UGANDA ADJUSTED MACROECONOMIC INDICATORS REPORT, 2024 EDITION

Ministry of Finance, Planning and Economic Development

Macroeconomic Policy Department

https://mepd.finance.go.ug

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List of Abbreviations

ANNI	Adjusted Net National Income
ANS	Adjusted Net Savings
BOP	Balance of Payments
CFC	Consumption of Fixed Capital
CO_2	Carbon-dioxide
CWON	Changing Wealth of Nations
CY	Calendar Year
DAS	Depletion Adjusted Savings
ESA	Education Satellite Accounts
FAO	Food and Agriculture Organisation of the United Nations
FRA	Forest Resources Assessment
FY	Financial Year
GDP	Gross Domestic Product
GFS	Government Finance Statistics
GNI	Gross National Income
GNS	Gross National Savings
GOU	Government of Uganda
MDA	Ministries, Departments and Agencies
MEMD	Ministry of Energy and Mineral Development
MOFPED	Ministry of Finance, Planning and Economic Development
NFA	National Forestry Authority
NNI	Net National Income
SEEA	System of Economic Environmental Accounts
UBOS	Uganda Bureau of Statistics
UGX/UShs	Ugandan Shillings
US$/USD	United States Dollars
WAVES	Wealth Accounting and Valuation of Ecosystem Services

Introduction

1. Overview

The Natural Capital Accounting (NCA) framework represents a significant advancement in the measurement of economic activity, aligning with global trends that seek to broaden traditional accounting methods. Conventional economic indicators, such as Gross Domestic Product (GDP) and the System of National Accounts (SNA), primarily measure income and output but fail to capture the full scope of economic activity's impact on natural resources and the environment. Specifically, they do not adequately account for:

1. The depletion of natural resources,
2. The costs associated with pollution, and
3. The long-term effects of environmental degradation.

This limitation creates a gap in economic assessments, as traditional accounting frameworks primarily focus on short-term income flows rather than providing a full balance sheet that reflects both assets and liabilities. As a result, they often overlook the broader concept of national wealth, which includes natural, human, and produced capital.

Just as a company's financial sustainability requires an analysis of both its income statement and balance sheet, the same principle applies to national economies. A more comprehensive approach to measuring wealth is essential to determine whether a country's economic growth is being achieved sustainably or is driven by the unsustainable depletion of its natural assets. The NCA framework addresses this gap by integrating natural capital into economic assessments, offering a more holistic view of long-term prosperity.

To address the limitations of traditional economic accounting, the System of Environmental-Economic Accounting (SEEA) was developed under the auspices of the United Nations Statistical Division (UNSD). The SEEA Central Framework is aligned with the System of National Accounts (SNA), which underpins GDP calculations and other economic indicators—while incorporating a broader range of environmental costs and benefits. This expanded approach enables the calculation of two key macroeconomic indicators:

1. Adjusted Net National Income (ANNI), and
2. Adjusted Net Savings (ANS).

These indicators provide a more comprehensive assessment of whether national income is generated sustainably, considering factors such as resource depletion and environmental degradation.

Alongside the development of the SEEA, the Changing Wealth of Nations (CWON) initiative, led by the World Bank, extended the SEEA framework by incorporating a national balance sheet approach to measure comprehensive wealth. In addition to traditional measures of produced capital and financial assets, CWON includes natural

capital assets (both renewable and non-renewable) and human capital[1]. By tracking these components, CWON provides a clearer picture of whether economic growth is depleting a country's wealth or sustaining it through reinvestment in other forms of capital. Information on **ANNI, ANS, and comprehensive wealth components** is critical for assessing the sustainability of economic growth. Specifically, these indicators help determine whether GDP is being driven by resource depletion and, if so, whether investments in other types of capital are sufficient to offset this loss.

This report presents the results of Uganda's adjusted macroeconomic indicators, highlighting key policy considerations for government planning and budgeting. The findings are based on a mix of domestic data sources and the World Bank ANS database estimates where gaps exist. As NCA is an ongoing exercise, many of these indicators are updated annually and should be reviewed alongside traditional economic measures to inform long-term and medium-term planning. Given that resource-based industrialisation is a central pillar of Uganda's National Development Plan, NCA metrics will be essential in monitoring the strategy's implementation and impact. Additionally, the development of some key indicators remains incomplete, requiring further data collection and refinement. For instance, oil and gas resources, which are critical to Uganda's economic trajectory, must be integrated into national wealth accounts as reliable data sources become available.

[1] The Adjusted Macroeconomic Indicators tools can be found in the World Bank's data catalogue.ANS:https://datacatalog.worldbank.org/dataset/adjusted-net-savings
Comprehensive wealth: https://datacatalog.worldbank.org/dataset/wealth-accounting

2. Introduction to the key SEEA Macroeconomic Indicators

The key macroeconomic and wealth indicators developed under the SEEA and Changing Wealth of Nations (CWON) are categorised as follows:

Adjusted Macroeconomic Indicators

1. Adjusted net national income
2. Adjusted net savings

Comprehensive wealth components (CWON)

1. Produced capital
2. Natural capital
3. Financial capital
4. Human capital

2.1 Adjusted Macroeconomic Measures

To address the limitations of traditional economic indicators in capturing the sustainability of growth, Adjusted Macroeconomic Indicators provide a more comprehensive assessment of national income and savings[2]. These indicators account for the depletion of natural resources and environmental costs, ensuring a more accurate reflection of long-term economic stability. They include:

2.1.1. Adjusted Net National Income (ANNI)

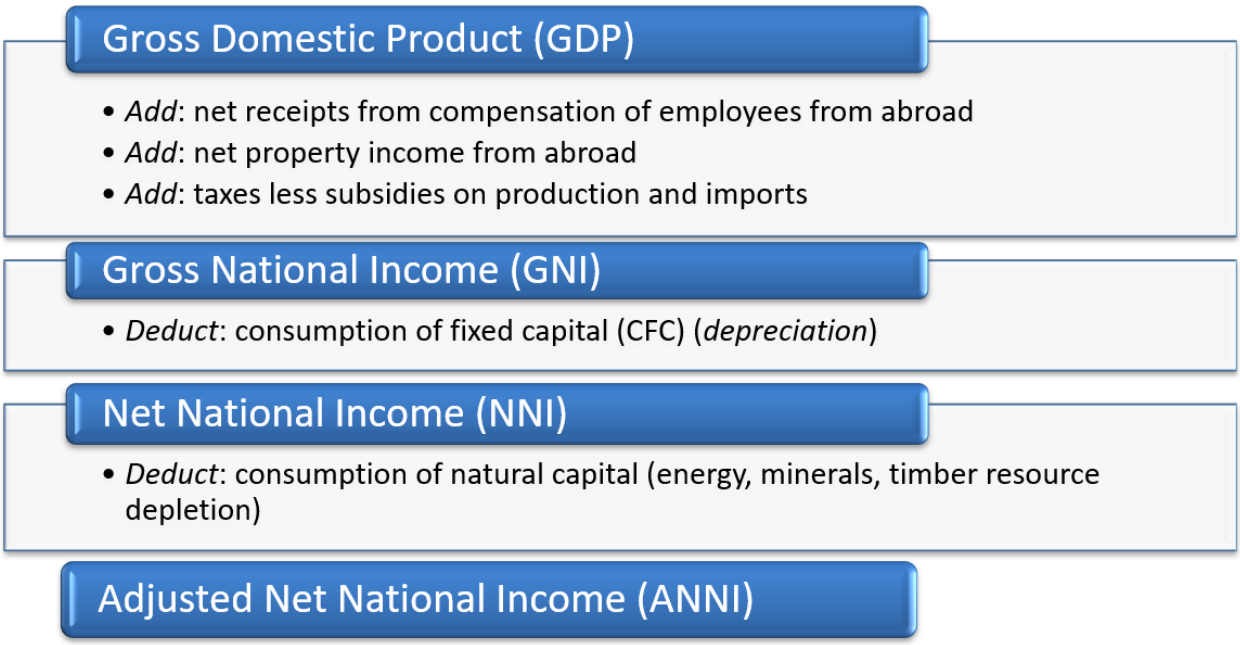
Conventional measures of Gross National Income (GNI) are adjusted by deducting the value of depleted assets, which includes produced capital (measured as the consumption of fixed capital) and natural capital (both renewable and non-renewable resources. *See* ***Figure 1***):

- The depletion of non-renewable resources (e.g., minerals and energy resources) is measured directly by the amount extracted during production.
- Depletion of renewable resources (e.g., forests, fisheries) is measured by the difference between the rate of extraction and the natural rate of regrowth. In principle, the consumption of renewable natural capital is sustainable if it does not exceed the rate at which the resource regenerates.

This adjustment provides a more accurate representation of a country's net income, ensuring that economic performance reflects the sustainability of its wealth.

[2] ANNI and ANS figures are published annually by the World Bank. They are included in the World Development Indicators database, along with the various components used in the calculations. However, it is useful to compile the indicators using local data as it is often more representative and relevant than the World Bank estimates.

Figure 1: Calculation of Adjusted Net National Income from GDP



2.1.2. Adjusted Net Savings (ANS)

Conventional measures of Gross National Savings (GNS, *See* ***Figure 2***) are adjusted to add the value of investments in human capital while deducting the depletion of produced and natural capital, and the costs of pollution damage to provide a more comprehensive assessment of a country's true savings and wealth preservation.

To account for the value of human capital, a proxy is used based on recurrent government spending on education, and where possible, private sector spending is also included. Only recurrent spending is considered, as investment in education is already reflected in the measure of produced capital stock. Due to data availability and the need for consistency across countries, the World Bank ANS calculation relies solely on government education expenditure data. However, we have also made efforts to include other sources of education funding in our analysis.

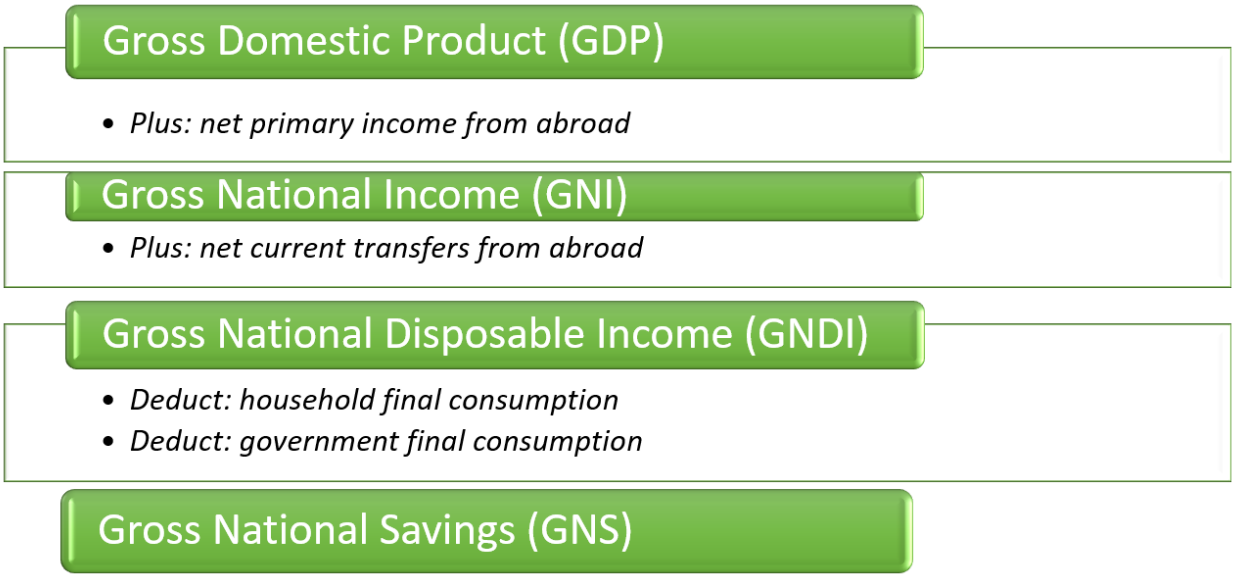
The calculation of pollution damage costs includes two critical components that reflect the economic costs of environmental degradation:

1. The value of CO2 emissions, which accounts for the long-term impact of carbon dioxide emissions on climate change and global warming.

