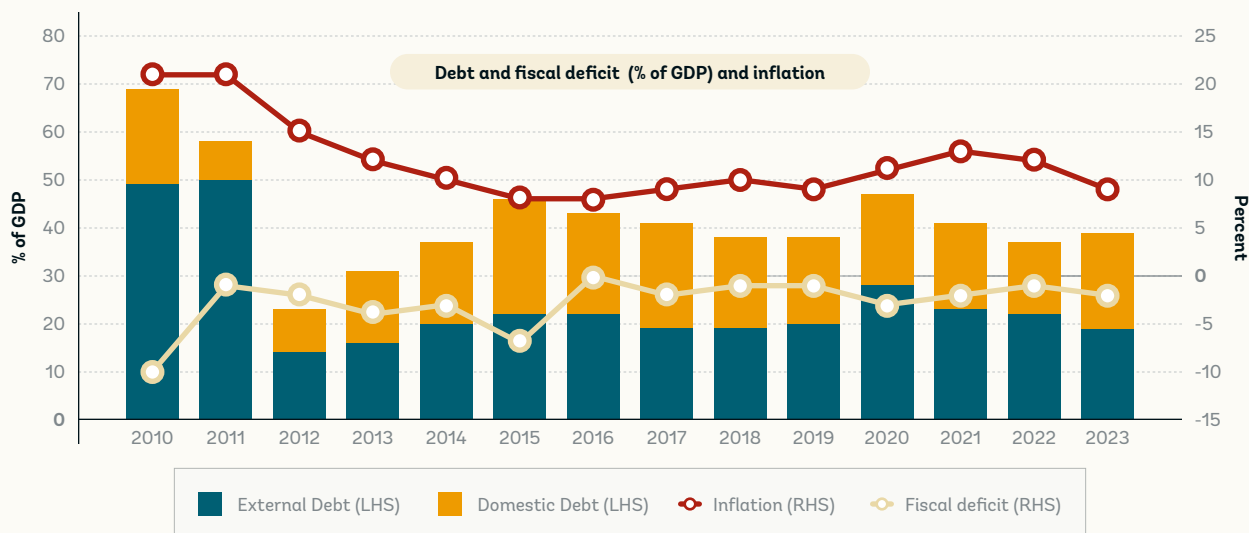


Source: Guinean authorities and World Bank staff calculations.

14. Guinea's capital expenditure is marked by inefficiency in addition to being lower than that of its peers.

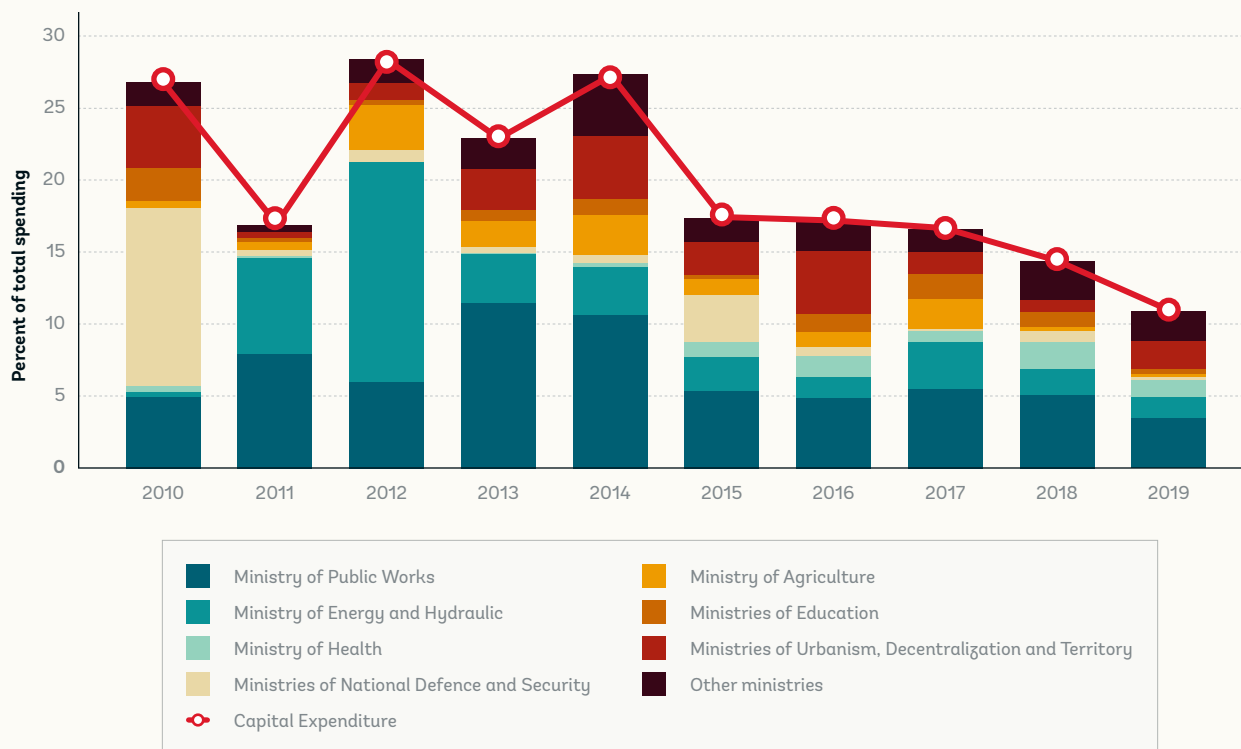
The share of capital expenditures has declined from 5.2 percent of GDP in the period from 2010 to 2015 to 4.3 percent in the period from 2016 to 2023 (Figure 9). The ambitious infrastructure investment program initiated in the mid-2010s, including significant hydropower projects like Kaleta and Souapiti electricity generation plants, were financed through special purpose vehicles, partly owned by the state, and with costs that are not captured in capital expenditures in the budget. The execution rate of capital expenditures has been consistently low, deteriorating from 67 percent in 2010-2015 to 61 percent in 2016-2023, indicating a lack of implementation capacity (Figure 8). In the past three years, this rate has barely remained above 50 percent. Capital expenditure often serves as the adjustable variable in the budget, while the execution of current spending is invariably high, sometimes surpassing 100 percent (Figure 8). A result has been a concerning decline in capital expenditures across all ministries in recent years (Figure 11). Additionally, the management of public investment is notably inefficient, with an efficiency gap of 50 percent compared to the efficiency frontier, exceeding the Sub-Saharan Africa average of 36 percent and the global average of 27 percent. This inefficiency may be due to the structure of capital spending (Guinea 2021 PER), which would benefit from a shift towards more investment in transport and communication infrastructure.

Figure 10: Prudent fiscal management helps lowering the deficit, inflation, and debt ratios



Source: Guinean authorities and World Bank staff calculations.

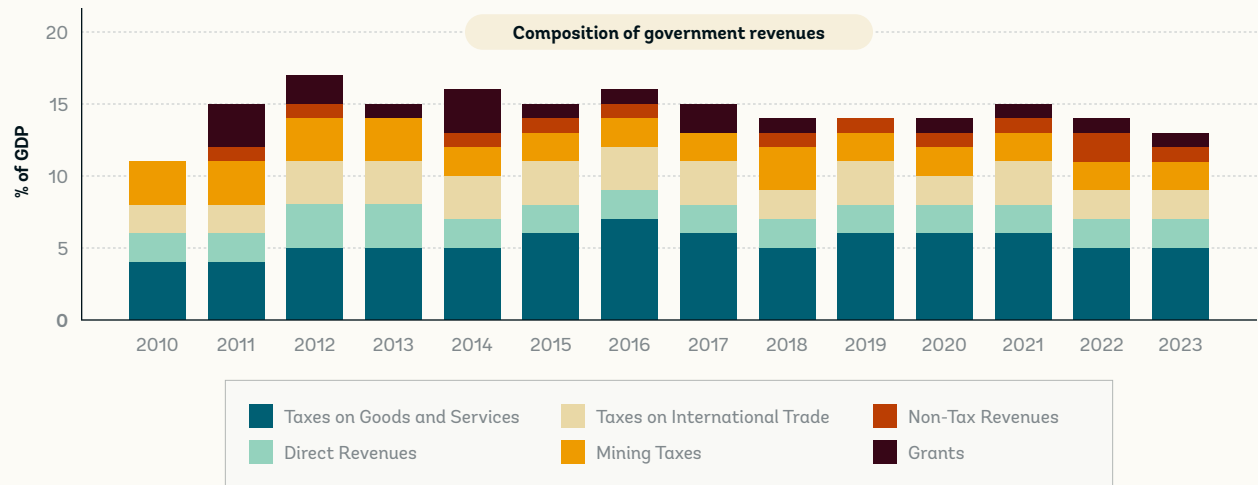
Figure 11: Capital expenditures share by ministry show a downward trend over 2010-2019



Source: 2021Guinea PER: Boost Database, World Bank. Expenditure stage corresponds to value-based purchasing (VBP).

