Adjusted Macroeconomic Indicators and Measures of Comprehensive Wealth

UGANDA

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SUMMARY

- This report summarises the work done to calculate adjusted macroeconomic indicators for Uganda. These indicators give a more holistic understanding of macroeconomic developments because they factor in a wider range of capital. This means we can understand whether growth has come at the expense of depleting resources, or whether resource extraction has been investing in other types of capital.

- The analysis enhanced World Bank estimates by incorporating Ugandan data where it was appropriate to do so. The analysis recalculated Adjusted Net Savings and Adjusted Net National Income. No change was made to the World Bank's estimates for Comprehensive Wealth.

- It became apparent that human capital development is a crucial factor in Uganda maintaining its wealth. Deforestation seems to be an issue, that will detract from Uganda's wealth, if not addressed. Overall Uganda's sustainable growth has not outpaced population growth, and therefore comprehensive wealth per capita has been reducing, albeit slightly. Uganda's growth compares favourably to that of its regional peers, although it starts from a lower baseline.

- This report makes the following recommendations;

    - Firstly, that these indicators should be monitored and compiled annually.
    - The annual growth rate of ANNI should be at least as high as the growth rate of gross national income (GNI); if not, it means that part of the growth in recorded national income is derived from the depletion of assets;
    - The rate of ANS should be maintained at a positive level and should increase over time.
    - The total level of comprehensive wealth per capita (measured in real US dollars) should increase by at least 2.4% annually, so that past trends are at least maintained.

- Some policies that will help to achieve objectives geared at increasing countries wealth include:

    - Increasing the rate of domestic financial savings;
    - Ensuring that domestic financing, in the context of increased savings, is used as far as possible to finance domestic investment (using foreign borrowing to finance investment does not lead to an increase in national wealth, as increased produced capital is offset by reduced net financial assets);
    - Reducing (preferably reversing) the rate of net forest depletion;
    - Reducing pollution from CO_2 and related emissions and particulate emissions damage;

- Ensuring productive assets are properly maintained so as to extend their lifespan and reduce annual consumption of fixed capital;
- Increasing (public and private) education spending;
- Increasing the productivity of farmland (hence increasing its capital value from higher future earnings);
- Shifting the balance of government spending towards capital and education spending (both of which are investment and add to capital), while ensuring that investment spending is prioritised on high-return projects;
- Minimising recurrent budget deficits (which reduce Adjusted Net Savings);
- Considering the adoption of a 'Sustainable Budgeting Rule' and accompanying measures to ensure that future fiscal revenues from minerals and energy are spent only on public investment (including education spending).

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ACRONYMS

ANNI	Adjusted Net National Income
ANS	Adjusted Net Savings
BoU	Bank of Uganda
CFC	Consumption of Fixed Capital
CNDPF	Comprehensive National Development Planning Framework
CWON	Changing Wealth of Nations
DAS	Depletion Adjusted Savings
EAC	East African Community
FAO	Food and Agriculture Organisation of the United Nations
FRA	Forest Resources Assessment
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GNI	Gross National Income
GNS	Gross National Savings
IIP	International Investment Position
MoFPED	Ministry of Finance, Planning and Economic Development
NCA	Natural Capital Accounting
NDP	National Development Plan
NFA	National Forest Authority
NNI	Net National Income
NPV	Net Present Value
SBI	Sustainable Budget Index
SEEA	System of Economic Environmental Accounts
SNA	System of National Accounts
UBOS	Uganda Bureau of Statistics
UNSD	United Nations Statistical Division
WAVES	Wealth Accounting and Valuation of Ecosystem Services
WDI	World Development Indicators

1.0 INTRODUCTION

1. **The Natural Capital Accounting (NCA) framework being developed in Uganda reflects recent developments and global trends in broadening the measurement framework for economic activity.** Traditional measures of economic activity, such as GDP and the conventional national accounting framework measures, do not take into account some of the broader impacts of that activity, such as the consumption of natural resources, pollution and environmental degradation. A further gap in traditional economic accounting measures is the lack of a comprehensive measure of a country's wealth, or a balance sheet, to accompany the income measures. As a parallel, to assess a company's financial status and sustainability it is necessary to consider both its income statement and its balance sheet, or assets and liabilities. The same applies to countries. A measure of wealth can help to identify whether a country's income is being generated sustainably, or is dependent upon the depletion of assets.