2. The value of particulate matter ($PM^{2.5}$) emissions, which assesses the harmful effects of fine particulate pollutants on human health and the environment.[3]

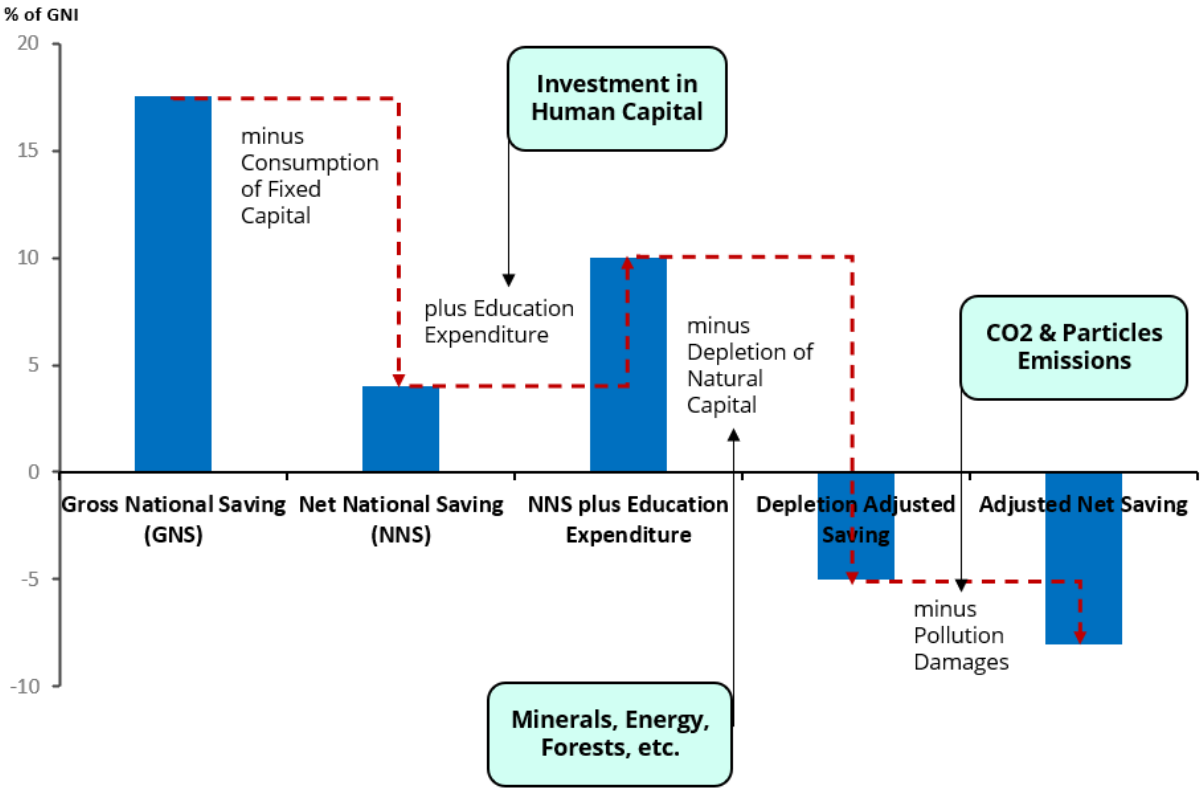
These components help quantify the economic burden of pollution, providing a clearer understanding of how environmental damage affects a country's wealth and sustainable development. By factoring in these costs, the ANS calculation offers a more comprehensive view of national savings, reflecting both economic activity and the toll of pollution on future generations *(See **Figure 3**)*. A negative figure for ANS indicates that wealth is being depleted and, therefore, that the pattern of economic activity is not sustainable.

Figure 2: Calculation of Gross National Savings from GDP



[3] Full details of the methodology can be found in: Estimating the World Bank's Adjusted Net Saving: Methods and Data, 2018 (https://datacatalog.worldbank.org/dataset/adjusted-net-savings)

Figure 3: Adjusted Net Saving (ANS) Visualisation from GNS



2.2 Comprehensive Wealth Measures (CWON)

The measures of comprehensive wealth encompass four main categories: produced capital, net financial assets, natural capital, and human capital. While the first two categories; produced capital and net financial assets, are well-established in conventional national accounts, the inclusion of natural capital and human capital represents a significant expansion of the traditional framework. These new additions provide a more holistic view of national wealth by capturing the value of a country's environmental and human resources, which are essential for long-term economic sustainability and development (*See* ***Figure 5***).

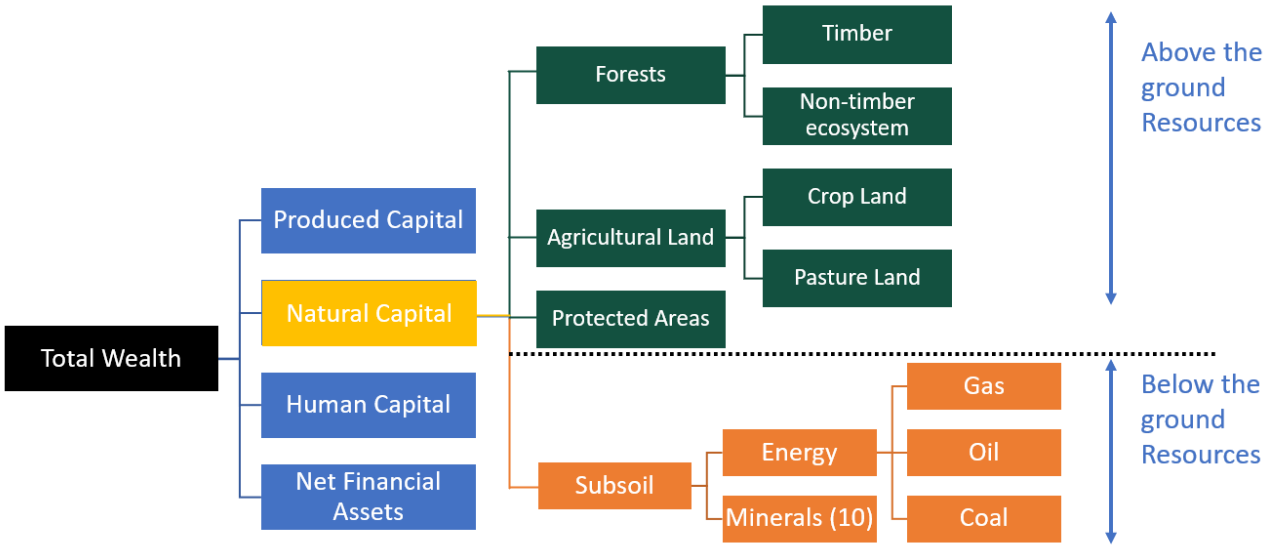
- **Produced capital (also known as capital stock)**: Refers to the physical assets used in production, such as buildings, machinery, and infrastructure. It is measured in national accounts by tracking gross fixed capital formation (GFCF), which represents new investments in capital, and consumption of fixed capital (CFC), which accounts for depreciation or wear and tear over time.
- **Net financial assets:** The balance of financial assets and liabilities with the rest of the world. It represents the difference between a country's financial assets (such as foreign investments and reserves) and its liabilities (such as debt owed

to other countries). This balance is recorded in the Balance of Payments (BOP) and is commonly known as the International Investment Position (IIP). It indicates whether a country is a net lender (owns more assets than liabilities) or a net borrower (owes more than it owns) in relation to the rest of the world.

- **Natural Capital**: Natural capital represents the stock of natural resources that provide economic and environmental benefits to a country. It is broadly categorized into subsoil resources and above-ground resources (*See* ***Figure 4***):

  - **Natural capital, subsoil resources:** This includes minerals and energy resources below the ground. Energy resources include coal, oil, and gas, while minerals include the ten major commodities mined globally: copper, nickel, tin, gold, bauxite, iron ore, phosphate, lead, silver, and zinc. These are all non-renewable.
  - **Natural capital, above-ground resources:** This is divided into several subcategories, including agricultural land, forests, and protected areas. Agricultural land is further subdivided into cropland and pastureland. Forest land is divided into two categories: timber and non-timber ecosystems.

Figure 4: Composition of Comprehensive Wealth [decomposing natural capital]

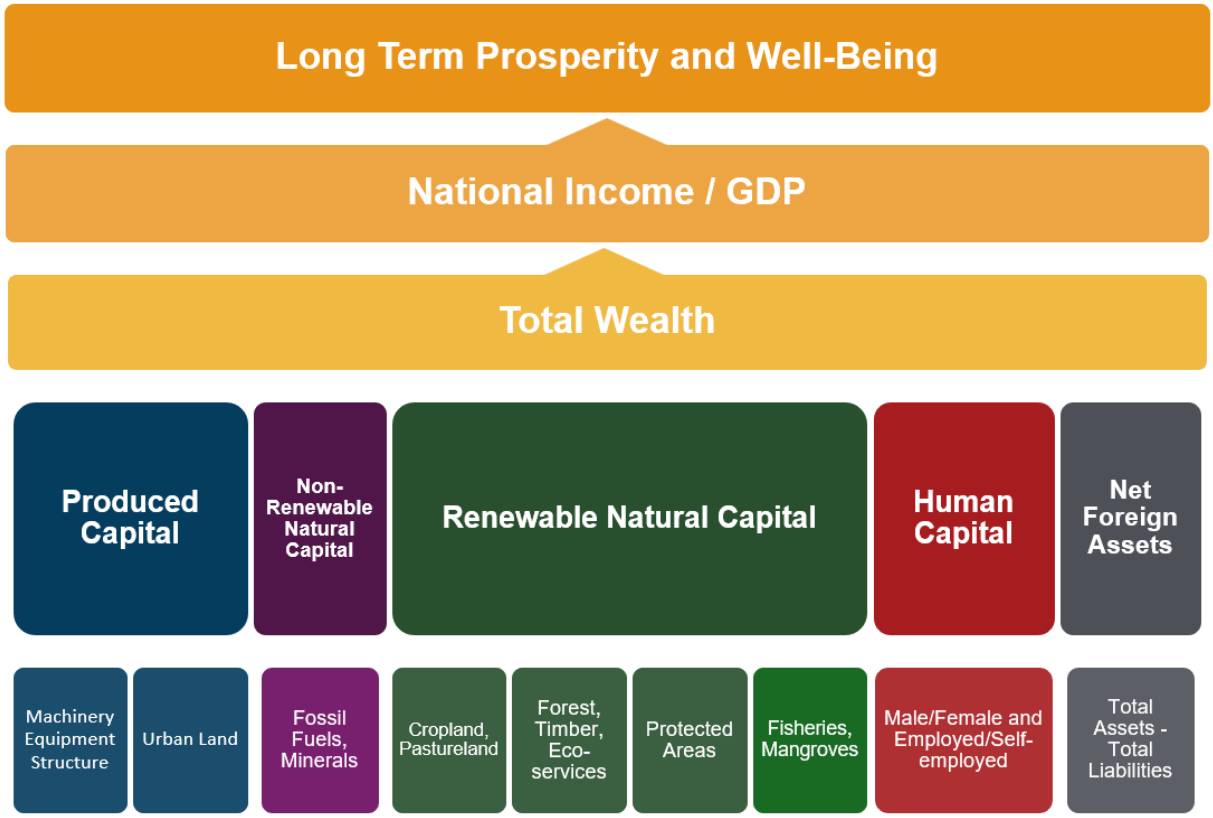


- **Human capital:** This is the value embodied in the education, training, and skills of the population, which is as important an input to the production of economic value as the produced capital stock conventionally measured.

Different methods are employed to value the various forms of capital. Net foreign assets are measured directly by the central bank as part of the Balance of Payments (BOP) statistics. Produced capital stock figures can be generated by the Perpetual Inventory Method, where the capital stock at the end of each year is simply the previous year's value plus additions (GFCF) less depletion (CFC) during the year. For natural resources,

all types of capital are valued as the net present value (NPV) of future flows of value generated, based on calculated or estimated rental rates.[4]

Figure 5: Schematic Representation of Total Wealth and its Relationship to GDP and Prosperity



Comprehensive Wealth can be used in several ways. First, the total wealth figure can be used to track whether a country is maintaining, building, or depleting wealth as it develops. Wealth should be measured as a percentage of GNI or per capita (in real terms) for such tracking. If real per capita wealth is being depleted, then the pattern of development may not be sustainable.

Second, the composition of wealth can be tracked. If some categories of natural capital are depleted, for instance, through mining or excessive consumption of renewable resources, then this needs to be matched by building other forms of capital. If mineral or energy resources are being extracted, the value of the depletion should be compensated by building up other assets, such as capital, human resources, or financial assets.

[4] https://datacatalog.worldbank.org/dataset/wealth-accounting

3. Methodology

Data Sources

Most of the data used is from the World Bank database, but where suitable local alternatives exist, they have been used for some variables that are components of ANS and ANNI, and updates are done annually. Replacing some World Bank data with Ugandan sources is beneficial. For example, Uganda's education expenditure includes significant non-government contributions, which the World Bank methodology does not capture. Including both private and public sources provides a more accurate picture. Similarly, the World Bank uses export prices for timber products, which do not reflect Uganda's internal market. Given the country's significant deforestation, domestic prices are more relevant.

This approach also facilitates future custom statistical calculations as more data inputs become available. This section outlines the adjustments made, challenges encountered, and potential improvements

Table 1: Data Used in the Report

Variable	***Source***
Gross National Income (GNI)	World Bank
Gross National Saving (GNS)	World Bank
Capital Stock	Uganda Bureau of Statistics (UBOS)
Capital Depreciation Rate	MOFPED
GDP Deflators	UBOS
Exchange Rate (UShs/US$)	Bank of Uganda (BOU)
Education Expenditure	UBOS and MOFPED
Timber Production by Type (m^3)	UBOS
Charcoal and Wood Fuel Prices	Uganda National Charcoal Survey, 2020[5]
Poles and Sawn Timber Prices	UBOS
Productive Forest Area	UBOS, Wood Asset and Forest Accounts
Energy Depletion	World Bank
Mineral Depletion	World Bank
Rental Rate (%)	World Bank
Annual Commercial Increment (m3/ha/yr)	World Bank
Baseline CO_2 Damage	World Bank
Total Forest Area	World Bank[6]
CO_2 Emissions per ha of Deforestation	Uganda's Forest Reference Emission Level report
Air Pollution Damage	World Bank

[5] MEMD (Ministry of Energy and Mineral Development). 2020 update, National Charcoal Survey for Uganda

[6] The data reported by the World Bank on total forest area is derived from the FAO Forest Resources Assessment (FRA), which is published every five years (most recently in 2020). The source of the Uganda data included in the FRA is from the NFA.