Note: "Other ministries" includes culture and sports, health, defense and security, trade and industry and other expenditures.

Figure 12: Tax revenues have been relatively low, mostly due to shortfalls in mining revenues



Source: Guinean authorities and World Bank staff calculations.

15. Inadequate domestic revenue mobilization significantly hampers public investment in infrastructure and human capital. Tax revenues have been relatively low, with an annual average of 12.7 percent of GDP from 2016 to 2023 (Figure 12). This subdued performance is linked to the mining sector, which has been the driver of GDP growth during this period has yet to contribute an increasing share of revenues—indeed the annual average tax revenue from mining decreased from 2.6 percent of GDP in the 2010-2015 period to 2.1 percent in 2016-2023. Additionally, the collection of taxes on international trade and direct taxes both declined by 0.2 percentage points of GDP, falling to 2.6 percent and 2.4 percent of GDP, respectively. In contrast, the tax revenue from goods and services, primarily VAT, improved, increasing by 1 percentage point to an average of 5.9 percent of GDP in 2016-2023. The IMF has estimated a tax gap of approximately 7.3 percent of GDP on average over the past decade, which includes a 5 percent GDP shortfall attributable solely to the mining sector.⁸

16. The decline in mining revenues presents a considerable challenge for Guinea's development. Guinea's capacity to collect mining revenues is constrained by multiple factors.⁹ The 2013 mining code includes a range of tax exemptions that are more extensive than those in Côte d'Ivoire, Burkina Faso, Mali, and Zambia. After the mining code was enacted, most mining conventions have expanded the scope and duration of these tax exemptions. Since the abolition of the 1 percent export tax in 2017, artisanal gold has been exempted from taxation. Bauxite company revenues, and hence the associated tax assessments, also fall short due to prevalent use of transfer pricing (non-market-price-based transactions between affiliated companies), enabled by the vertically-integrated cross-border operations of bauxite conglomerates. Additionally, there is a deficiency in technical capacity of the Guinea's fiscal and mining administrations to adequately monitor the quality and quantity of the ore that is extracted and exported. The fiscal administration's ability to effectively scrutinize the financial statements of large companies, including those in the mining sector, is also limited.

8. IMF. 2021. Guinea: Selected Issues. Country Report No. 21/147. Washington, DC: IMF.

9. See Guinea 2021 PER, World Bank.

17. **Guinea remains at moderate risk of debt distress, with some space to absorb shocks.** The April 2024 IMF-World Bank Debt Sustainability Analysis (DSA) concluded that Guinea remains at moderate risk of debt distress, with some space to absorb shocks—unchanged from the previous DSA (December 2022). All external debt ratios lie sufficiently below thresholds to allow some space to absorb shocks. The risk of overall public debt distress has increased significantly since the last DSA but is assessed to remain moderate. After declining in recent years, aided by prudent fiscal and monetary policies and restrained central bank fiscal financing, public debt as a share of GDP increased slightly to 38.7 percent of GDP at end-2023 (from 38.5 percent at end-2022), reflecting an increase in domestic debt due to higher issuance of government securities in 2023 to finance public infrastructure investment. External public debt, on the other hand, declined to 18.9 percent of GDP in 2023 (from 20.6 percent of GDP at end-2022). While the mechanical risk signals point to a high risk of overall debt distress, judgement was applied given that the breaches of the threshold for the present value of overall public debt-to-GDP ratio are marginal in 2024-25 and within decimal point in 2026-27. In addition, the commencement of exports from the Simandou mines, currently anticipated by end-2025 and not yet included in the DSA baseline, would be an important mitigating factor, hence an upside risk. The total debt service-to-revenue ratio is also on a declining trend. The greatest risk to the debt outlook is a shock to exports, but the recent shift toward more non-concessional borrowing, uncertainty around the stock of domestic payment arrears to suppliers, and gaps in debt coverage, also represent substantial downside risks. The DSA underscores the need for continued debt management reforms in line with recent assessments.¹⁰ Prudent macro, fiscal, and financial policies, including maximizing the concessionality of new debt, strengthening debt management capacity, and enhancing public investment management, remain key to preserving medium-term debt sustainability.

1.3. External sector and exchange rate management lead to stable currency, lower inflation but also appreciation of the real effective exchange rate.

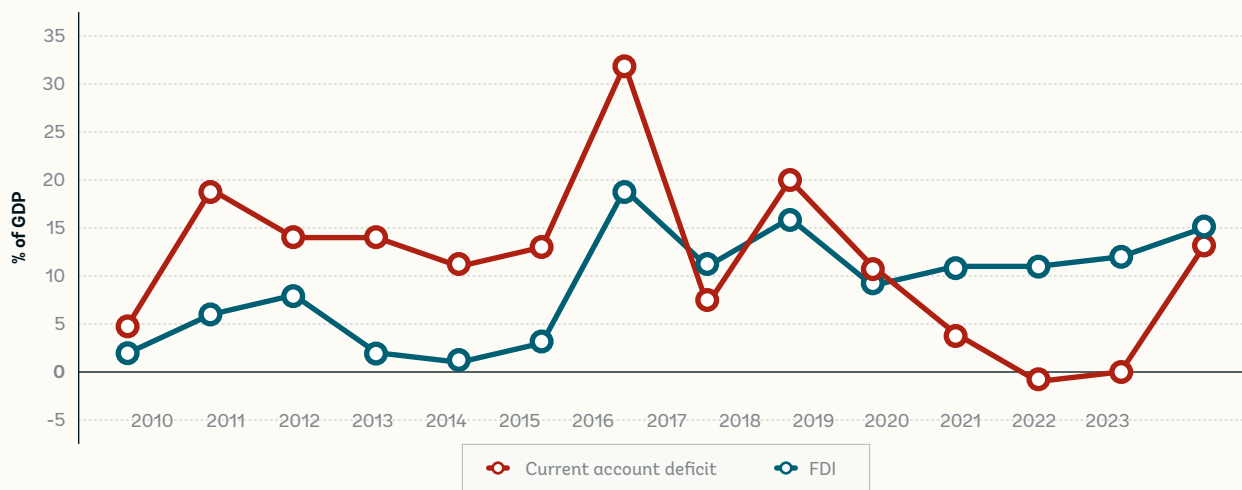
18. **Fluctuations in Guinea’s current account balance are largely attributable to mining-related exports and foreign direct investment (FDI)-related imports, reflecting the country’s growth trajectory.** The current account deficit has remained substantial but experienced a decline from an annual average of 12.7 percent of GDP in 2010-2015 to 10.6 percent in 2016-2023. This reduction is primarily due to a significant narrowing of the trade deficit, which fell from 11.0 percent to 4.7 percent of GDP. Export growth was driven predominantly by bauxite and gold, which surged between 2016 and 2023, with the export share in GDP increasing from an annual average of 24 percent to 44.5 percent in the latter period. Imports also rose, fueled by FDI, but not to the same extent as exports. FDI, the principal source of external financing, grew from an annual average of 3.6 percent of GDP, in 2010-2015, to 12.9 percent in the period 2016-2023 (Figure 13).

19. **The external sector’s performance from 2016 to 2023, along with the application of a foreign exchange (FX) intervention rule, has stabilized the nominal exchange rate amid continued appreciation of the real effective exchange rate.** An improved overall external balance has bolstered external reserves and the coverage of prospective imports. This improvement, combined with a tighter monetary policy and Dutch disease dynamics (Box 1), has led to a sustained appreciation of the real effective exchange rate (REER). Additionally, since November 2020, the Central Bank of the Republic of Guinea (BCRG) has consistently implemented a rules-

10. World Bank (2018) Debt Management Performance Assessment (DeMPA) and subsequent debt TA missions.

based FX intervention policy. This policy conditions auctions on the volatility of the market exchange rate, with the BCRG conducting an FX auction to buy or sell foreign currency when the market rate is below or above 0.25 percent of its 5-day moving average. The policy has increased exchange rate flexibility, enhanced the transparency and coherence of the BCRG's foreign exchange operations, and has been well received by commercial banks. By 2022, the premium typically associated with the parallel exchange rate market was virtually eliminated.