2. **An important initiative to address these shortcomings is the System of Economic-Environmental Accounts (SEEA), developed under the auspices of the United Nations Statistical Division (UNSD).** The SEEA Central Framework was published in 2012 (United Nations, 2014). The SEEA follows the principles of the System of National Accounts (SNA) that underpins the calculation of Gross Domestic Product (GDP) and other related measures of economic activity. The SEEA is consistent with the SNA (and therefore follows the appropriate statistical principles), but incorporates a broader range of activities (costs and benefits) in the calculation of two key macroeconomic indicators: Adjusted Net National Income (ANNI) and Adjusted Net Savings (ANS).

3. **While developing the SEEA, the World Bank was also engaged in a related project, the Changing Wealth of Nations (CWON).** This made use of the adjusted macroeconomic indicators in the SEEA, but extended it to include measurements of different types of assets. The CWON project therefore began to present measures of Comprehensive Wealth, a form of national balance sheet, to accompany the (adjusted) income accounts. The components of comprehensive wealth include, besides the usual measures of produced capital stock and (net) financial assets, a range of natural capital assets - both renewable and non-renewable - and human capital. This enabled tracking of levels of national wealth, and whether national income is being generated sustainably from the perspective of preserving national wealth. The CWON project and its related publications (Lange et al, 2011; World Bank, 2006, 2011) and databases[1]

[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

now includes information on ANS, ANNI and the components of comprehensive wealth. All of these are intended to assist in identifying whether a country's GDP is being generated in a sustainable manner, and whether the pattern of growth is sustainable. In particular, it addresses whether national income is being generated by the depletion of natural resources, and if so, are other types of capital being increased to compensate for this.

4. **These measures of adjusted national income and wealth play an integral role in the related Wealth Accounting and Valuation of Ecosystem Services (WAVES) project, a broad-based initiative co-ordinated by the World Bank.** The WAVES project includes the preparation of a number of different types of accounts for participating countries. These may include accounts for water, energy, land, forests, wetlands, fisheries, minerals and other elements of natural capital or ecosystem services, alongside adjusted macroeconomic and wealth accounts. Uganda is now undertaking a natural capital accounting exercise covering a range of accounts, including land, forest and wetland accounts, as well as macroeconomic and overall wealth accounts. The exercise is being facilitated by World Bank group under the WAVES program.

5. **This Issues Paper presents the results of the adjusted macroeconomic indicators and wealth accounts for Uganda, and identifies policy issues that need to be considered during government planning and budgeting.** The empirical results use a mixture of data for Uganda generated from local sources and, where there are gaps, data from the World Bank Adjusted Net Savings (ANS) and CWON databases. Based on these results, implications for policy and planning are identified, to be incorporated into NDP III.

6. **Natural capital accounting (NCA) for Uganda is intended to be an ongoing exercise.** Many of the indicators need to be calculated and updated annually, and should be presented alongside other measures of economic activity so that they can guide both long term and medium-term plans and budgets. It is also intended that targets for the key indicators will be included in the Monitoring and Evaluation Framework for NDP III, and hence performance against those targets will need to be regularly assessed. Given that resource-based industrialisation plays a central role in NDP III, natural capital accounting measures will be central to monitoring the implementation and impact of the strategy. Furthermore, development of some of the desired indicators is incomplete, as data sources will need to be identified and developed, so that new components of national wealth – such as oil and gas resources – can be incorporated. Hence there will be an ongoing NCA work programme.

7. **The rest of this issues paper is structured as follows.** Section 2 briefly describes the relevant adjusted macroeconomic indicators and wealth measures, and Section 3 presents the methods used whilst Section 4 discusses results for Uganda. Section 5 presents policy implications, identifies links with NDP III strategies and proposes indicators to be included in the NDP III M&E framework along with target values.