Net National Saving (NNS)

NNS is Gross National Saving (GNS) less Consumption of Fixed Capital (CFC). The logic is that the depreciation of assets is equivalent to dissaving. CFC numbers come from the macroeconomic modelling team within the Ministry of Finance, Planning and Economic Development (MOFPED). They are based on a depreciation of 5 percent of the year's capital stock, that is:

$$NNS = GNS - CFC$$

The World Bank data on which most of this modelling depends is in current US$ by calendar years (and with which comparisons will be made). Therefore, the modelling has been done in current US$ in calendar years. CFC numbers are in real Ugandan Shillings per financial year, so they were first converted into nominal terms, then into US$, and finally to calendar years.

NNS + Education Expenditures

Recurrent education expenditure is then added to NNS, as it represents an investment in human capital, an asset to the country, and should be counted positively. Only recurrent education expenditure is added, as any development expenditure (building schools, for example) is already captured in fixed capital investment, which is already reflected in the GNS calculation. Furthermore, education expenditure includes spending by the public sector (government), the private sector (households), and development partners. This was considered important for Uganda, where a large proportion of education spending comes from outside government and is thus not captured in World Bank data.

$$NNS + Education = NNS + Recurrent\ Education\ Expenditure$$

Education spending data is from two sources: the Education Satellite Accounts (ESAs), compiled by the Uganda Bureau of Statistics (UBOS), and Government Finance Statistics (GFSM2014).

Data from the Education Satellite Accounts was used for the period 2008/09 to 2013/14. The accounts provided comprehensive information on total education expenditures from all sources, including households, external contributions, and income generation. The report also detailed spending by recurrent and development components, which helped estimate the government's share of total education expenditures, averaging 31.4 percent over the period. The proportion of total education spending allocated to recurrent expenditures was estimated at 83.5 percent.

A log-log regression with a linear trend was used to assess the elasticity of private education spending relative to government education spending. The estimated elasticity of -0.1 suggests that a reduction in government education spending is partially offset by an increase in private spending, with up to 30 percent of the initial decrease being compensated, given that private spending is more than twice the size of government expenditure.

Data on education expenditure from Government Finance Statistics (GFSM 2014) was used to estimate total education expenditure. Government education expenditure data is available from 1997/98 to 2023/24. Using the ratios and elasticity estimates from the Education Satellite Accounts (ESAs), corresponding private spending was calculated as follows:

1. Since no clear trends were observed in the Education Satellite Accounts, the analysis assumes that the share of education spending between the government and private sector has remained stable over time. The government's share of total education spending is estimated at 31.4 percent, which means private spending makes up the remaining 68.6 percent. To estimate the total spending, the government's share is inverted, meaning total spending is approximately 3.187 times (or 318.7 percent) the government's spending, and private spending is about 218.7 percent of government spending. Using this ratio, total long-term education spending can be estimated based solely on government expenditure.
2. To account for long-term trends, the uplift was applied to a three-year moving average of government spending rather than to spending in a single year. This average includes the current period, one year prior, and one year ahead.
3. Additionally, private spending was adjusted for short-term changes in government spending using an elasticity of -0.1. This means that a decrease in government spending leads to a partial increase in private spending based on previous-period changes.

Estimated total education spending in the current period is thus the sum of three components:

1. Current period government spending.
2. The general level of private spending is computed as a 218.7 percent markup over the 3-year moving average of government spending, including one past and one future spending period.
3. The short-term private spending response to changes in government spending – calculated as the response of the level of private spending calculated in Step (2) to the percentage change in government spending from the previous period Step (1), using the estimated elasticity of -0.1. Table 2 provides a numerical example.

Table 2: Example of Education Spending Calculation

Step	Time	t-1	T	t+1
(1)	Current GOU spending	3.4	**4.2**	5.6
	3-Year Moving Average [= (3.4 + 4.2 + 5.6) / 3]	…	4.4	…
(2)	Estimated private spending (218.7% uplift) [-4.4 * 2.187]	…	**9.62**	…
	Log-difference of GOU Spending from t-1 to t [= ln(4.2/3.4)]	…	0.21	…
(3)	Estimated short-term private response [=9.62 * 0.21 * - 0.1]	…	**-0.20**	…
	Estimated total spending = (1) + (2) + (3) [=4.2 + 9.62 – 0.20]	…	**13.62**	…

This estimate was then converted to calendar years and added to NNS to give NNS + Education Expenditure.

Depletion Adjusted Savings

Depletion-adjusted Savings (DAS) are calculated as NNS plus education expenditures minus net natural capital depletion. The rationale behind this is that saving at the expense of depleting natural capital doesn't truly constitute saving. The methodology includes both renewable resources (such as forests) and non-renewable resources (such as energy and minerals).

$$DAS = NNS + Education - Net\ natural\ capital\ depletion$$

Net natural capital depletion is the sum of net forest depletion, energy depletion, and mineral depletion. Please refer to the annexes for more details on these components.

$$Net\ natural\ capital\ depletion = \begin{matrix} Net\ forest\ depletion \\ + \\ Energy\ depletion \\ + \\ Mineral\ depletion \end{matrix}$$

Net forest depletion plays a crucial role in valuing forest timber resources, a key component of natural capital accounting in Uganda. This valuation is approached through the lens of NCA-related macroeconomic indicators and the measurement of comprehensive wealth, as it is important for both:

1. In calculating ANS, NNS is adjusted to account for (inter alia) the depletion of renewable and non-renewable natural capital, including forest timber resources.
2. Natural capital includes the valuation of forest timber (as well as non-timber) capital in the calculation of comprehensive wealth.

The global ANS and CWON databases, produced by the World Bank, include the valuation of forest timber depletion and forest timber assets for Uganda. Many of the inputs used for these valuations are derived from global databases and regional values for reasons of consistency of data sourcing, definitions, and measurement across countries. However, it is often preferable to use domestic sources as much as possible for a more accurate valuation. This note describes the process of producing domestic valuations for forest timber depletion in Uganda. Net forest depletion is calculated as:

$$Net\ forest\ depletion = (Q - N)\pi$$

where:

- Q is the volume of timber harvested, measured in cubic meters,
- N is the annual volume of natural growth in production-oriented forest, (Q – N) therefore represents overharvest
- π is the unit rent per cubic meter, calculated using export unit values and a constant regional rental rate.

In the World Bank approach, timber is divided into three categories:

1. Wood fuel
2. Industrial round wood (coniferous)
3. Industrial round wood (non-coniferous)

Production and rental values are derived from export unit values for each of the three categories. However, the use of export unit values may not be appropriate when most timber resources are sold domestically and are not exported or competing with imports. Production figures are obtained from the FAO Global Forest Resources Assessment, which are in turn obtained from the NFA. The World Bank/FAO-FRA data do not include the use of timber for producing charcoal.

Alternative data sources for timber production and valuation are available in Uganda. The starting point is Table (1.2.1 - 1.2.3) in the UBOS Annual Statistical Abstract 2020, which provides data on timber production (in '000 tonnes) and valuation (in UShs millions) for several different categories of timber:

- Broad leaved Plantations
- Conifer Plantations
- THF is well stocked
- THF low stocked
- Woodland

The FAO-FRA and World Bank data are presented slightly differently, in cubic metres rather than tonnes. The link between the two is the density of wood. By making assumptions of wood density for the different categories (the default assumption is 720 kilograms per cubic metre [kg/m3]), the volume of timber production can be estimated and compared with the FAO and World Bank numbers.

There are, however, concerns about the reliability of Uganda's timber production data, which may be overstated. The largest component of production is non-monetary domestic fuelwood consumption, for which data is highly uncertain. The recorded production levels seem unusually high compared to estimates of the standing timber stock. For example, the FAO-FRA 2015 reports a total growing stock of 92 million cubic meters of timber on forest land and 21 million cubic meters on other woodland, totalling 114 million cubic meters. However, with annual production estimated at 48,000 tons in 2016 (approximately 69,600 cubic meters), the entire growing stock would be depleted in less than two years, which is unlikely. This discrepancy suggests that either the growing stock is underestimated, the production rate is overestimated, or both. Furthermore, the 2016 National Charcoal Survey, the only other source for domestic fuelwood consumption data, provides an estimate that is less than half of the UBOS data.

The valuations based on UBOS production data are much lower than the FAO/WB data, particularly for fuelwood/charcoal. There is a marked downward trend in the (US$) values of wood for charcoal and fuelwood, which requires further investigation.

Both data sets indicate that timber use for fuelwood and charcoal is by far the primary application in Uganda. Consequently, changes in timber valuation are likely to significantly impact the assessments of net forest depletion and forest timber asset value. An alternative valuation can be derived from the 2016 Uganda National Charcoal Survey[7], which provides the following information for calculation:

Table 3: Calculation of Implied Value of Wood used for Charcoal Production

	Per Bag	Per Ton	Source of Information
Average weight of a bag of charcoal [Uganda] (kg)	61		Table 6-11
Average farm-gate price for a bag of charcoal (UShs)	18,500	303,279	Paragraph 13.1.2
Wood proportion of charcoal production costs	34%		Table 5-7
Wood input value (per bag of charcoal)	6,265	102,698	Calculated
Conversion factor (kiln efficiency)	18%	18%	TZ charcoal kiln study
Wood input weight	0.34	5.56	Calculated
Wood density (t/m^3)	0.72	0.72	Forest Research UK
Wood input volume (m^3)	0.47	7.67	Calculated. NB PROFOR 2014 uses a conversion factor of 6
Wood input cost (UShs/m^3)	13,395	13,395	Calculated
Exchange rate (UShs/US$)	3,420	3,420	BOU
Wood input cost (US$/m^3)	3.92	3.92	Calculated

Source: *MOFPED calculation based on data from MEMD*

The calculated value of wood inputs to the charcoal value chain is US$3.92 per cubic metre, broadly consistent with but somehow higher than the values derived from UBOS data.

Energy and Mineral Depletion. World Bank data was used for energy and mineral depletion, as there were no strong indications that these figures would be inaccurate (and they are relatively small). These values were then included in the calculation of net forest depletion to determine net natural capital depletion.

Adjusted Net Saving

Adjusted Net Savings (ANS) is depletion-adjusted savings less pollution damage. The logic is that you are not truly saving if that saving comes with negative externalities.

[7]MEMD (Ministry of Energy and Mineral Development). 2015

These externalities can be either global, in the case of greenhouse gas emissions, where citizens of every country bear the cost, or local, as in the case of air pollution, where the health of local citizens is negatively affected.

$$ANS = DAS - Pollution\ damages$$

Under the World Bank methodology, pollution damage is the combination of baseline CO_2 emissions and air pollution damage. Baseline CO_2 emissions are those from fossil fuel use and cement production. Our analysis also includes an estimate for CO_2 damages from deforestation, as the net forest depletion calculations clearly show that deforestation is a significant factor in Uganda[8].

$$Pollution\ damages = \begin{matrix} Baseline\ CO_2\ damage \\ + \\ Deforestation\ CO_2\ damage \\ + \\ Air\ pollution\ damage \end{matrix}$$

The World Bank numbers were used for baseline CO_2 and air pollution damage, and Ugandan estimates were used for deforestation CO_2 damage.

The Forest Reference Emission Level report for Uganda[9] provided an estimate for the average annual CO_2 emissions from deforestation over the period 2000 to 2015. When compared to the change in total forest area reported by the World Bank over the same period, an average of 73.7 tCO_2e of CO_2 emissions per hectare per year, was estimated. We applied this emissions factor to the total forest area lost by year, calculated from the same World Bank numbers, to give CO_2 emissions per year. We then multiplied this by an estimated carbon price to give a monetary value.

The carbon price was inferred from World Bank data. The annual CO_2 damage value provided in the ANS dataset in US$ was divided by the CO_2 emissions estimates provided by World Bank Open Data to give an implied annual damage cost of carbon emissions. This price increases over time. Both CO_2 damage estimates and air pollution damage were combined to give total pollution damage. This was deducted from DAS to give ANS.

Adjusted Net National Income

Adjusted Net National Income (ANNI) was calculated from the starting point of GNI, as calculated by the World Bank. From this MOFPED's estimation of CFC was deducted,

[8]Deforestation CO_2 emissions result from the burning of forest, which is not replaced. Although the burning of charcoal and wood fuel also releases CO_2, if this is replanted (resulting in no deforestation), then net CO_2 emissions from this source is zero as the growing stock absorbs CO_2.

[9]The Proposed Forest Reference Emission Level for Uganda, February 2018, is published by the Ministry of Water and Environment, and is available here: https://www.mwe.go.ug/sites/default/files/library/Final%20-%20Uganda%20Forest%20Reference%20Emission%20Level%20Document%20-February%202018.pdf

yielding NNI. The same value for natural capital depletion was then deducted as was used for DAS to give ANNI.

Comprehensive wealth

No adjustments have been made to the World Bank's methodology or data for comprehensive wealth, though this remains a consideration for the future. While some changes were explored, it was concluded that any modifications at this stage would not enhance accuracy or usefulness. This may change as Uganda further develops its natural capital accounts.