Figure 13: Foreign direct investment in mining drives the current account deficit



Source: Guinean authorities and World Bank staff calculations.

1.4. The outlook for Guinea is overall positive, but clouded by ongoing Dutch-disease dynamics and possible delays to the transition and reforms

20. **Following a robust economic and fiscal position in 2023, Guinea's outlook for 2024 is overall positive though with lower growth than projected prior to the December 2023 explosion.** Initial assessment of the economic impact of the December 2023 fuel depot explosion suggested temporary and relatively minor repercussions for GDP growth, fiscal and external balances. This also reflected the authorities' quick action to reestablish fuel supplies (Box 2). No significant challenges to fiscal and debt sustainability or macroeconomic stability were expected based on that analysis, albeit with lower GDP growth.

- **GDP growth was assessed to be about 1 percentage point lower in 2024.** This scenario is consistent with the authorities' estimate that the expected oil supply gap of 15 percent for 2024 will last up to 6 months. The analysis modeled oil supply shortages as primarily affecting private household consumption on the demand side, and the services and agriculture sectors on the supply side. The projection was based on the calculated elasticity between the growth of GDP components and changes in the oil supply. Reflected in this elasticity were transmission channels whereby the services sector was seen to be impacted by oil distribution, transport, and trade, while the agriculture sector was seen to be impacted by lower market access due to limited supply and higher cost of transport.

- **The impact on inflation was seen likely to be insignificant**, as the extra cost of oil supply was estimated to be between US\$15 and 20 million annually.¹¹ Given this amount was readily absorbed in the budget, it was deemed unlikely that the government would find the need to increase the petrol price at the pump.

- **The fiscal impact was deemed manageable, with an estimated additional deficit of 0.3 percent of GDP.** This slight increase stemmed from unchanged nominal Government spending in line with its initial 2024 Budget and slightly lower fiscal revenues, endogenous to (lower) GDP growth in 2024. In sum, the lower denominator (GDP) increases constant expenditures to GDP while lower revenues to GDP yield a roughly constant revenue to GDP ratio.

21. Despite the slower post-explosion growth, mining will continue to drive growth while the non-mining economy recovers following the explosion.

- a. Growth is projected slow to around 4.9 percent in 2024 (2.4 percent per capita) and accelerate to 6.3 percent on average in 2025–2026 (excluding Simandou mine exports anticipated by end-2025), though below the potential of 9.3 percent indicated by the analysis.
- b. Inflation would decelerate to 8.8 percent in 2024 and 8.1 percent on average in 2025-26, due to easing supply constraints and improving road-network conditions, facilitating food distribution, as well as to prudent monetary policy including minimal fiscal financing.
- c. Despite deceleration in agriculture and services, the \$2.15 international poverty rate is projected to decline to 8.5 percent in 2024 and 7.3 percent in 2025 due to easing food price inflation improving the population's purchasing power. Given the limited poverty gains from mining-driven growth, redistribution mechanisms to vulnerable populations and productivity gains in non-mining sectors will be required for inclusive growth in the short to medium term.

22. The fiscal deficit (including grants) is projected to widen to 2.7 percent of GDP due to increased capital expenditures but decrease to 2.1 percent in 2025-2026 consistent with prudent fiscal policies. Tax revenues are to increase slightly in 2024 to 12.7 percent of GDP, buoyed by tax administration reforms and additional mining revenues from implementing the bauxite-reference-price mechanism as of July 2022. Electricity subsidies are to decrease by 38 percent, per the 2024 budget law, as utility company reforms bear fruit, particularly the continued rollout of prepaid meters and intensified billing recovery efforts. The debt-to-GDP ratio would decrease slightly to 36.8 percent in 2024 and to average 34.5 percent in 2025-2026, due to reduced domestic debt.

23. The current account deficit is forecast to remain high at 12.7 percent of GDP in 2024 as FDI-induced imports continue to drive the trade deficit; but will decline to an average 10.1 percent in 2025-26. Mining-related FDI, the main source of external financing, is expected to rise to 17 percent of GDP in 2024, while the real effective exchange rate would likely continue to appreciate. Risks are tilted to the downside as political transition uncertainties leading up to the elections could slow implementation of reforms, potentially reducing private investment. Spillovers from conflicts in neighboring countries represent another important risk that could affect economic activity by disrupting production, including in mining and agriculture, and reducing revenues, further constraining public investment in physical and human capital. On the upside, mining-related FDI inflows could increase, reflecting planned new projects.

11. This figure accounts for the extra expenses incurred due to the immobilization of fuel tankers and the transportation costs of oil from Sierra Leone.

BOX 2: Impact of hydrocarbon depot explosion on Guinea's economy

This note presents an initial assessment finalized in February 2024 of the limited economic impacts of the December hydrocarbon depot explosion.

Guinea concluded 2023 in a robust economic and fiscal position. In 2023, growth accelerated to 7.1 percent, or 4.6 percent per capita, bolstered by strong mining sector performance. Bauxite production surged by 22 percent, and gold exports increased by 10 percent, attributable to both the artisanal gold sector and the emergence of new formal sector companies. Growth on the demand side was driven by private investment, including related to the Simandou project, as well as public investment. Despite external price pressures, the Guinean franc's appreciation against the US dollar which, along with prudent fiscal and monetary policies and the lack of central bank fiscal financing, helped maintain economic stability. Inflation declined, from 11.6 percent in 2022 to 9.3 percent at end-2023. The fiscal deficit remained below 2 percent of GDP and was financed equally by external and domestic sources (table 1). Guinea's current account experienced a significant deficit in 2023, largely due to imports related to foreign direct investment (FDI).

On December 18, 2023, an explosion at a hydrocarbon depot in Conakry severely damaged most of the fuel tanks at the country's main oil terminal, leading to widespread, but temporary, fuel shortages. The government reported that 13 fuel storage tanks were put out of service, while 5 remained operational. The blast primarily affected gasoline tanks and reserves, while diesel and heavy oil supplies were relatively unscathed. Nearby homes and a warehouse also incurred significant property damage. The fuel shortage lasted approximately four weeks, until government measures restored the fuel supply chain. Starting January 9th, a fuel tanker docked in Conakry, providing about 90 percent of the fuel needs, although at an additional cost of around US\$40,000 per day. Less than 10 percent of the country's fuel supply is imported from neighboring Sierra Leone. The authorities are considering the construction of a new terminal, with cost estimates exceeding US\$ 300 million for completion over 24 to 30 months. Both the interim and new fuel supply measures add to economic activity.

Table 1: Economic outlook for Guinea: baseline w/o shock (left columns) and shock scenario (right).

Variable	2023	2024e		2025p		2026p	
		base	shock	base	shock	base	shock
<i>Annual percent change unless indicated otherwise</i>							
Real GDP Growth, at constant market prices	7.1	5.3	4.4	6.1	6.1	6.5	6.5
Private Consumption	2.0	4.7	3.3	4.7	4.7	4.7	4.7
Government Consumption	3.4	24.1	24.8	4.6	4.6	5.6	5.6
Gross Fixed Capital Formation	43.7	45.5	45.2	41.3	41.4	5.4	5.4
Exports, Goods and Services	13.3	6.8	6.8	6.0	6.0	5.9	5.9
Imports, Goods and Services	18.2	25.3	25.3	20.3	20.3	3.3	3.3
Real GDP Growth, at constant factor prices	7.1	5.3	4.4	6.1	6.1	6.5	6.5
Agriculture	5.1	4.5	3.0	4.4	4.4	5.1	5.1
Industry	10.8	6.7	6.7	7.8	7.8	8.9	8.9
Services	5.1	4.5	3.2	5.5	5.5	5.1	5.1
Inflation (Consumer Price Index), end of period	9.3	8.8	8.8	8.7	8.7	7.5	7.5
Current Account Balance (% of GDP)	-12.1	-12.0	-12.0	-11.7	-11.7	-7.2	-7.2
Net Foreign Direct Investment, Inflow (% of GDP)	15.1	17.4	17.5	16.9	17.0	9.6	9.7
Fiscal Balance (% of GDP)	-1.7	-2.4	-2.7	-1.9	-2.1	-1.9	-2.2
Revenues (% of GDP)	13.7	13.9	13.9	14.2	14.2	15.3	15.3
Debt (% of GDP)	34.0	34.1	35.7	32.8	34.2	29.7	30.9
Primary Balance (% of GDP)	-0.4	-1.5	-1.7	-1.0	-1.2	-1.2	-1.4
GDP nominal in US\$ (millions)	22950	26958	26779	31635	31435	34827	34601

Source: Guinea national accounts and World Bank staff calculations. February 2024.