Section 6 concludes and lays out the future work plan (developing data sources, extending the coverage of indicators and reporting frameworks).

1.1 Links to National Development Plans

8. **Uganda's development planning is encapsulated in the Comprehensive National Development Planning Framework (CNDPF) that was developed in 2007.** To realize the 30-year vision aspirations, five-year medium-term NDPs are formulated highlighting development priorities. Out of the expected six NDPs to be implemented by 2040, two have been implemented, NDP I and NDP II, which is ending in FY2019/20.

9. **The third National Development Plan (NDP III) for FY2020/21-2024/25 is in its formative phase.** NDP III aims at enhancing household incomes and improving the quality of life of the population by holistically focusing on resource-led industrialization for export-led growth.

10. **The theme of NDP III is '*Sustainable Industrialization for Inclusive Growth, Employment and Sustainable Wealth creation*'.** However, the currently available metrics of performance of the economy do not adequately cater for sustainability, since they do not account for welfare changes or externalities. In addition, GDP growth measurements do not consider the impact on the stock of wealth of the economy. For instance, NDP III's focus on resource-led industrialization will involve depletion of non-renewable resources like oil, iron ore and phosphates. This means that an increase in GDP could result from depletion of these non-renewable resources. Similarly, with renewable resources, unless interventions to ensure sustainability are undertaken (reducing depletion to match natural regeneration), even renewable resources may be exhausted.

11. **The System of Environment-Economic Accounting (SEEA) broadens the measure of key macroeconomic indicators.** It takes into account the depletion of natural resources, accumulation or depletion of human capital and impacts of economic activity on the environment. The SEEA adjusted macroeconomic indicators (Adjusted Net National Income (ANNI) and Adjusted Net Savings (ANS) address key sustainability issues which are at the core of NDPIII's focus. The adjusted macroeconomic indicators will provide a reliable source of information for planning and policymaking as far as sustainability issues are concerned.

12. **Uganda is now regarded as a resource rich country[2] after the discovery of oil in the Albertine region.** Various projects and programs are underway to prepare for the

[2] A resource rich country is one where the Government derives a significant proportion of revenues from mineral resources (can be through different channels) (25% +), resources exports account for a

extraction of the oil. There will be a need to take precautionary measures when the oil revenues begin to flow, because the key fiscal and macroeconomic aggregates may be subject to high volatility that will be difficult to forecast, raising sustainability issues. Adjusted Macroeconomic Indicators will help determine if wealth creation is enough to offset the depletion of energy resources.

13. **The ANS and comprehensive wealth accounts both take into account the depletion of forests.** These indicators will be key in tracking the progress towards the attainment of the increased forest cover target and will complement the already existing indicators in tracking the forest cover of the country.

significant proportion of total export earnings and resources production accounts for a significant proportion of GDP.

2.0 MACROECONOMIC INDICATORS

2.1 Introduction

14. **The main macroeconomic and wealth indicators developed under the SEEA and the World Bank CWON project are as follows:**

Adjusted Macro-economic indicators

i) Adjusted net national income
ii) Adjusted net savings

Comprehensive wealth components

i) Produced capital
ii) Natural capital
iii) Financial capital
iv) Human capital

2.2 Adjusted Macroeconomic measures

15. **The main principles are to extend the range of economic activities and impacts that are measured. These principles are as follows:**