The World Bank estimates human capital wealth using the income method, which is a valid approach. Although Uganda has a high proportion of non-government expenditure on education, this is not an issue, as income-based measures of human capital capture all forms of education, regardless of how they are obtained.

As part of this study's preparations, human capital was also recalculated using the expenditure method. However, this approach yielded an unrealistically low figure. This suggests that Uganda may benefit from significant informal education, such as on-the-job learning (leading to high productivity gains), a considerable amount of education and training abroad, or exceptionally cost-effective education spending. Any combination of these factors could be true. Since the expenditure method did not provide more accurate or credible results, it was ultimately disregarded.

4. Latest Results

The latest compilation of adjusted macroeconomic measures offers insights into Uganda's net wealth status and its evolution up to 2024.

Key Results

- Uganda recorded a positive Adjusted Net Savings (ANS) as a percentage of GNI in 2024, despite a slight decline to 18.9% from 19.4% in 2023.
- The most significant negative impact on ANS in 2024 stemmed from a rise in the Consumption of Fixed Capital, followed by declines in Gross National Savings and education spending, along with increased pollution damages (in absolute terms).
- Consumption of Fixed Capital (CFC) increased by 11.7%, rising from UShs 15,274 billion in 2023 to UShs 17,059 billion in 2024, representing 8.6% of GNI.
- In absolute terms, education expenditure declined by 8.0%, from UShs 6,599 billion in 2023 to UShs 6,072 billion in 2024, primarily due to reduced allocations to the sector.
- Air pollution damage has steadily declined as a percentage of GNI, from 1.5% in 2014 to 0.7% in 2024. This suggests that Uganda's national income growth has not been driven by increased pollution-related damages.

4.1. Adjusted Macroeconomic Indicators

4.1.1. Adjusted Net Savings (ANS)

In 2024, Uganda recorded a positive ANS (*See* ***Figure 6***), driven by education expenditure, and a reduction in the monetary value of net forest depletion. However, the most significant negative factor remained the consumption of fixed capital. Uganda's ANS as a share of GNI in 2024 was 18.9 percent (*See* ***Figure 7***), down from 19.4 percent of GNI in 2023, translating to an absolute 0.5 percent change.

Figure 6: ANS Visualisation (current US$ million), 2024

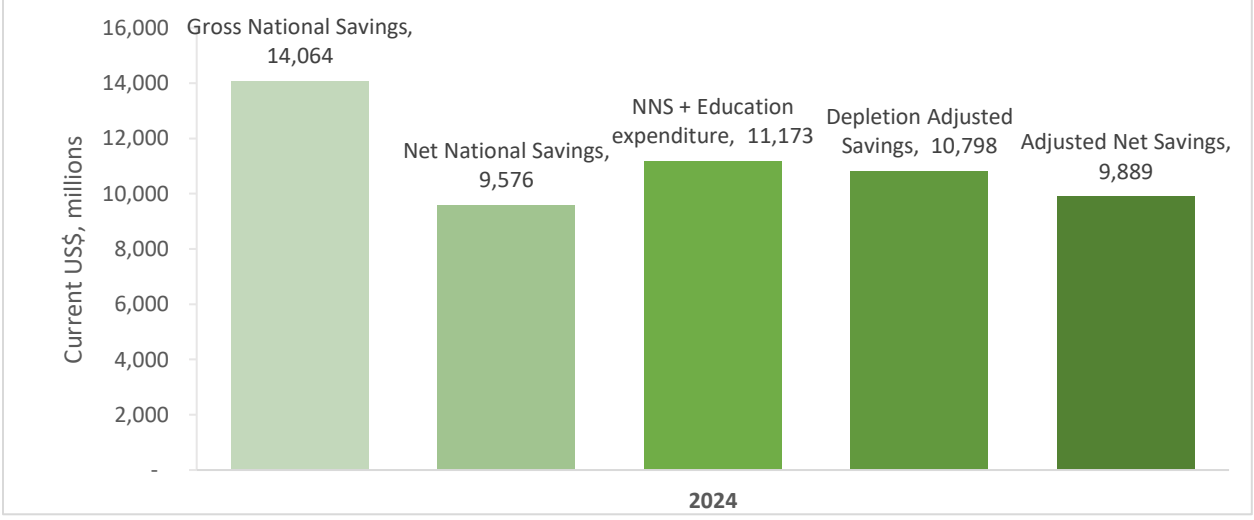
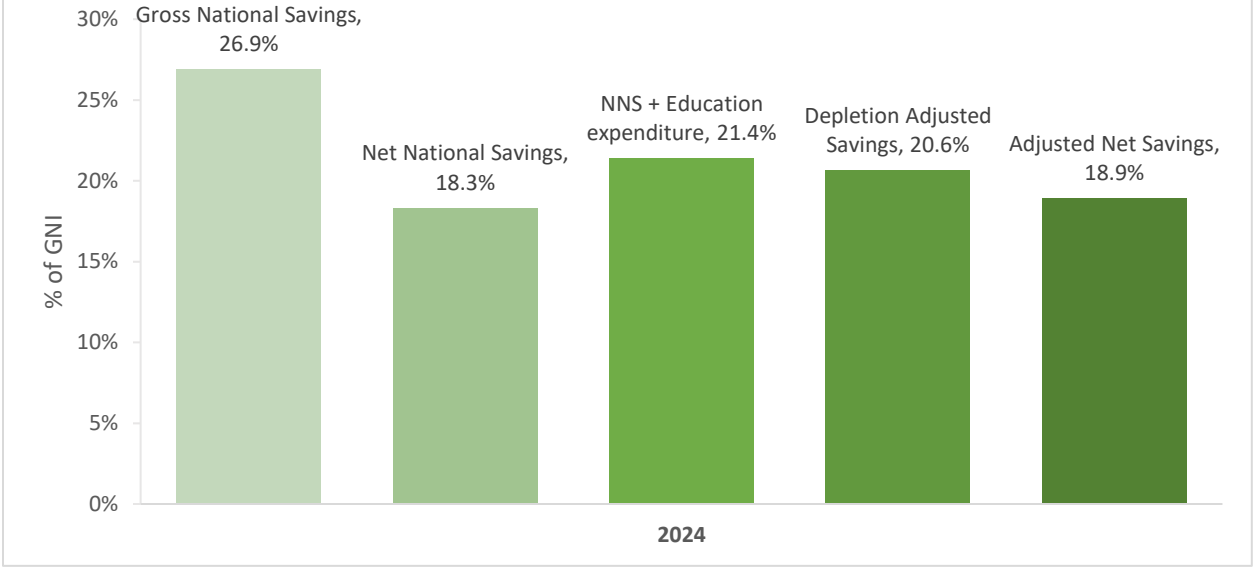
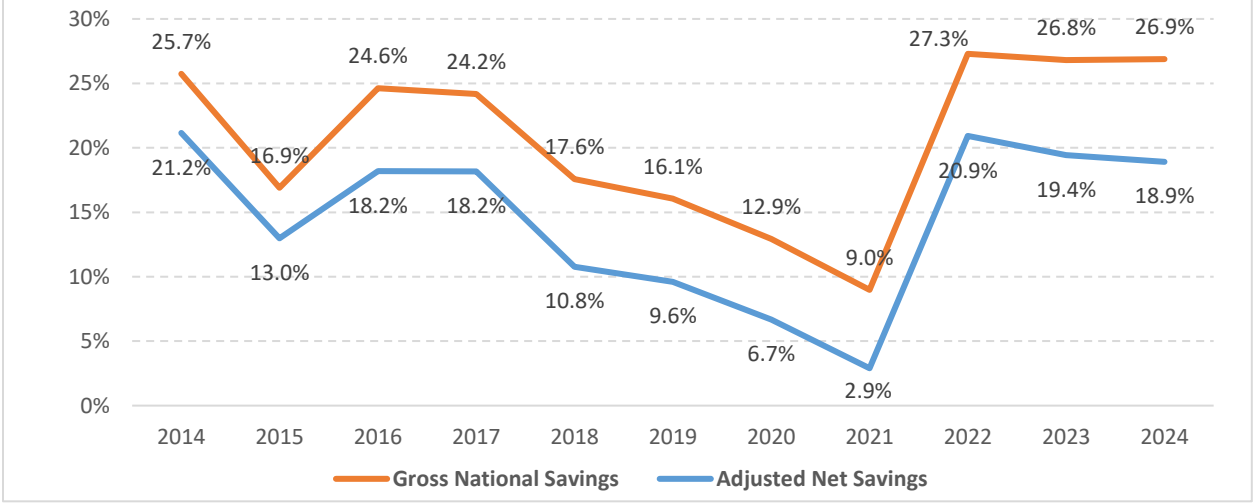


Figure 7: ANS Visualisation as a percentage of GNI, 2024



In 2024, Adjusted Net Saving (ANS) as a percentage of GNI declined to 18.9 percent from 19.4 percent recorded in 2023. The decline in ANS as a percentage of GNI is greater than the trend of GNS as a percentage of GNI (to 26.9 percent in 2024, from 26.8 percent in 2023) (*See* ***Figure 9***), largely on account of net forest depletion in recent years.

Figure 8: Trend of ANS and GNS as a share of GNI, 2014 - 2024



Gross National Savings (GNS) as a percentage of GNI has averaged 27 percent in the past three years, improving from 9 percent in 2021 (*See* ***Figure 8***). In absolute terms, GNS increased from US $3,561 million in 2021 to US $14,064 million in 2024, following the economic recovery after the COVID-19 pandemic. However, Government consumption continues to weigh down Gross National Savings.

Figure 9: Breakdown of ANS as a share of GNI, 2019 - 2024

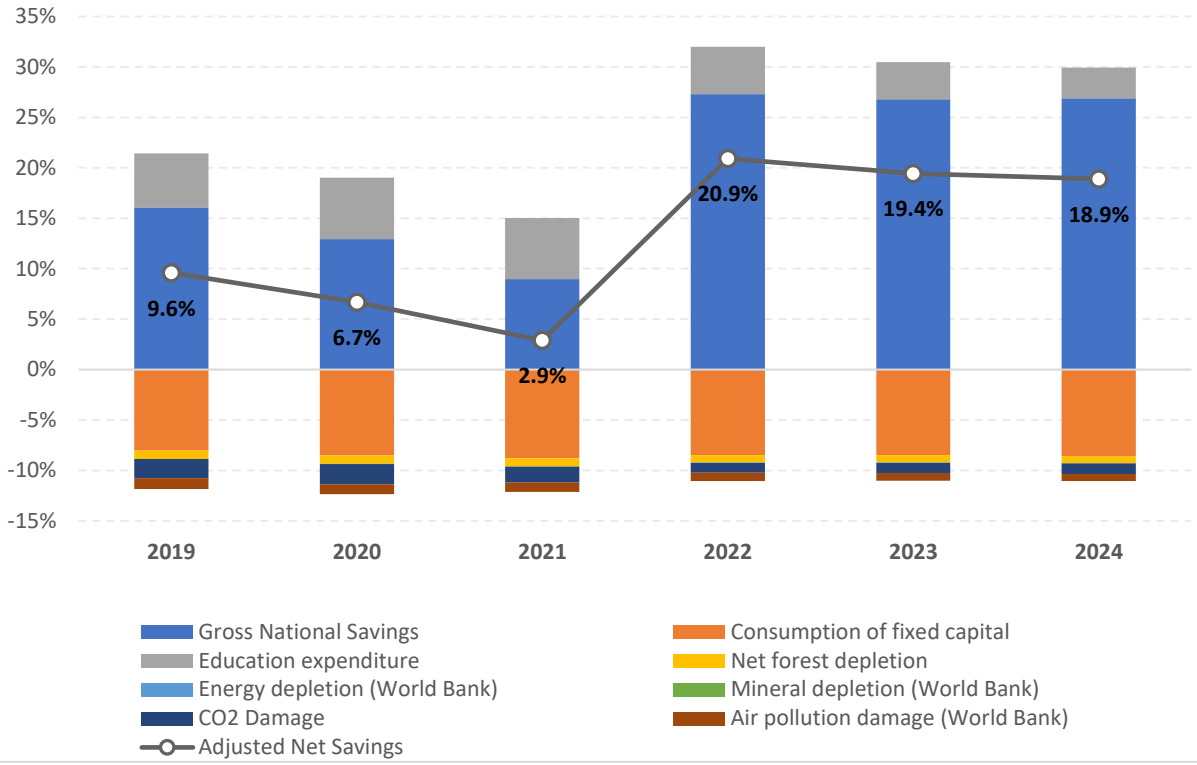
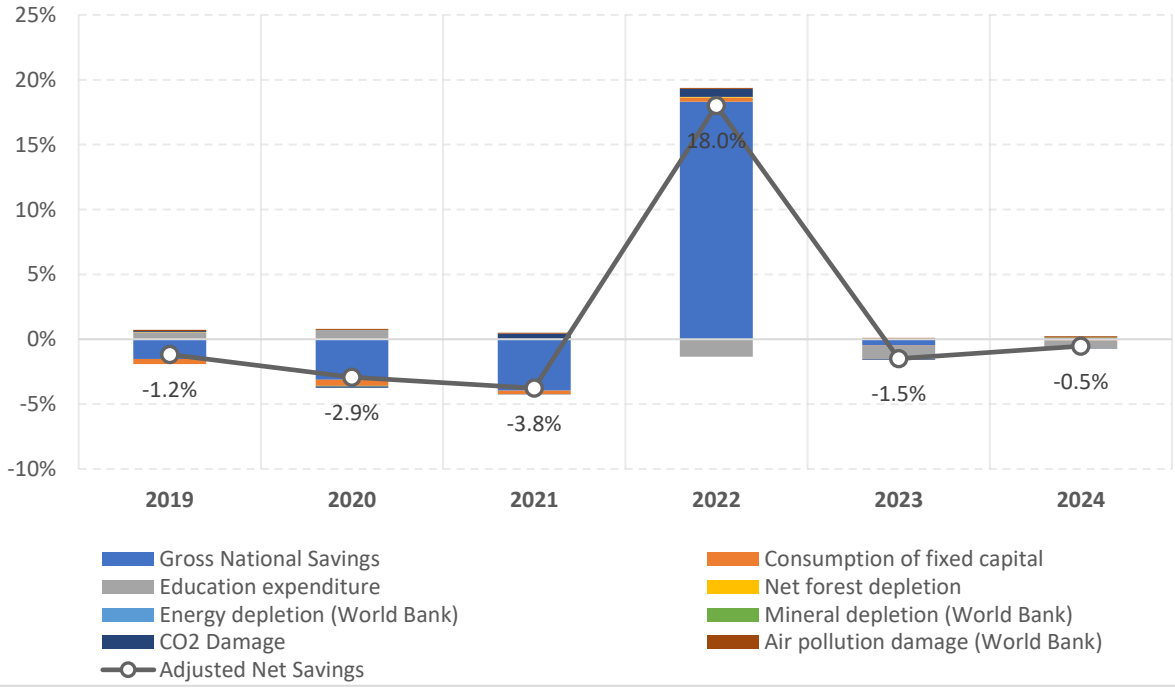