24. **Beyond 2026, mining-driven growth and Dutch-disease dynamics (Box 1), if not managed, would limit inclusiveness of growth while maintaining vulnerability to commodity price volatility.** Mining is expected to continue to drive growth in Guinea, and to accelerate in the medium term with the emergence of iron ore exports expected by end-2025, to at least double the magnitude of exports and significantly increase GDP. Guinea's main mineral export, bauxite, along with soon-to-emerge iron exports from the Simandou mines, are important "transition minerals" required for supplying zero-carbon technologies that have favorable growth prospects for many years to come. Ex ante, Guinea's growth characteristics of the recent past that hamper growth of non-mining sectors, are thus likely to persist unless reforms are implemented to counter Dutch-disease dynamics.

25. **Reversing competitiveness losses is necessary, though not sufficient, for spurring non-mining sector development, broader job creation and hence inclusive growth.** It requires enhancing domestic revenue mobilization and public finance management, maintaining macro-fiscal stability and debt sustainability. It also requires prioritizing productivity-enhancing measures that expand access to physical capital services (electricity, quality roads and digital telecommunication) and human capital services (social protection, health, and education) and linking climate change to development objectives.

- **Domestic revenue mobilization and public finance management:** To enhance domestic revenue mobilization and management, the authorities should (a) fully implement the bauxite reference price regulation, including recovery of any residual taxes owed each year by bauxite companies that apply unauthorized bauxite transfer prices that deviate from the reference price; (b) pursue recovery of the shortfall in tax payments due, as indicated in the audit of the large enterprises' 2021 financial statements; (c) undertake audits of the 2022 and 2023 financial statements of the large enterprises, and also the 2024 financial statements when available, to identify and recover any shortfalls in tax payments due and to encourage companies to have better financial reporting practices; (d) expand the capability of digital tax registration, tax declarations and payments; and (e) with Simandou exports anticipated to start by end-2025, accelerate reflection on mechanisms to assess and monitor fiscal payment obligations of the companies.
- **Macro-fiscal stability and debt sustainability:** Prudent macroeconomic should continue to be pursued, with pursuit of annual fiscal surplus and monetary policies that target reductions in inflation. In addition, contingent on significantly increased mining revenues, and to expand capability to foster macro-fiscal stability in the face of potential commodity price shocks, the authorities could create a stabilization account at the central bank with clear fiscal rules for allocating the funds for investments and/or countercyclical investment spending when needed. In addition, to preserve medium-term debt sustainability, the authorities would best (a) maximize the concessionality of new debt; (b) strengthen debt management capacity by implementing crucial reforms from the 2024 organizational audit of the debt management agency,¹² such as the adoption of a regulation on information sharing between institutions involved in debt management, that specifies the type of data to be transmitted, the timeline and method of transmission; and (c) enhance public investment management by adopting a decree that formalizes an improved public investment management process, covering all phases from the selection of investment projects to the evaluation of project execution.
- **Expand access to infrastructure services.** For electricity and water, an important first step is to enhance the financial viability of the sectors by ensuring that cost-recovery schedule of tariffs (including a low social tariff for the poor and vulnerable) are charged which will allow for increased investment, and subsequently increased

12. Debt management agency organizational audit. <https://mefp.gov.gn/wp-content/uploads/2024/04/DOC-20231226-WA0000.pdf>

quality of services, and will free up fiscal space through lower or minimal subsidies. To improve the quality and quantity of the road network, especially in a context of increasing infrastructure investment, the authorities should rationalize the mandates of key sector institutions, notably, by consolidating the Observatoire Nationale des Routes into the Agence des Routes (AGEROUTE) as quickly as feasible; by updating the mandate of the Road maintenance fund (FER) to enable it to generate resources, for example through tolls; and by opting to increase the portion of fuel levy that the government currently allocates to the FER.

- **Expand human capital:** Improve spending prioritization and use part of the savings from reduced energy and water subsidies to increase investments in education (especially for girls), health and social protection. The authorities could also strengthen the unified social registry data management and procedures for social program access, by adopting a revised decree for the Unified Social Registry (USR()) that specifies the USR's key principles on (i) the generation and the use of a unique identification number; (ii) first time registration of households in the URS database; (iii) periodic updates of socio-economic household data; (iv) interoperability with other household databases; and (v) data sharing with social programs.
- **Climate Proofing Guinea's Economy.** With the increasingly substantial impact of climate change on natural, physical, and human capital, Guinea must link its efforts to structurally transform and diversify its economy to the impact of and capacity to adapt to climate change.¹³ Chapter two provides an analysis, focused on agriculture as an example, of how the Guinean Government could foster growth that is inclusive, more resilient to climate change risks, while also contributing less to climate change.

13. The upcoming (2025) Country Climate and Development Report for Guinea will support these efforts by helping identify how Guinea can prioritize the most impactful actions that can reduce greenhouse gas emissions and boost adaptation, while delivering on its broader development goals.

Chapter II.

THE IMPORTANCE OF AGRICULTURE FOR STRUCTURAL TRANSFORMATION AND CLIMATE PROOFING GUINEA'S ECONOMY

2.1. Natural resource management is central to guinea's long-term development

26. **Guinea has abundant natural resources, a growing population, and privileged geographic location, with significant untapped potential for inclusive wealth creation yet high vulnerability to climate change.** Guinea has about a third of the world's known bauxite reserves (7 to 8 billion tons), the world's largest untapped iron ore deposits (estimated at 4 billion tons), significant reserves of gold (estimated 700 million tons), diamonds (30 to 40 million carats) and other minerals. Guinea's hydropower potential is estimated at 6,000 MW, only a third of which exploited so far,¹⁴ which would enable exports to the subregion through interconnection with the West African Power Pool in addition to fully meeting domestic electricity needs.¹⁵ Abundant rainfall provides excellent agro-climatic conditions for cultivating an extensive range of agricultural products, yet a dearth of water management infrastructure exposes farmers to rainfall variability risks, while poor quality roads limit access to more lucrative markets. Climate change—notably rising temperatures and increased rainfall variability—negatively impact Guinea's wealth creation potential, amplifying the risks to sustainable growth and weakening resilience to climate-induced shocks.

27. **Management of natural resources can make or break Guinea's longer-term development aspirations.**

a. **To overcome Dutch Disease dynamics typical of extractives-led economic growth, and thereby enhance diversification prospects, mining revenues and macroeconomic trends need to be carefully managed.** As a mining-dependent economy, Guinea's development prospects are closely linked to its ability to leverage the mining boom for broader non-mining sector growth and sustainable development. Yet as with other countries experiencing extractives-led growth, Guinea's mining boom, due to bauxite, gold, and soon iron exports, induces Dutch-disease dynamics that, unaddressed, erodes competitiveness of non-mining sectors capable of creating jobs, and hampers inclusivity of growth. There is substantial empirical evidence that resource rich countries that save their earnings from extractives and allocate them to productivity-enhancing expenditures

14. Including the recently installed large hydropower operations at Kaleta for 240 MW and Souapati for 450 MW.

15. Increased electricity access, and energy exports, depend on completing installation of high voltage transmission lines and end-user connection infrastructure.

are best positioned to avoid Dutch disease dynamics and enable a more inclusive and sustainable economic growth trajectory.¹⁶ While addressing Dutch-disease-related macroeconomic trends is necessary to rollback losses in competitiveness faced by the non-mining sector, it is not sufficient in and of itself for fully enabling diversification. Complementary microeconomic and structural reforms would be beneficial.¹⁷