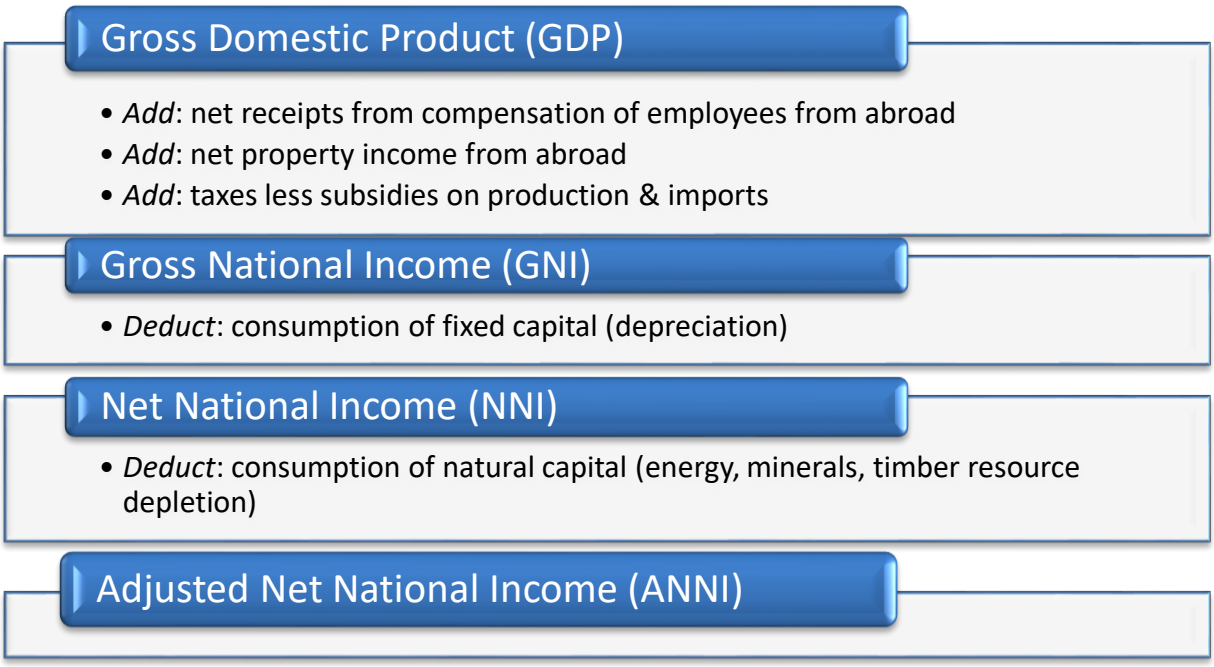
Adjusted Net National Income (ANNI): conventional measures of gross national income (GNI) are adjusted by deducting the value of depletion of assets, including produced capital (consumption of fixed capital) and natural capital (both renewable and non-renewable).

Adjusted Net Savings (ANS): conventional measures of gross national savings (GNS) are adjusted by adding the value of investment in human capital, deducting the value of depletion of assets (as above), and deducting the value of pollution damage.

16. **The depletion of non-renewable natural capital (such as minerals and energy resources) is measured directly by the depletion component of production (extraction).** For renewable natural capital (e.g. forests, fisheries), depletion is measured by the excess of production (extraction) over the natural rate of re-growth. In principle, the consumption of renewable natural capital is sustainable if it does not exceed the rate at which the resource regenerates.

17. **The ANNI measure is intended to adjust conventional measures of national income to take account of depletion of assets.** Conventional GDP or GNI measures – which are usually the basis for assessments of economic expansion - record gross income regardless of whether part of that "income" comes from the depletion of assets. ANNI is therefore a more accurate measure of real income.

Figure 1: Calculation of Adjusted Net National Income from GDP



18. **For the ANS calculation, the value of investment in human capital is added, as human capital is treated as part of the comprehensive wealth base of the economy.** It is proxied by the value of recurrent spending on education by the public, and if possible, also the private, sectors[3].

19. **The pollution damage incorporated in the ANS calculation has two components:** (i) the value of CO_2 emissions and (ii) the value of particulate ($PM^{2.5}$) emissions[4].

20. **ANS is particularly useful as it is a more comprehensive measurement and is directly linked to the components of comprehensive wealth.** A negative figure for ANS indicates that wealth is being depleted, and therefore that the pattern of economic activity is not sustainable.

21. **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 if it is closer to reality than the World Bank estimates.

[3] Only recurrent spending is included, as the investment component is already included in the measure of produced capital stock. For reasons of data availability and consistency across countries, the World Bank ANS calculation uses only data on public (i.e. government) spending on education.