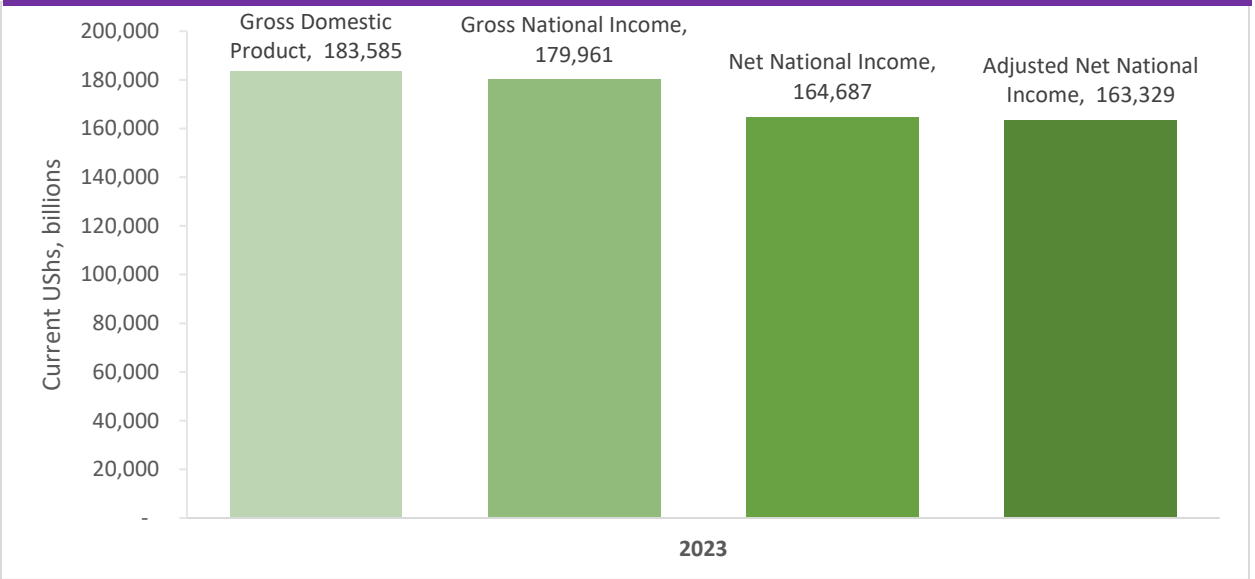
Figure 10: Breakdown of the change in the share of ANS in GNI, 2019 - 2024



4.1.2. Adjusted Net National Income (ANNI)

Uganda's ANNI is also relatively high because of a low net natural capital depletion (*See* ***Figure 11***). Again, this is because timber products have such a low monetary value in Uganda (compared to export unit prices), and consumption of fixed capital may be underestimated (according to the World Bank results).

Figure 11: ANNI in Current Ugandan Shillings, 2023

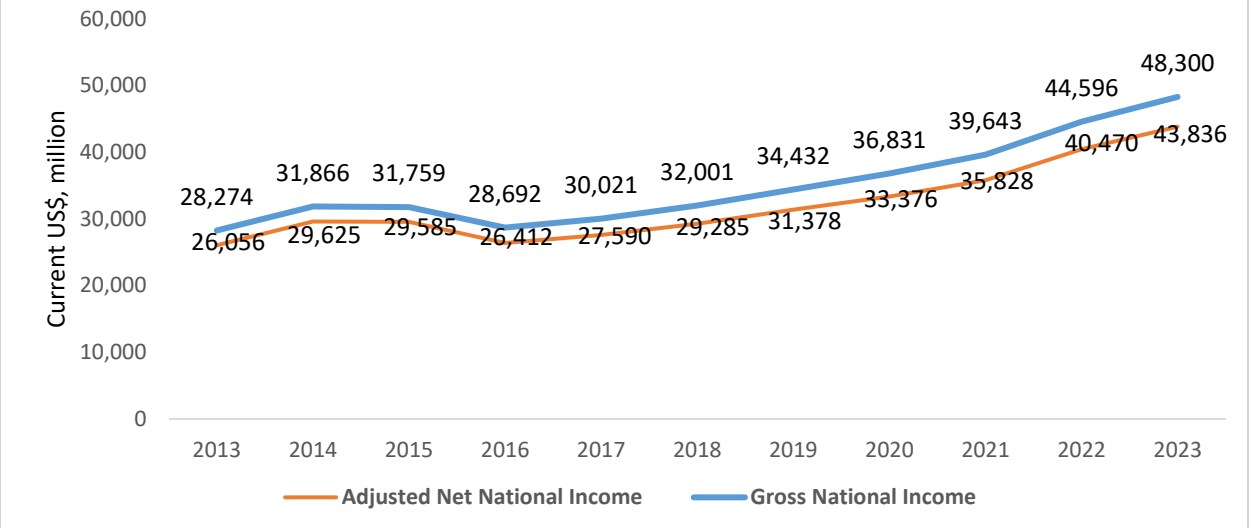


Uganda's GDP in CY 2023 stood at UShs 183,585 billion, while Gross National Income (GNI) was slightly lower at UShs 179,961 billion, reflecting net factor income outflows of UShs 3,624 billion (*See* ***Figure 11***). This suggests that while foreign capital and labour contribute to domestic production, a portion of the income generated is repatriated, indicating moderate reliance on external capital. Compared to previous years, the GDP-GNI gap remains relatively stable, implying that Uganda's dependence on foreign-owned assets has not significantly changed.

Net National Income (NNI) was UShs 164,687 billion, meaning that UShs 15,274 billion (8.5% of GNI) was absorbed by capital depreciation. This is a slight increase from past trends, suggesting a growing need for reinvestment in capital stock to maintain productive capacity. Adjusted Net National Income (ANNI) stood at UShs 163,329 billion, with environmental depletion accounting for UShs 1,358 billion, or 0.8% of NNI. This proportion has remained relatively stable, indicating that while capital consumption is increasing, environmental depletion is not yet a major drag on national income.

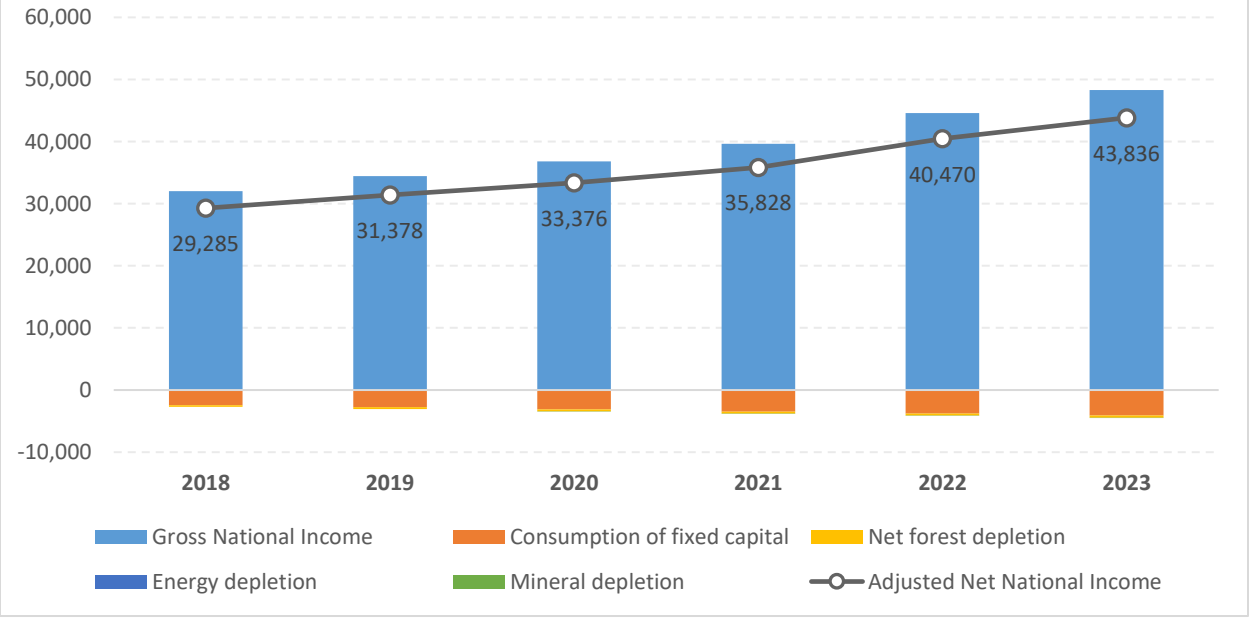
The data highlights two key trends: first, Uganda's reliance on foreign capital remains moderate but persistent, necessitating policies to retain more income domestically. Second, capital depreciation is rising, underscoring the need for increased domestic investment to sustain long-term growth. Strengthening capital formation while integrating sustainability measures into economic planning will be crucial to improving Uganda's long-term income resilience.

Figure 12: ANNI compared to GNI (current US$), 2013 - 2023



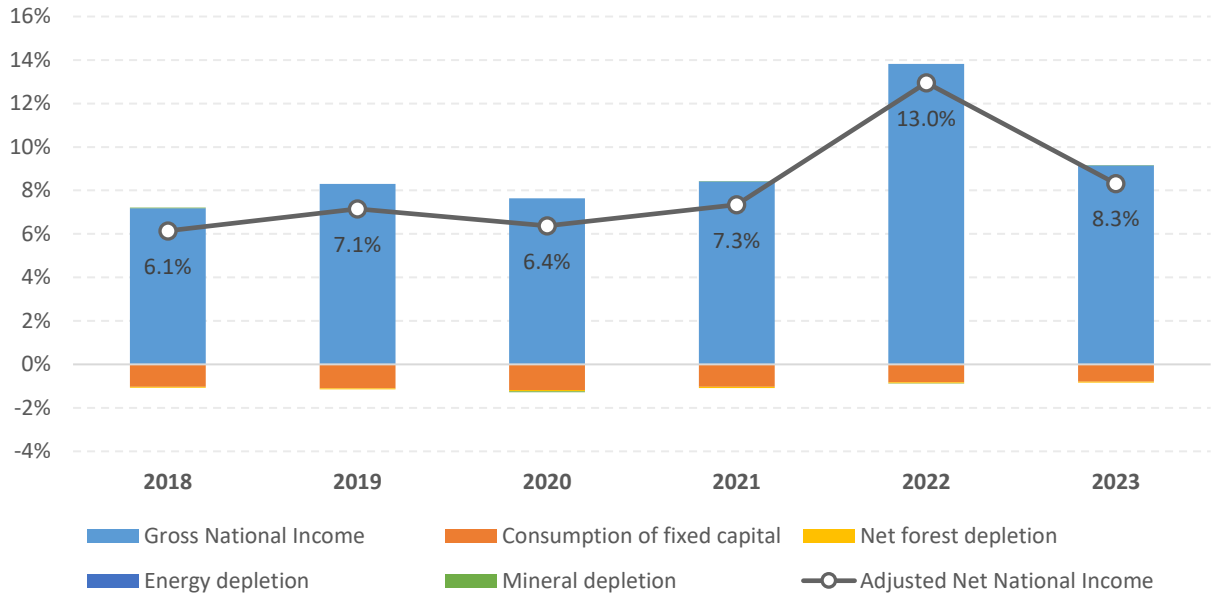
The ANNI and GNI curves exhibit an upward trajectory over the years, indicating overall economic growth (*See* ***Figure 12***). From 2013 to 2016, ANNI shows some declines, particularly in 2016 and 2017, reflecting possible economic downturns or increased depreciation effects. From 2017 onwards, both indicators exhibit steady growth, with sharper increases post-2019. The gap between ANNI and GNI remains relatively stable but widens in later years, indicating a higher rate of capital depreciation as adjustments impact on ANNI. Strategic policy focus on investment efficiency and sustainable economic planning is crucial to combat the higher depreciation rates of capital.