- b. When linking climate change and growth from the Changing Wealth of Nations¹⁸ lens, effective resource management emerges as vital for enabling inclusive and sustainable growth.** Notably, higher government savings helps widen the fiscal space to replenish the loss in wealth stemming from depletion of natural resources and depreciation of physical assets, to preserve Guinea’s medium- and long-term wealth-generating capacity. Increased savings fosters resilience via mechanisms to mitigate the impact of macroeconomic shocks¹⁹ and funding of reforms to restore the competitiveness losses non-mining sectors face due to Dutch disease dynamics.²⁰ Actions to mitigate climate damages²¹ will also be critical for enabling increases in national savings.
- c. Agriculture²² can play a key role as springboard for structural transformation but needs climate proofing.** This chapter presents agriculture as a cornerstone for Guinea’s climate resilient structural transformation, as it is both the highest sector contributor to green-house gas emissions and holds the largest potential for job creation and diversification. Efforts to structurally transform and diversify, starting from raising productivity in agriculture, will be intrinsically linked to the impact of and capacity to adapt to climate change. Given the early stage of more comprehensive analysis for the Guinea Climate Change Development Report (CCDR), the focus would lay out Guinea’s emerging programs for achieving its climate commitments (the Nationally Determined Contributions) and discuss specific adaptation/mitigation measures as well as initial cost estimates. More precisely, how can the Government foster agriculture growth that is inclusive, more resilient to climate change risks, while contributing itself less to climate change. The first section discusses the role of agriculture as the main climate change driver in Guinea and its potential for enabling inclusive growth. The second section discusses policy priorities under Guinea’s NDC program. The last section concludes and offers some preliminary recommendations.

16. Atkinson and Hamilton (2003); Larsen, E. R. (2006).

17. The 2020 Country Private Sector Diagnostic (CPSD) for Guinea (“Creating Markets in Guinea”) contains extensive discussion of the potential to create synergies between mining and non-mining sectors, including agriculture and agri-business. The CPSD also identifies cross cutting constraints to growth and private sector development such as weaknesses in the commercial justice system, with land and property rights, and weak public financial management. A follow on report in 2023—“The Elusive Quest for Jobs and Economic Transformation: How Guinea Can Leverage Trade and Investment for More Inclusive Growth”—builds on the CPSD with emphasis on assessing the drivers of competitiveness of the Guinean economy to inform the national policy agenda on jobs and economic transformation.

18. The Changing Wealth of Nations (CWON) framework assesses sustainability of growth currently and going forward, through the lens of a country’s wealth balance sheet comprising its natural resources in addition to physical and human capital. A key CWON objective for sustainability of growth in resource rich countries is to ensure evolution of the sources of wealth from non-renewable natural capital toward renewal resources and higher quality physical and human capital. (World Bank, 2021. <https://openknowledge.worldbank.org/server/api/core/bitstreams/c0debd7c-e47a-5213-9959-64659494f791/content>)

19. These would best be backstopped by continued prudent fiscal management, and fiscal reforms to expand revenue mobilization and to improve efficiency and transparency of revenue management, as discussed in chapter 1.

20. Reforms include policies and actions to boost productivity growth, via: (i) expanding access to electricity, quality road networks and digital services (telecommunications and internet access) at more affordable costs, to lower household and business costs; (ii) human capital development (health, education, social protection); and (iii) fostering transformation of agriculture from subsistence to market-oriented production. (Guinea CEM.)

21. Mitigation measures include reducing forest-based energy usage by households and fostering use of lower-carbon agriculture practices. For mining sector, measures include commitments by the Guinean government to induce mitigation of GHG emissions, including deploying a competitive carbon pricing mechanism focusing initially on bauxite and iron ore. This would send a positive signal to external pressures such as the EU’s CBAM and others that Guinea’s mining industry is taking requisite actions to address its GHG emissions.

22. In this report, “agriculture” comprises crop production, livestock, and fisheries.

2.2. Agriculture is central for addressing climate risks and inclusive growth²³

28. Agriculture holds enormous potential for inclusive growth, while being central to climate proofing Guinea's economy. Agriculture (including livestock and aquaculture) contributes 27.8 percent to national GDP and employs 53 percent of the population. The sector is also critical for food security, and poverty reduction particularly in the rural areas. Key climate change variables—rising temperatures, decreased rainfall, increased rainfall variability and rise in sea levels—directly impact productivity of agriculture (inclusive of livestock and fisheries) and livelihoods of most Guineans. At the same time, Guinea's overall emissions are low, less than 0.01 percent of global emission in 2019, however, they are generated primarily from agriculture, livestock, and aquaculture (52 percent) and land use and forestry (30 percent)²⁴ (Figure 14). Agriculture is also the largest contributor to methane and nitrous oxide emissions,²⁵ hence opening opportunities to boost agriculture productivity while avoiding carbon lock-in and mitigating sector externalities.

29. The latest model (CMIP 5 model)²⁶ developed by the Inter-Governmental Panel on Climate Change (IPCC) finds that Guinea will experience large changes in average temperature, rainfall, and sea level rise, with significant impact on agriculture. According to different emission scenarios from the 5th IPCC report, the average annual temperature increase will be between 1.1 and 3°C by 2060, and between 1.6 and 5.3°C by 2090 (Figure 15 left graph). Periods of high heat will be more intense in the northern and northwestern areas of the country, regardless of the emissions scenario. Average annual rainfall would fall, especially in northwest and northeast Guinea, comprising a delayed rainy season that is shorter and more intense (Figure 15 right graph). More frequent intense storms would heighten the risk of flooding and landslides, particularly in Guinea's Forest region, impacting agriculture productivity, market accessibility, hydrogeneration capacity, road asset quality. Sea level is projected to rise about 80 cm by 2100, inundating coastal marshlands and communities. These temperature and precipitation risks – exacerbated by deforestation and land degradation – are expected to worsen as the effects of global climate change accelerate.

30. Without appropriate measures, agricultural productivity could decline over the long term, by as much as 25 percent, negatively impacting inclusive growth and food security.²⁷ A recent study on West African countries attributes approximately 40 percent of the variation in cropland productivity to the combined effect of rainfall, land surface temperature and solar radiation,²⁸ suggesting large benefits to productivity growth if climate change risks are reduced. The Guinea CCDR analysis will provide estimates of the cost of climate change and the cost of inaction. Meanwhile a recent World Wildlife Fund study determined that the estimated cost of inaction for Guinea in the range of US\$1.91 billion and US\$4.37 billion (depending on assumptions related to discount rates) by 2050. In terms of GDP, the estimated potential losses for Guinea range from 8 percent to 19 percent of Guinea's GDP in 2023.

23. This section benefitted from upstream contributions by Mariama Altine Mahamane (Senior Agriculture Economist, SAWA4) and Jeanne Coulibaly Y epse Oyolola (Senior Agriculture Economist, SAWA4) to the Guinea CCDR activity under preparation for early 2025. Analysis and recommendations will be updated as needed upon finalization of the CCDR.

24. The remainder of emissions are generated from waste, manufacturing (including construction), transport and industry.

25. Fourteen percent of greenhouse gas emissions came from carbon dioxide (CO₂), 57.4 percent from methane (CH₄), and 23.5 percent from nitrous oxide (N₂O).

26. Guinea's NDC, 2021. Climate projection data is modeled data from the global climate model compilations of the Coupled Model Inter-comparison Projects (CMIPs), overseen by the World Climate Research Program. Guinea's NDC report is based on CMIP5 derived from the Fifth phase of the CMIPs, which form the data foundation of the IPCC Assessment Reports. Data is presented at a 0.25° x 0.25° (25km x 25km) resolution.

27. Republic of Guinea 2015.

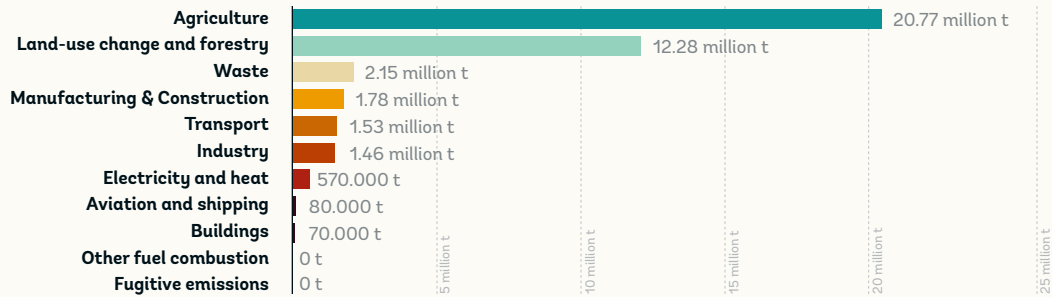
28. Mechiche-Alami, A. and Abdi, A.M. 2020.