[4] 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)

2.3 Comprehensive wealth measures

22. **The World Bank measure of comprehensive wealth comprises four main categories:** produced capital, net financial assets, natural capital and human capital. The first two form part of the conventional national accounts, but the second two are new additions.

23. **Produced capital**: also referred to as capital stock, generated alongside the national accounts after reflecting gross fixed capital formation (GFCF – additions to capital stock) and consumption of fixed capital (CFC – depletion of capital stock) each year.

24. **Net financial assets**: the balance of financial assets and liabilities with the rest of the world; conventionally generated as part of the balance of payments accounts and referred to as the International Investment Position (IIP).

25. **Natural capital – sub-soil 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, by definition.

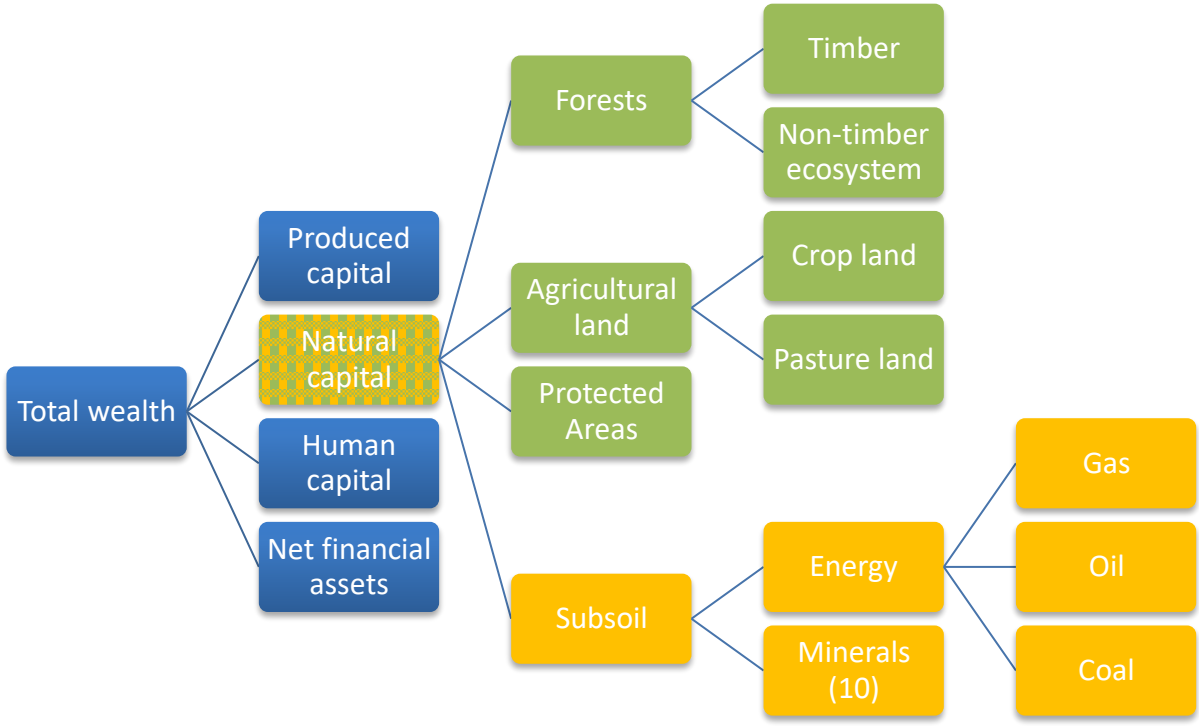
26. **Natural capital – above ground resources**: this is divided into several sub-categories, including agricultural land, forests and protected areas. Agricultural land is further sub-divided into cropland and pastureland. Forest land is divided into two categories, for timber and the non-timber ecosystem.

27. **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.

28. **Different methods are used to value the different forms of capital.** Net foreign assets are measured directly by the central bank as part of the balance of payments statistics. Produced capital stock figures can be generated by the Perpetual Inventory Method, whereby 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[5].