Figure 13: ANNI Breakdown (Current US$ million), 2018 - 2023



Uganda's Adjusted Net National Income (ANNI) has shown a consistent upward trend over the past five years (*See* ***Figure 13***). Uganda's ANNI increased by 49.7 percent, from US$ 29,284 million in 2018 to US$ 43,836 million in 2023. This growth was mainly driven by the expansion of Gross National Income (GNI), which increased by 50.9 percent over the same period. Consumption of Fixed Capital (CFC) rose by 67.9 percent, from US$ 2,441 million to US$ 4,099 million, indicating higher depreciation of productive assets.

Figure 14: ANNI Growth Rate Breakdown, 2018 - 2023



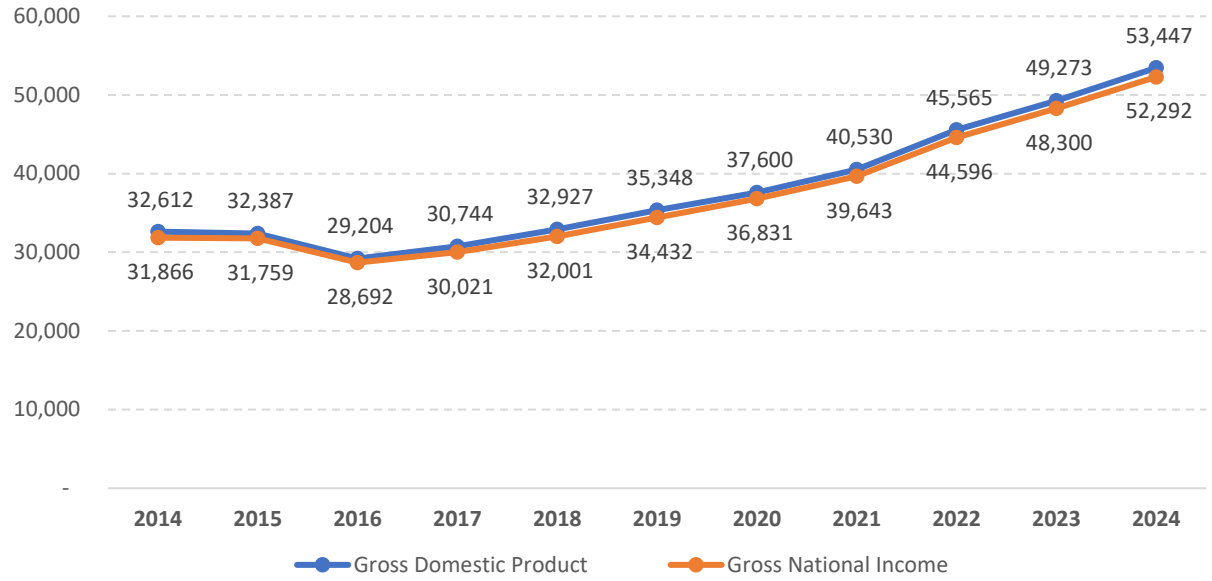
The Adjusted Net National Income (ANNI) increased from 6.1 percent in 2018 to 8.3 percent in 2023. ***Figure 14*** above shows the factors influencing the growth rate of ANNI over six years. The primary driver was Gross National Income (GNI), which rose from 7.2% in 2018 and peaked at 13.8% in 2022 before declining to 9.2% in 2023. Overall, there is a positive economic trend, with ANNI growth benefiting from rising GNI and rising deductions from Consumption of Fixed Capital (CFC) and natural capital depletion over the period.

4.2. Components of ANS and ANNI

4.2.1. GDP and GNI

GDP and GNI have improved, as reflected in ***Figure 15***, largely due to strategic government interventions to support economic activity, better weather conditions, increased investments in the oil and gas sector, growth in exports, and global economic growth.

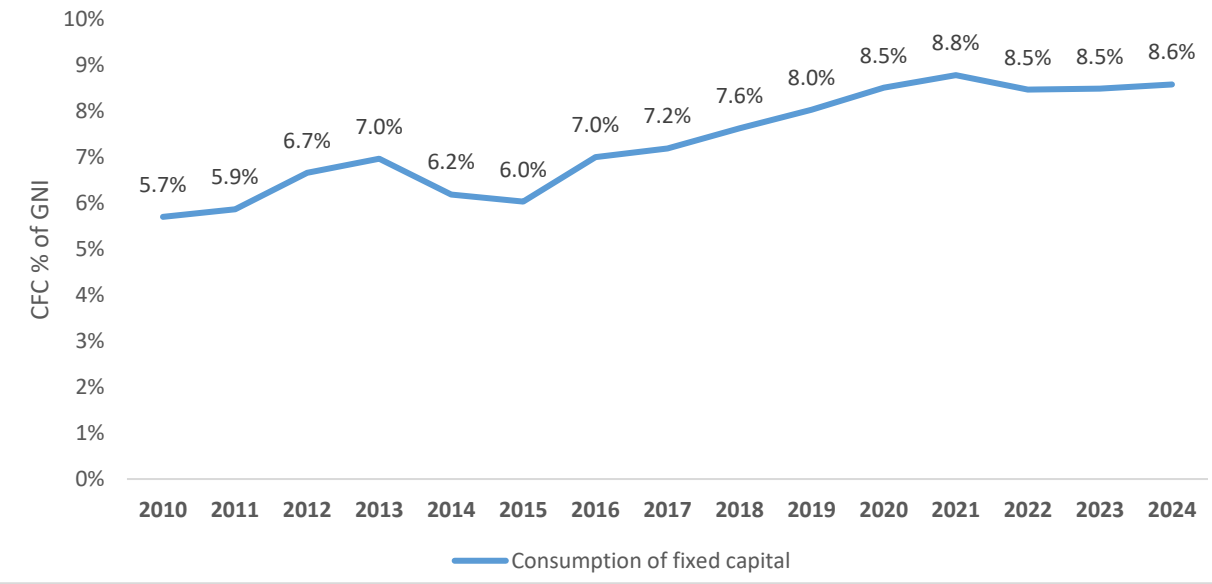
Figure 15: GDP and GNI (Current US$ million), 2014 - 2024



4.2.2. Consumption of Fixed Capital

Consumption of Fixed Capital (CFC) increased by 11.7%, rising from UShs 15,274 billion in 2023 to UShs 17,059 billion in 2024, representing 8.6% of GNI (*See* ***Figure 16***). This increase suggests that national income growth is occurring alongside a higher rate of fixed asset depreciation, without sufficient reinvestment in new capital to sustain future generations.

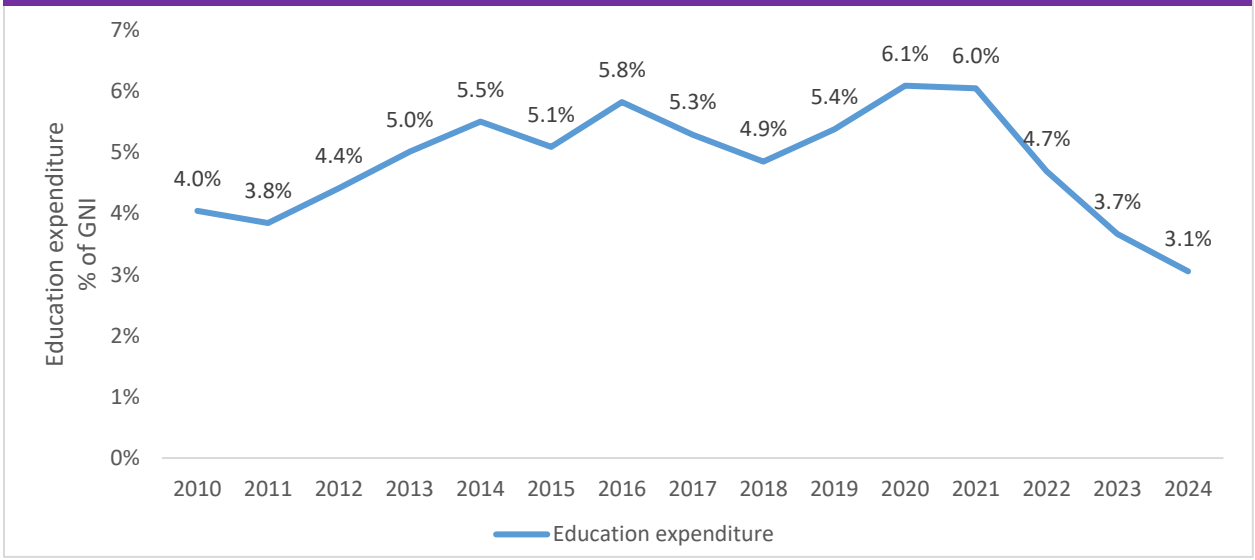
Figure 16: Consumption of Fixed Capital as a percentage of GNI, 2010-2024



4.2.3. Education Expenditure

Education expenditure has been declining as a share of GNI since 2021, reaching 3.1% in 2024, down from 3.7% in 2023 (See **Figure 17**). In absolute terms, education spending decreased by 8.0%, from UShs 6,599 billion in 2023 to UShs 6,072 billion in 2024, primarily due to reduced allocations to the sector.

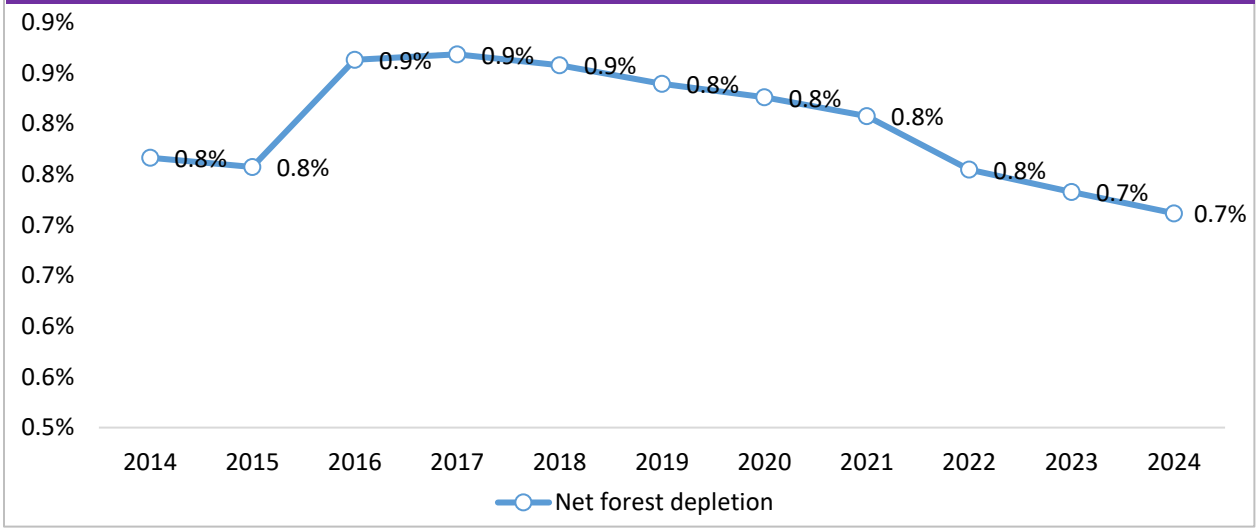
Figure 17: Education expenditure as a percentage of GNI, 2010-2024



4.2.4. Net Forest Depletion (NFD)

Net Forest Depletion increased from US$ 244 million in 2014, to US$ 372 million in 2024. However, as a percentage of GNI, it steadily declined from 0.8 percent to 0.7 percent over the same period, as shown in ***Figure 18*** below.

Figure 18: Net Forest Depletions as a percentage of GNI



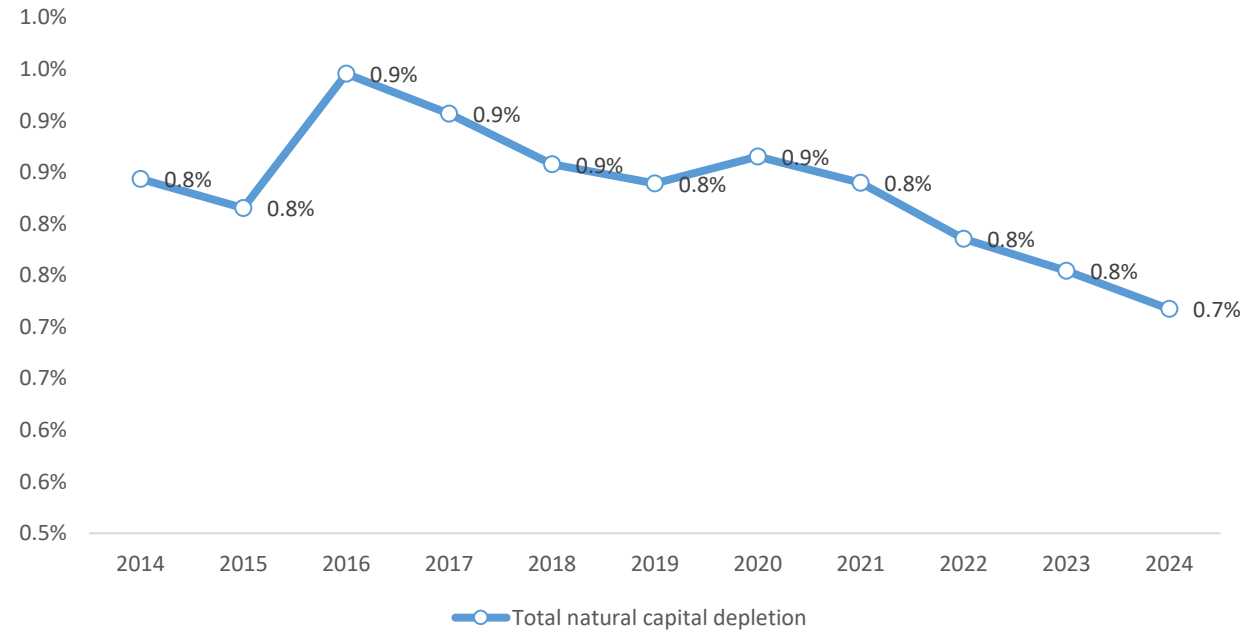
4.2.5. Energy and Mineral Depletion (EMD)

Uganda does not yet produce oil, gas, or coal. However, with the anticipated start of commercial oil production in late 2026, this is expected to change. For now, energy asset depletion remains zero, however, future estimates of Adjusted Net Savings (ANS) must account for energy depletion. Mineral depletion in Uganda remains minimal, averaging below 0.02% of GNI in most years and never exceeding 0.1% of GNI.