Figure 14: Agriculture is by far the largest Greenhouse gas emitter in Guinea (2019)

Greenhouse gas emissions by sector, Guinea, 2019

Emissions are measured in carbon dioxide equivalents (CO₂eq).

This means non-CO₂ gases are weighted by the amount of warming they cause over a 100-year timescale.



Source: Our World in Data based on a Climate Analysis Indicators Tool (CAIT)

Note: Greenhouse gases are weighted by their global warming potential value (GWP100). GWP100 measures the relative warming impact of one molecule of a greenhouse gas, relative to carbon dioxide, over 100 years.

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

31. Guinea's agriculture must transform from subsistence activities and extensive modes of production, to intensive, productivity driven practices to boost competitiveness, climate resilience and food security. Subsistence characterizes around 90 percent of agricultural activities, with the remaining 10 percent being commercially oriented production. And despite the potential (e.g., for rice²⁹) there are virtually no cash crops. Subsistence farming persists, sustained by low access to public infrastructure such as roads that limit connectivity of producers to larger more lucrative markets, whether domestic or external. Productivity of subsistence farming is low and productivity growth languished (Figure 16), in view of insufficient mechanization and limited access to quality inputs (seeds, fertilizer), water management practices, or extension services, among other constraints.^{30,31} Low connectivity to markets is a factor driving higher inflation, in part due to resulting higher food costs in consumption baskets,³² that Guinea experiences relative to its neighbors and that hamper faster reductions in

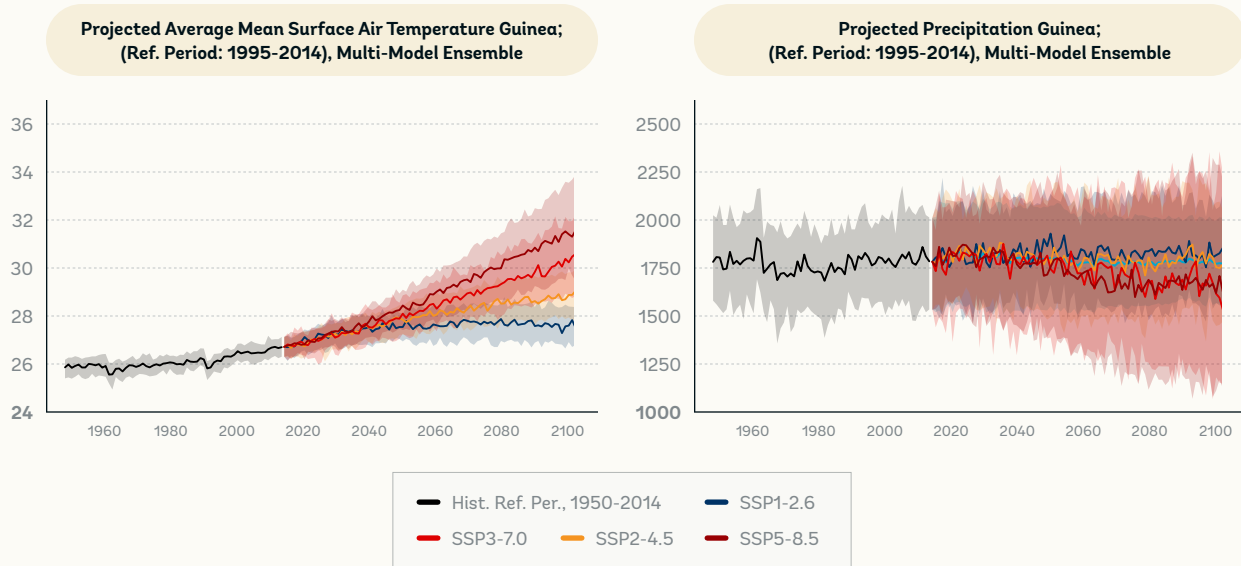
29. Although rice is a dietary staple and households prefer the local rice variety, the latter faces strong competition from lower-priced imported rice due partly to weak market connectivity of domestic producers and to Dutch disease dynamics.

30. Insufficient and low-quality roads in Guinea translate into 33% of farmers being more than two hours from nearest urban area. Lack of rural access to the lower-cost electricity grid that can ensure cold storage facilities and sustain agro-processing operations, limits value addition in the sector—post-harvest losses are estimated at: 10% for rice; 15-20% for maize; 20-45% for roots and tubers; 30-60% for fruits and vegetables.

31. Guinea's extension services and associated agriculture research and development have not been meeting the sector needs in at least the last decade (World Bank, Guinea Policy Notes FY22). They have limited reach and capacity, and knowledge not fully adapted to local sector conditions. Sector R&D spending declined during 2012-16 and is much lower than in comparator countries (0.3 percent of GDP versus 2 percent in Sierra Leone and 3 percent in Senegal).

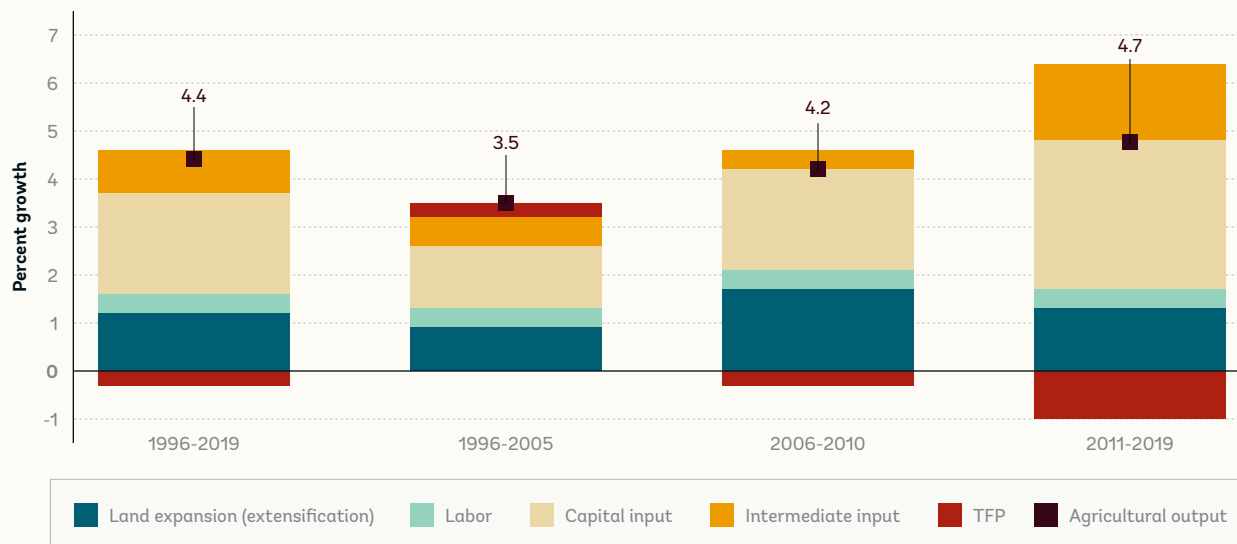
32. Interestingly, Guinea's inflation data through August 2023 reflects a CPI series based solely on prices in Conakry, the capital. It uses an outdated consumption basket from 2002 and appears to report higher inflation than is reflective of the country average. The national statistics office introduced a new CPI index in August 2022 that has national coverage and an updated base year (2019 instead of 2002), that shows slightly lower inflation for Conakry (though an annualized inflation nationwide based on the new index is only available from August 2022). Nonetheless the narrative of appreciating REER remains. Compared to the previous CPI, the new index uses the same methodology as countries of the West Africa Economic and Monetary Union (WAEMU), takes 2019 as base year (instead of 2002), and has national coverage as well as indexes for each of the 8 regions of the country (instead of only Conakry).