[5] For full details, see: Building the World Bank's Wealth Accounts: Methods and Data, 2018 (https://datacatalog.worldbank.org/dataset/wealth-accounting)

Figure 2: Composition of comprehensive wealth



29. **Comprehensive Wealth data 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, the then pattern of development may not be sustainable.

30. **Second, the composition of wealth can be tracked.** So, for instance, 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 up other forms of capital. So, for instance, if mineral or energy resources are being extracted, the value of the depletion should be matched by building up other assets – produced capital, human resources or financial assets – to compensate.

3.0 METHOD

31. **Our work uses Ugandan data for some variables that are components of Adjusted Net Savings (ANS) and Adjusted Net National Income (ANNI).** These variables are calculated annually by the World Bank. There is good reason to replace some of the World Bank data with local sources of data. For example, a relatively high proportion of Uganda's education expenditure comes from non-government sources which is not captured by the World Bank methodology. Therefore, there is merit in including private as well as public sources of education spending. The export price for timber products which is used by the World Bank poorly reflects Uganda's internal market, and Uganda is undergoing significant deforestation, hence domestic prices are more relevant. This exercise will also make it easier to calculate bespoke statistics in future, as more inputs are developed. This section will summarise what has been done and why, the issues encountered, and what improvements could be considered.

3.1 ANNI & ANS

32. **Adjusted Net National Income is Gross National Income adjusted for depreciation and natural capital depletion.** *Figure 1* shows the process. This project has not replicated the calculation of Gross National Income, as that is a well-defined process in the standard national accounts. Instead Gross National Income has been used as the starting point for calculating ANNI.

33. **Adjusted Net Savings is a more comprehensive measure of a country's inflows than Gross National Savings, from which the calculation begins.** *Figure 4* shows the process, but essentially, various deductions and additions are made in order to reflect a truer picture of income and expenditure. Firstly, depreciation of fixed assets is deducted. Then education expenditure is added to reflect investment in human capital. Natural capital depletion is deducted, and so are pollution damages.