4.2.6. Total Natural Capital Depletion

Given the negligible contribution of energy and mineral depletion, total natural capital depletion mirrors NFD almost exactly (see **Figure 19**).

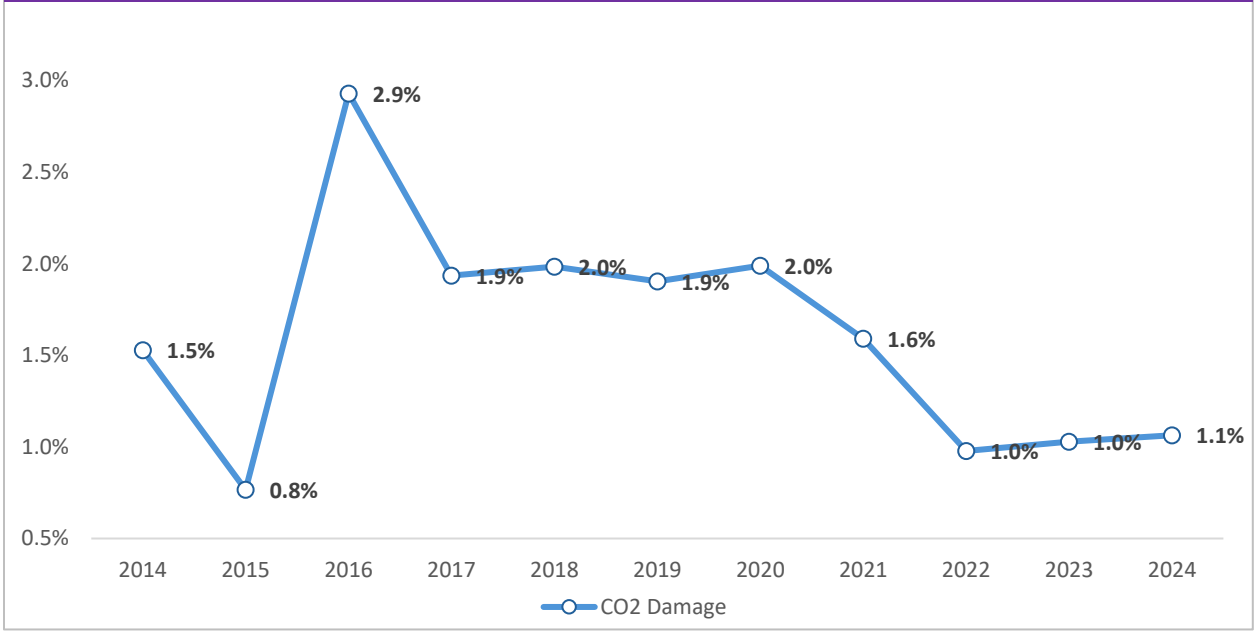
Figure 19: Total Natural Capital Depletion over time as a Share of GNI



4.2.7. CO_2 Damages

CO_2 damages as a percentage of GNI have fluctuated over the years. After a significant decline in 2014, CO_2 damages surged in 2016 before stabilising in the following years. More recently, between 2020 and 2024, CO_2 damages declined from 2.0% to 1.1%, reflecting a continued downward trend, as shown in ***Figure 20***. This decline is partly due to GNI growing at a faster rate than CO_2 emissions, meaning that even if absolute emissions remained stable or increased slightly, their impact relative to the economy became smaller.

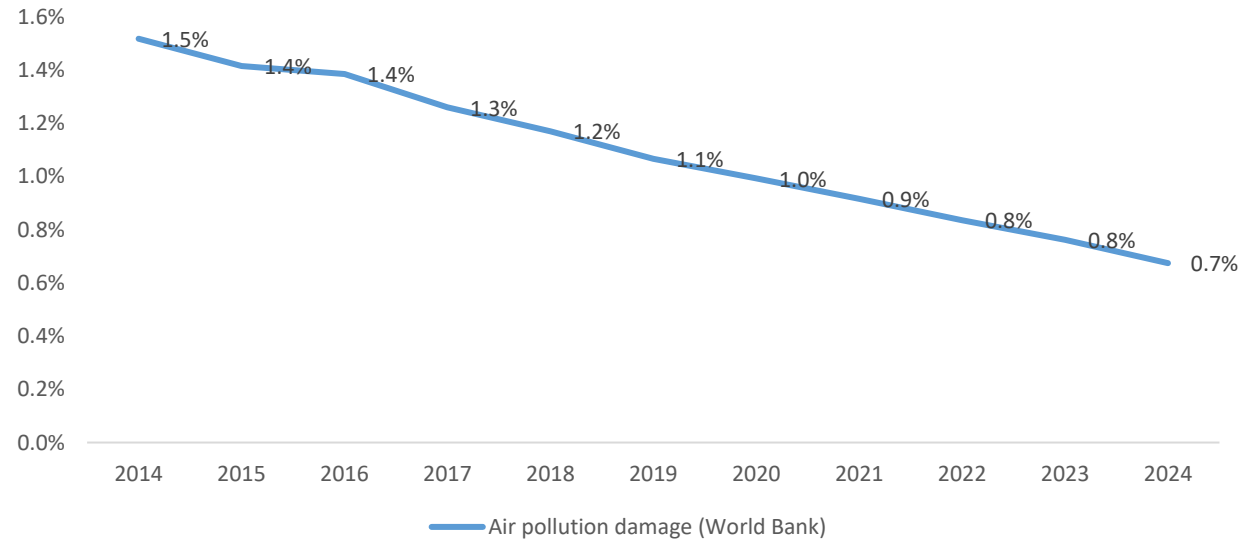
Figure 20: CO2 Damage as a percentage of GNI, 2014 - 2024



4.2.8. Air Pollution Damage

Air pollution damage has steadily declined as a percentage of GNI, from 1.5% in 2014 to 0.7% in 2024. Although its absolute value has increased in Uganda, its share of GNI has decreased, now standing at 0.7%, slightly lower than CO_2 damage, as shown in **Figure 21**.

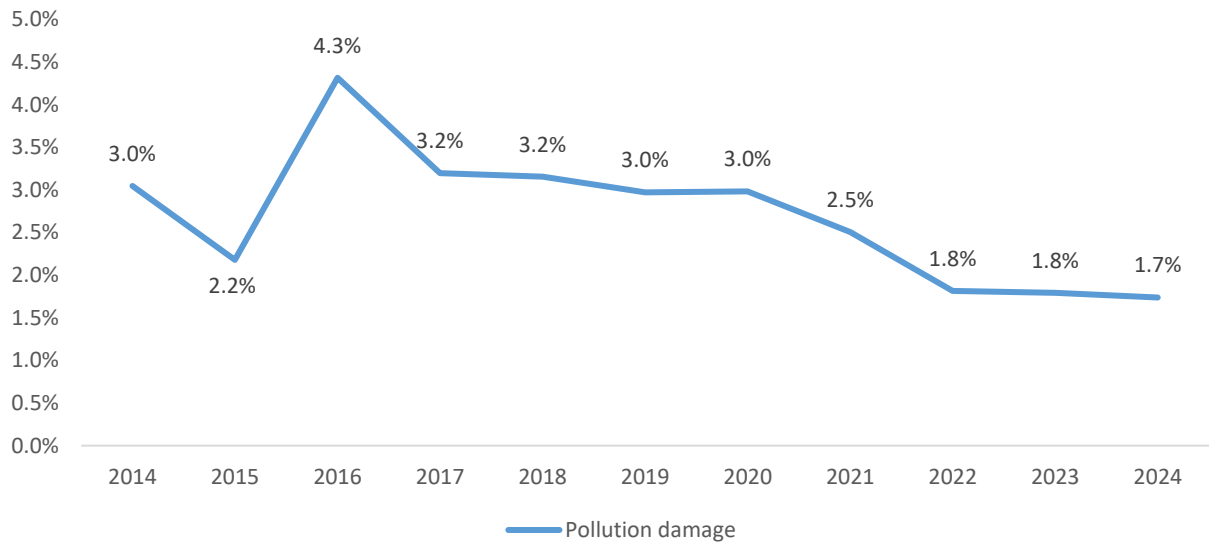
Figure 21: Air Pollution Damage as a % of GNI, 2014 - 2024



4.2.9. Total Pollution Damage

Total pollution damage declined by 1.5% between 2017 and 2024. In 2017, it was estimated at 3.2% of GNI (US$ 959 billion). However, from 2017 to 2020, pollution damage remained relatively stable before declining to 1.7 % of GNI, as shown in **Figure 22**.

Figure 22: Total Pollution Damage over time as a percentage of GNI

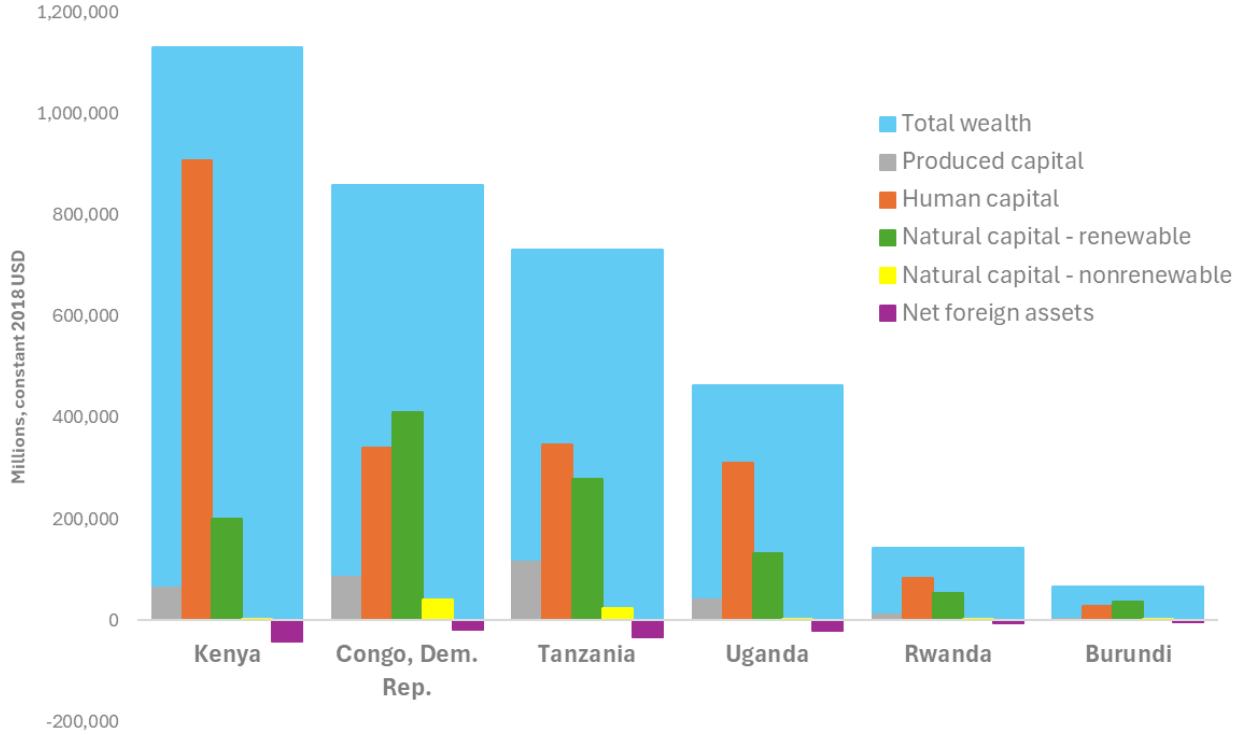


4.3. Comprehensive wealth

The total wealth of a nation consists of four broad categories: produced capital, natural capital, human capital, and net foreign assets.

1. Produced Capital encompasses buildings, machinery, equipment, and urban land.
2. Natural Capital comprises forests, protected areas, cropland, pastureland, fossil fuel energy, and minerals.
3. Human Capital is directly estimated as the discounted value of earnings over a person's lifetime.
4. Net Foreign Assets (NFA) denote the value of overseas assets owned by a nation, less the value of its domestic assets owned by foreigners, adjusted for changes in valuation and exchange rates. The IMF also provides data on NFA.