Figure 15: Climate change, already present in Guinea, is bound to accelerate (variables across a range of SSP-RCPs)



Source: <https://climateknowledgeportal.worldbank.org/country/guinea/climate-data-projections>. Indicators are presented as multi-model ensemble, which represent the range and distribution of the most plausible projected outcomes of change in the climate system for a selected SSP. Individual models will be made available soon.

Figure 16: Agricultural growth has been sustained by land extension and capital accumulation (i.e., machinery and livestock), while agriculture productivity (TFP) growth languished



Source: USDA data and World Bank staff calculations.

poverty.³³ Dutch-disease dynamics that also make imported food more attractive than domestic produce, further hinder investments needed for more productive agriculture and agro-processing sectors.

32. Important trade-offs between productivity enhancing practices and climate impact exist. Without a shift toward intensive production systems, Guinea's agriculture productivity growth and crop yields will remain among the lowest in the sub-region (Figure 17), with crops yields remaining below Guinea's historical average (Figure 18). Intensive practices can have the advantage of increasing resilience of agriculture to climate shocks, yet they may increase the carbon (and methane) footprint. However, there are also synergies to be had. Intensification may help avoiding deforestation, mitigating climate change, while other potential off sets may exist in other sectors. This would include reforestation and forest management to expand vegetation coverage to absorb more carbon from the atmosphere.

Figure 17: Guinea's agricultural TFP growth lags that of SSA and comparator countries

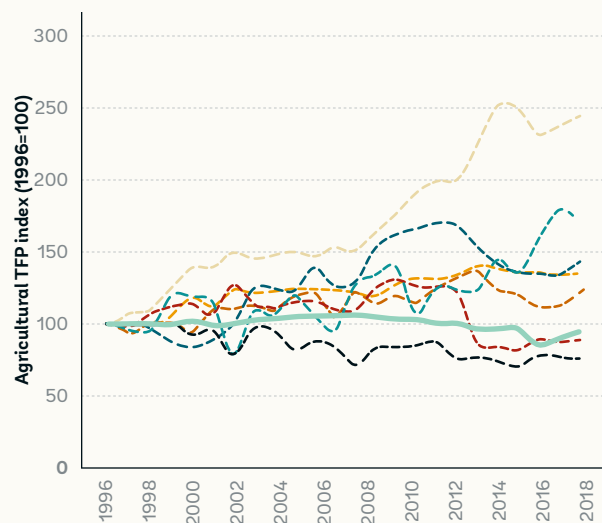
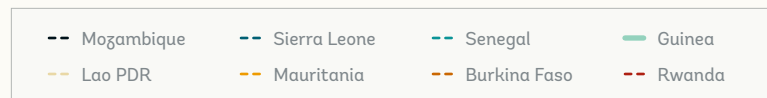
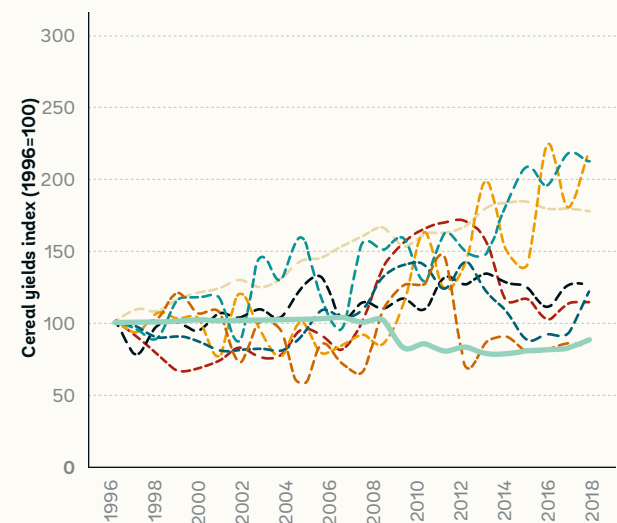


Figure 18: Guinea's cereal yields, already relatively low, declined to new lows in 2010 and remain below the historical average



Source: USDA data and World Bank staff calculations.

33. Guinea poverty assessment (2021) attributed weak poverty reduction in Guinea (largely a rural phenomenon) to low human capital, constraints to rural income growth, and high vulnerability to poverty. With low incomes and outputs vulnerable to shocks (due for example to weather, disease outbreaks, external wars), rural citizens remain in a poverty trap.

33. Climate proofing agriculture has already begun, but important challenges remain, notably on water management. Recent yield increases stemming from improved provision of inputs to producers, reflect reversal of past declines (Figure 19) and improved provision of inputs and fertilizer (Figure 20). Lower dependence on rainfall due to adoption of water management practices and technologies would, all else being equal, help stabilize agriculture output and reduce production risks. Yet in Guinea, limited irrigation infrastructure and water management practices keep the sector dependent on variable rainfall, able to have only one crop season a year—irrigation in Guinea covers only 18 percent of cultivated land, compared to 29 percent in Senegal, 42 percent in Cote d’Ivoire and 89 percent in Morocco. Furthermore, less than 1 percent of Guinea’s household farm plots are irrigated.³⁴ Reducing Guinea’s agriculture risks, such as through water management and other mechanisms (for example, crop or weather insurance), would encourage sector investment and value addition through improved storage and processing of produce that could spur development of agri-businesses.

Figure 19: Cereal yields, which declined precipitously in 2010, are starting to recover as fertilizer distribution improves, yet remain below historical levels

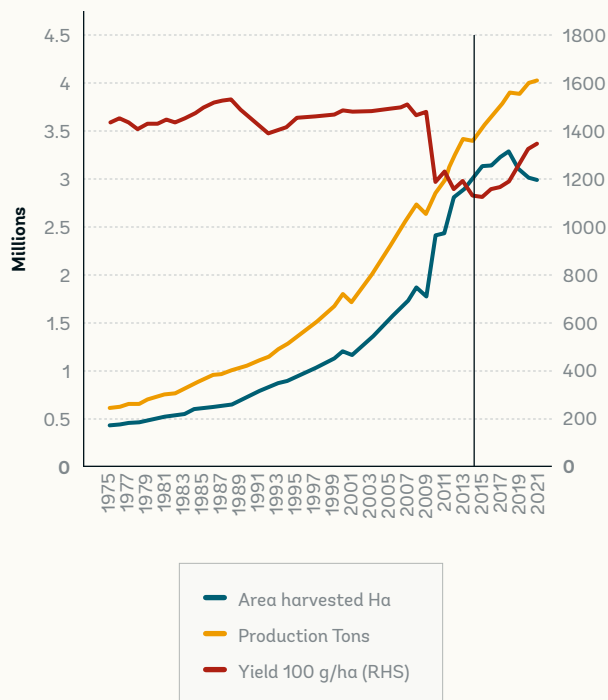
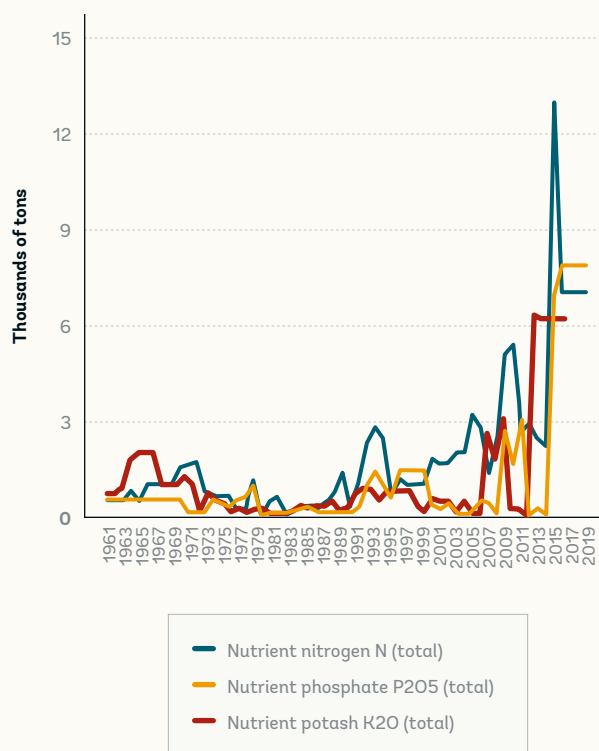


Figure 20: Increased provision of fertilizer after 2016, helped reverse the decline in cereal yields



Source: FAOSTAT data and World Bank staff calculations.