Figure 3: Calculation of Adjusted Net Savings from Gross National Savings

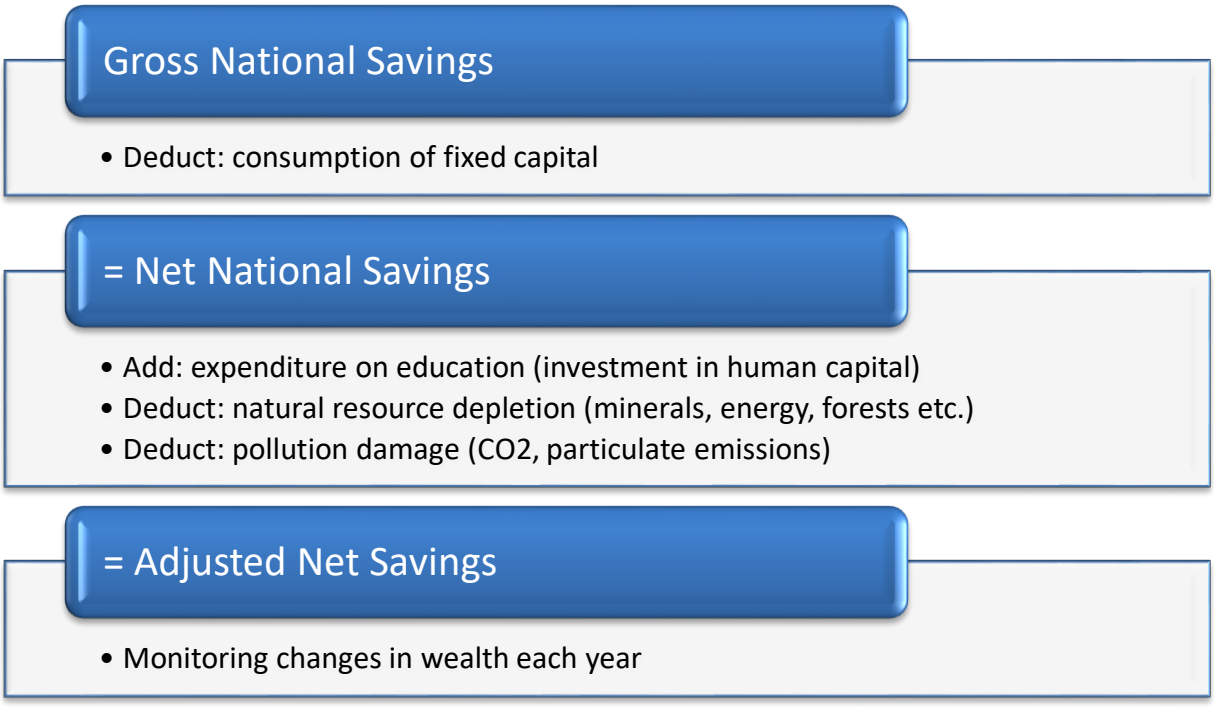
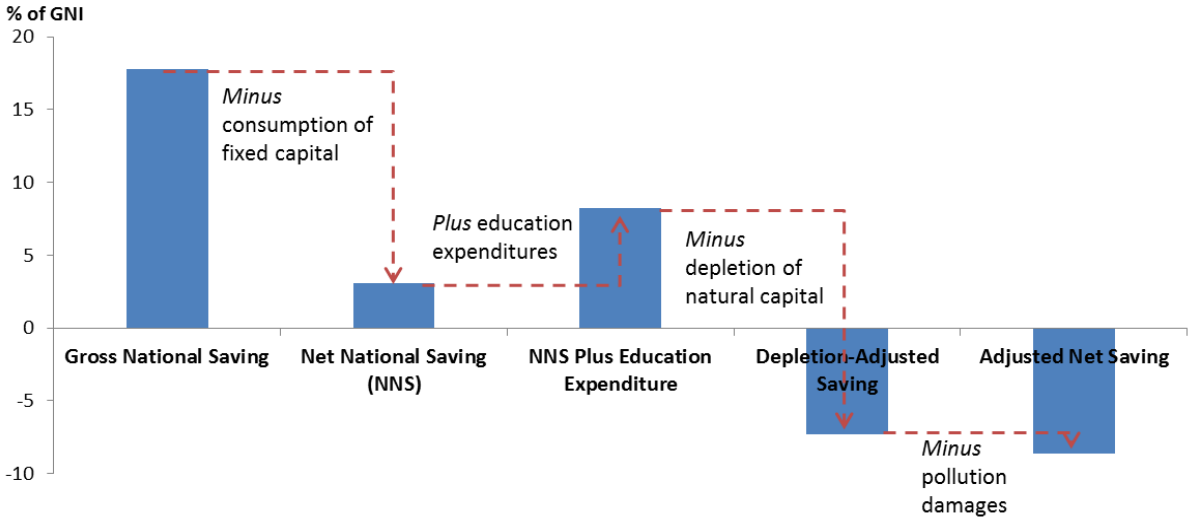


Figure 4: Adjusted Net Saving visualisation



34. **Adjusted Net Savings (ANS) and Adjusted Net National Income (ANNI) have been recalculated for Uganda, using locally available data, and some assumptions for:**

i) Consumption of fixed capital;
ii) Recurrent education expenditure, including non-government expenditure;
iii) Net forest depletion, and;
iv) CO_2 emissions from deforestation.

35. **In the medium term, these metrics should be improved, and new data should be added when it becomes available.**

3.1.1 Data Sources

36. **As the original work was carried out by the World Bank, most of the data is from this source.** Where an acceptable local alternative exists, it has replaced the World Bank data.