Figure 23: Wealth in EAC Countries (2020)

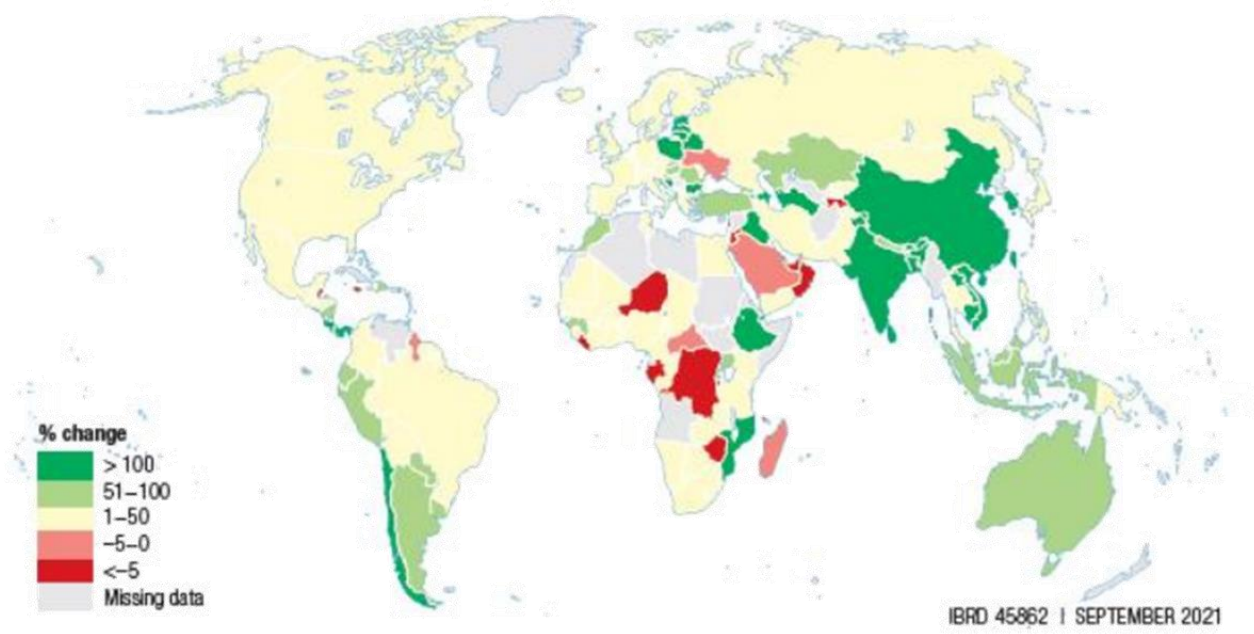


Source: *World Bank*

Note: *The East African Community (EAC) - 8 member states bloc, South Sudan and Somalia data is not with the World bank*

- Human capital is a key determinant of wealth in the East African Community.
- Congo, Dem. Rep. has the highest value of Natural Capital of both renewable and non-renewable resources, in the EAC region

Figure 24: Growth of Total Wealth per Capita, 1995–2018



Source: *The Changing Wealth of Nations 2021; Managing Assets for the Future. Washington, DC: World Bank*

- While wealth per capita has been generally increasing, but not for all countries

5. Annexe: Shows Adjusted Macroeconomic Indicators (AMI) Performance, Modelled Estimates and Projections

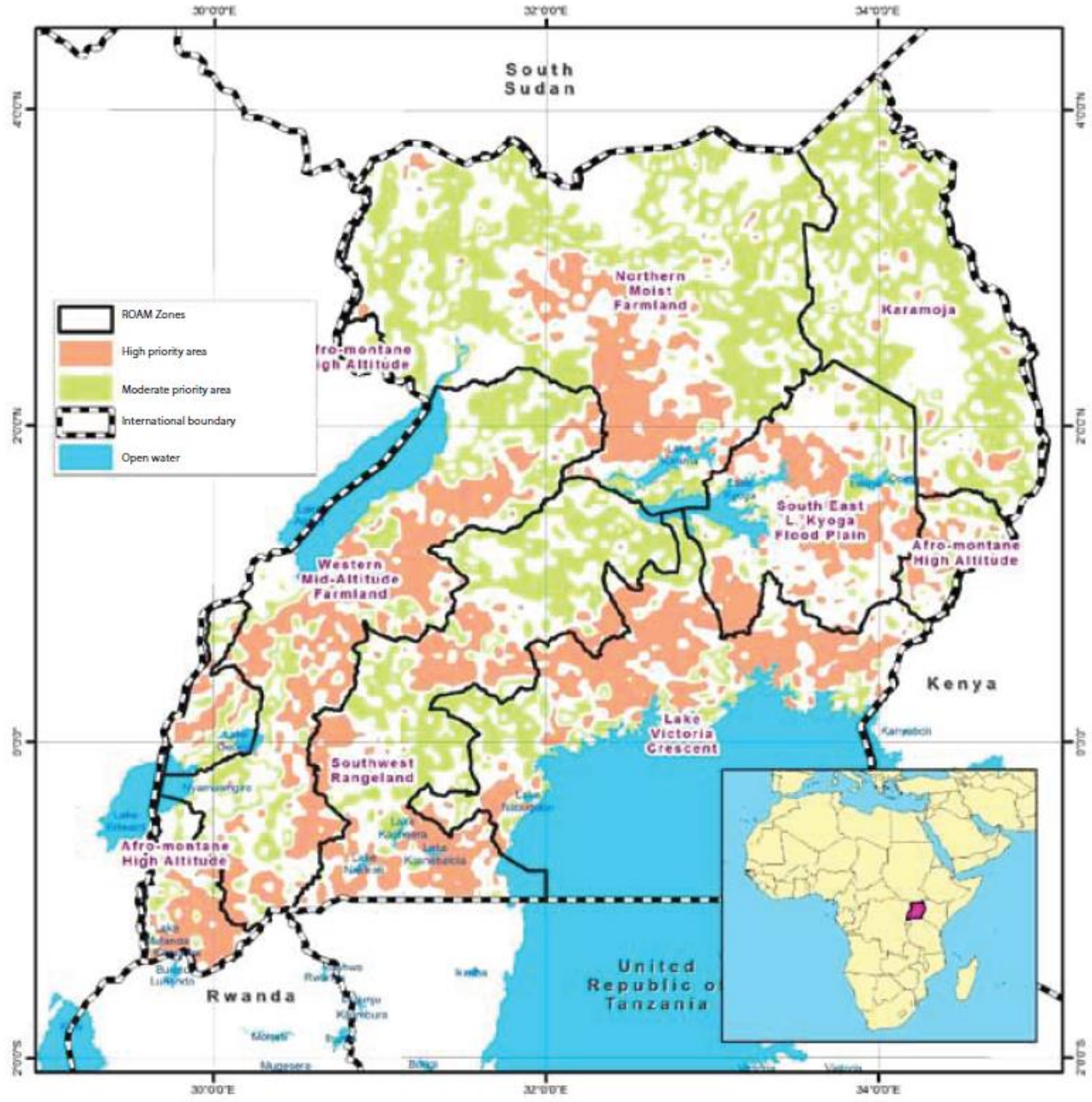
Calendar Year (% of GNI)	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*
Gross National Savings	27.3%	26.8%	26.9%	28.8%	31.5%	36.4%
Consumption of fixed capital	8.5%	8.5%	8.6%	8.8%	8.9%	8.8%
Net National Savings	18.8%	18.3%	18.3%	19.9%	22.6%	27.6%
Fully adjusted education expenditure	4.7%	3.7%	3.1%	3.1%	3.3%	3.4%
NNS + Education expenditure	23.5%	22.0%	21.4%	23.0%	25.9%	31.0%
Net forest depletion	0.8%	0.7%	0.7%	0.7%	0.7%	0.6%
Energy depletion (World Bank)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Mineral depletion (World Bank)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total natural capital depletion	0.8%	0.8%	0.7%	0.7%	0.7%	0.6%
Depletion Adjusted Savings	22.7%	21.2%	20.6%	22.3%	25.3%	30.4%
CO_2 Damage	1.0%	1.0%	1.1%	1.1%	1.1%	1.1%
Air pollution damage (World Bank)	0.8%	0.8%	0.7%	0.6%	0.5%	0.4%
Pollution damage	1.8%	1.8%	1.7%	1.7%	1.6%	1.6%
Adjusted Net Savings	20.9%	19.4%	18.9%	20.7%	23.7%	28.8%
Net National Income	91.5%	91.5%	91.4%	91.2%	91.1%	91.2%
Adjusted Net National Income	90.7%	90.8%	90.7%	90.5%	90.5%	90.6%

Calendar Year (Current US$, million)	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*
Gross Domestic Product	45,565	49,273	53,447	57,761	63,960	70,277
Gross National Income	44,596	48,300	52,292	56,530	62,668	68,980
Gross National Savings	12,171	12,944	14,064	16,260	19,724	25,121
Consumption of fixed capital	3,776	4,099	4,488	5,002	5,561	6,065
Net National Savings	8,395	8,845	9,576	11,257	14,163	19,056
Fully adjusted education expenditure	2,094	1,771	1,597	1,761	2,094	2,323
NNS + Education expenditure	10,489	10,616	11,173	13,018	16,257	21,380
Net forest depletion	337	354	372	391	412	433
Energy depletion (World Bank)	0	0	0	0	0	0
Mineral depletion (World Bank)	14	11	3	2	3	0
Total natural capital depletion	350	364	375	394	414	433
Depletion Adjusted Savings	10,139	10,251	10,798	12,625	15,843	20,947
CO_2 Damage	436	497	556	621	700	787
Air pollution damage (World Bank)	372	368	352	330	310	283
Pollution damage	809	865	909	951	1,010	1,070
Adjusted Net Savings	9,329	9,386	9,889	11,674	14,833	19,877
Net National Income	40,820	44,201	47,804	51,527	57,108	62,915
Adjusted Net National Income	40,470	43,836	47,429	51,133	56,693	62,482

Financial Year (Current US$, million)	*2021/22*	*2022/23*	*2023/24*	*2024/25*	*2025/26*	*2026/27*
Gross Domestic Product	43,048	47,419	51,360	55,604	60,861	67,119
Gross National Income	42,119	46,448	50,296	54,411	59,599	65,824
Gross National Savings	7,866	12,558	13,504	15,162	17,992	22,423
Consumption of fixed capital	3,629	3,938	4,294	4,745	5,282	5,813
Net National Savings	4,237	8,620	9,210	10,416	12,710	16,610
Fully adjusted education expenditure	2,246	1,932	1,684	1,679	1,928	2,209
NNS + Education expenditure	6,482	10,552	10,894	12,096	14,638	18,818
Net forest depletion	328	345	363	382	401	422
Energy depletion (World Bank)	0	0	0	0	0	0
Mineral depletion (World Bank)	13	12	7	3	3	3
Total natural capital depletion	342	357	370	384	404	424
Depletion Adjusted Savings	6,141	10,195	10,525	11,711	14,234	18,395
CO_2 Damage	534	467	527	589	661	744
Air pollution damage (World Bank)	368	370	360	341	320	296
Pollution damage	901	837	887	930	980	1,040
Adjusted Net Savings	5,239	9,358	9,638	10,782	13,253	17,355
Net National Income	38,490	42,510	46,002	49,665	54,317	60,011
Adjusted Net National Income	38,149	42,153	45,632	49,281	53,913	59,588

Financial Year (Current UShs, billion)	*2021/22*	*2022/23*	*2023/24*	*2024/25*	*2025/26*	*2026/27*
Gross Domestic Product	156,825	175,974	193,368	214,243	238,736	267,299
Gross National Income	153,444	172,371	189,361	209,645	233,786	262,146
Gross National Savings	28,868	46,600	50,842	58,444	70,592	89,361
Consumption of fixed capital	13,218	14,613	16,167	18,287	20,718	23,149
Net National Savings	15,650	31,987	34,676	40,156	49,874	66,212
Fully adjusted education expenditure	8,165	7,167	6,335	6,471	7,563	8,797
NNS + Education expenditure	23,815	39,155	41,011	46,628	57,437	75,009
Net forest depletion	1,195	1,281	1,366	1,470	1,575	1,682
Energy depletion (World Bank)	0	0	0	0	0	0
Mineral depletion (World Bank)	48	45	26	10	10	11
Total natural capital depletion	1,244	1,326	1,392	1,481	1,585	1,687
Depletion Adjusted Savings	22,572	37,829	39,619	45,147	55,852	73,322
CO_2 Damage	1,937	1,732	1,983	2,269	2,591	2,961
Air pollution damage (World Bank)	1,340	1,374	1,355	1,313	1,254	1,179
Pollution damage	3,276	3,106	3,338	3,582	3,846	4,140
Adjusted Net Savings	19,295	34,723	36,281	41,565	52,007	69,181
Net National Income	140,227	157,758	173,194	191,358	213,068	238,997
Adjusted Net National Income	138,983	156,432	171,802	189,877	211,484	237,310

Figure 25: Priority areas for Forest Restoration



Source: *Natural capital accounting, informing policy decisions and management of Uganda's natural resources. World Bank 2020*