34. Household Survey EHCVM 2018/19.

2.3. The national climate action plan provides a first framework to prioritize, but key questions on financing remain open

34. **Guinea published its Nationally Determined Contribution (NDC)³⁵ in 2021 and has started to establish the building blocks for participating in climate and carbon finance.** A total budget of US\$13.8 billion is indicated as being needed until 2030 to achieve its emissions reductions targets (9.7% vs. 15.8% reduction of its emissions in 2030 compared to the trend scenario) for the unconditional and conditional scenarios, respectively.³⁶ Guinea is the 24th most vulnerable country and the 148th most ready country according to the Notre Dame Global Adaptation Initiative (ND-GAIN) Country Index ranking further stressing the importance of adaptation.

- a. To achieve the country's objective of net-zero pathway by 2050, specific GHG net reduction targets (including carbon sequestration) for agriculture compared to the reference scenario will be set in 2024, consistent with expected growth of agriculture related emissions of 6 percent per year on average. Measures will include identifying sustainable, low-carbon practices for rice cultivation, management of livestock residues and savannah burning. Alternative carbon free pumping systems (electricity, solar and wind energy) will supplant land and carbon-intensive practices currently in place in most rural locales.
- b. The priority actions that Guinea has identified for adaptation are:
 - development and implementation of a National Water Policy (PNE) action plan;
 - design and enforce measures to protect, conserve and manage ecosystems;
 - strengthen the coastal zone's resilience; and
 - supporting rural communities to adapt to climate impacts, by developing agro-sylvo-pastoral techniques that allow for these economic activities to continue while preserving the resources on which they rely.

35. **To effectively translate Guinea's abundant natural resources into 'capital' inputs for growth, they will have to be sustainably managed.** Many current policies and practices are, over the long-term, undermining sustainable and productive use of natural resources for the Guinean economy and its people. For example, ecosystem services provided by forests declined from 15 per cent of natural capital to 9 percent in 2018, while those provided by croplands decreased from 34 per cent to 12 per cent over the same time.³⁷ Impacts are often regressive, affecting particularly the poor and particularly women.³⁸ Climate change will exacerbate this situation and potentially prevent any net development gains. Hence, climate impacts need to be addressed expeditiously to build overall resilience and protect the most vulnerable in Guinean society.

35. Republic of Guinea, 2021.

36. The Republic of Guinea has assessed two scenarios in addition to a business-as-usual baseline. Scenario 1 assesses an unconditional target (CDN) at 2,056 ktCO₂eq/year, i.e., a 9.7 percent reduction in emissions by 2030 compared with the trend scenario, i.e., emissions growth of 5 percent per year over the period 2020-2030. Scenario 2 assesses a conditional target (CDN+) is set at 3929 ktCO₂ eq/year, or 17.0 percent compared with the trend scenario, i.e., emissions growth of 4 percent per year over the period 2020-2030. (Republic of Guinea, 2021). The overall CDN targets reflect targets for sectors of energy (electricity), transport, mining, waste management, as well as for programs targeting biocombustibles, deforestation reduction and forest restoration.

37. Guinea Policy Notes to Support the Transition, Chapter 5, Macroeconomics, Trade and Investment Global Practice, January 2022

38. This is because rural areas, where 82 percent of the poor reside, have higher poverty rates and experienced larger poverty reductions compared to urban areas, yet rural vulnerabilities to shocks (climate, economic, pandemics) persist. (Guinea Poverty Assessment, 2022).

36. **Guinea is quantifying land use change through detailed land-mapping and a national forest-monitoring system with the potential for enhancing ecosystem services, biodiversity, and carbon trading.** Through NASA satellite imagery and analysis,³⁹ data exists from 2014 to-date on land use change. Land-use change is mapped to the level of communes, and this detailed analysis has enabled the Government of Guinea to revise its National Park and protected areas accordingly. Guinea also plans to develop its adaptation capacity, in addition to exploring a carbon pricing initiative for the mining sector. Regarding carbon trading, the objective is to set up a mechanism that establishes a carbon price to meet the mitigation commitments made by Guinea in its NDC; to meet the competitiveness concerns of importing countries (such as those that may be imposed by the European Union's Carbon Border Adjustment Mechanism (CBAM)); and to strengthen environmental, social and governance (ESG) aspects.

37. **The NDC is yet to specify how resources would be mobilized and allocated or how damages per sector are estimated.** Yet in Guinea's NDC Investment and Partnership Plan, published subsequent to the 2021 NDC to mobilize financing from external partners and the private sector, a preliminary minimum budget of US\$1 billion is indicated, leaving a financing gap of around US\$11.6 billion.⁴⁰ Key focus areas are to (i) effectively implement the National Water Policy, (ii) put in place necessary measures to protect, conserve and manage ecosystems, revitalize economic activities and strengthen the resilience of the populations of its coastal zone, and (iii) support the adaptation efforts of rural communities to develop agro-sylvopastoral techniques that enable them to pursue their activities while preserving the resources on which they rely. The ongoing CCDD to provide a more comprehensive estimates of climate impacts, cost, and financing. In any case, substantial mitigation efforts are planned, notably on the forestry and power sectors.

2.4. Towards sustainable management of natural resources: conclusions and directions

38. **Guinea has substantial natural capital and faces the challenge of how to leverage its booming non-renewable mining assets to better manage its renewable natural capital.** While preparation of the Guinea CCDD analysis is underway, with results expected by end 2024, this brief focus chapter has emphasized agriculture as central to productivity growth and structural transformation to foster inclusive growth, while also holding great potential for climate change mitigation.

39. **The following key recommendations emerge to respond to climate change:**

- **Prioritize policy reforms and investments in the most vulnerable sectors, namely agriculture, forestry, transport, trade, and industry.** This includes the scale-up of climate change resilient gender-sensitive technologies throughout the value chain (public and private sectors) that are essential for enhancing investment along the agricultural, livestock, land management and restoration value chain. (Short term measure)

39. <https://mangrovescience.earthengine.app/view/guinea-lcluc-explorer>

40. The cost estimate relied on documentation from projects already implemented or planned in Guinea. Another study, which uses a 'bottom up' approach that links temperature rise, vulnerable zones and socio-economic (GDP per capita) data estimates total adaptation costs of between US\$713 million and US\$1.9 billion by 2030, depending on the rate of climate change and discount rate. Global Futures: Assessing the global economic impacts of environmental change to support policy-making – WWF, 2020.

- **Rethink agricultural input subsidies** (mainly water and fertilizer use) to support the adoption of climate-resilient agricultural production practices and approaches to reduce post-harvest losses. Promote nature-based solutions comprising soil health and fertility management, and sustainable forestry practices such as reforestation and afforestation; and increase public spending on irrigation infrastructure, on agricultural research and extension, on protecting vulnerable assets and reducing disaster risk. (Short term measure)
- **Rehabilitate and upgrade and make irrigation infrastructure and make it more resilient** to climate change to reduce system losses and expand irrigation infrastructure. Rainfed agriculture is highly vulnerable to droughts and increasingly unreliable precipitation, and floods and salinization can create problems for irrigation systems. Along with making irrigation systems more climate-resilient, it is important to establish last-mile connections between irrigation infrastructure and low-income farmers' land, and to provide some irrigation for vulnerable rainfed smallholders. (Short to medium term measure)
- **Invest in water mobilization infrastructure** including hydraulic, irrigation and drainage work at communal level (e.g., installation of irrigation, drainage and flood control systems, and development of individual water storage systems). (Short to medium term and ongoing)
- **Establish mechanisms to facilitate transforming agriculture and food systems from subsistence to market oriented**, while moving towards food security, as an urgent priority. Preserving forests and natural capital in general is a key aspect of this transition. This means that agriculture growth must avoid further encroachment into uncultivated lands, instead must emphasize approaches for increasing agriculture productivity. This would involve public and private sectors and strengthening of agriculture research and development and extension services. (Short to medium term)
- **Investing in sustainable forestry practices**, such as reforestation and afforestation, can help reduce encroachment of agriculture on the forest and enable absorption of carbon from the atmosphere to trees and other vegetation. (Short to medium term and ongoing)
- **Upgrade road and power assets to climate-resilient design standards**. This will incorporate design elements to maximize climate co-benefits, including efficient waste management and the systematic use of materials and designs that are climate-resilient and energy-efficient (and/or that use renewable energy). (Medium to long term)

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