Table 1: Data utilised in this report

Variable	Source
Gross National Income (GNI)	*World Bank*
Gross National Saving (GNS)	*World Bank*
Consumption of fixed capital	*MoFPED*
GDP deflators	*UBoS*
Exchange rate (Shs/US$)	*BoU*
Education Expenditure	*UBOS & MoFPED*
Timber production by type	*UBOS*
Charcoal & wood fuel prices	*Estimated from Uganda National Charcoal Survey, 2016*
Poles and sawn timber prices	*UBOS*
Productive forest area	*Estimate based on conversations with NFA*
Energy depletion	*World Bank*
Mineral depletion	*World Bank*
Rental rate	*World Bank*
Annual commercial increment	*World Bank*
Baseline CO_2 damage	*World Bank*
Total forest area	*World Bank*[6]
CO_2 emissions per ha of deforestation	*Estimated from Uganda's Forest Reference Emission Level report*
Air pollution damage	*World Bank*

3.1.2 Methodology

3.1.2.1 Net National Saving

37. **Net national saving (NNS) is Gross National Saving (GNS) less consumption of fixed capital (CFC).** The logic is that depreciation of assets is equivalent to dissaving.

[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 2015). The source of the Uganda data included in the FRA is the National Forest Authority (NFA).

Consumption of fixed capital numbers come from the macroeconomic modelling team within MoFPED. They are based on a depreciation of 5% of the year's capital stock.

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

39. **Consumption of fixed capital was then deducted from Gross National Savings to give Net National Savings.**

3.1.2.2 NNS + Education Expenditures

40. **Recurrent education expenditure is then added to Net National Savings.** The logic here is that any expenditure on education is an investment in human capital, an asset of the country, so 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 Gross National Savings calculation. Furthermore, education expenditure includes spending by the public sector (government), the private sector (households) and development partners. This was considered important for Uganda, as it was suspected a large proportion of education spending came from outside government, and therefore would not be captured in World Bank data.

41. **Education spending data came from two sources.** The Education Satellite Accounts, compiled by UBOS, gave good information on the total education expenditure from all sources, including household, external and income generation. It also provided a breakdown of spending by recurrent and development.

42. **The education satellite accounts were only compiled for the period 2008/09 to 2013/14.** These were used to estimate the proportion of total spending that comes from government. Over the period it was 31.4%. We also estimated the proportion of total education spending that was recurrent. Over the period it was 83.5%.

43. **Government data on education expenditure was uplifted to give an estimate for total expenditure.** This data series runs from 1997/98 to 2016/17, and was uplifted by 318.7%, to give an estimate for total expenditure, based on the ratio of 31.4% of total expenditure coming from government. 83.5% of total education expenditure was assumed to be recurrent.

44. **This estimate was then converted to calendar years, and added to Net National Savings to give NNS + Education Expenditure.**

3.1.2.3 Depletion Adjusted Saving

45. **Depletion Adjusted Savings (DAS) are NNS + Education Expenditures less net natural capital depletion.** The logic is that if you are saving at the expense of depleting natural capital, you are not really saving. Both renewable (forests) and non-renewable (energy and minerals) resources are included in the World Bank methodology, and so are also included here.

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

47. **Net natural capital depletion was deducted from NNS + Education to give Depletion Adjusted Savings.**

3.1.2.4 Adjusted Net Saving

48. **Adjusted Net Savings (ANS) is Depletion Adjusted Savings less pollution damages.** The logic is that you are not truly saving, if that saving comes with negative externalities. 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.

49. **Pollution damages, under the World Bank methodology, are 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 it was clear from the net forest depletion calculations that deforestation is a significant factor in Uganda[7].

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

50. **For baseline CO_2 damage and air pollution damage World Bank numbers were used.** For deforestation CO_2 damages we produced our own estimate.

51. **The Forest Reference Emission Level report[8] for Uganda gave us an estimate for the average annual CO_2 emissions from deforestation over the period 2000 to 2015.** When we compared this against the change in total forest area reported by the World Bank over the same period, we were able to estimate an average CO_2 emission per ha per year, of 73.7 tCO_2e. 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.

52. **The carbon price was inferred from World Bank data.** The annual CO_2 damage value provided in the Adjusted Net Saving 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.

53. **Both CO_2 damage estimates and air pollution damages were combined to give total pollution damage.** This was deducted from Depletion Adjusted Savings to give Adjusted Net Savings. Finally, the results were converted back into Ugandan Shillings, and also into financial years.

3.1.2.5 Adjusted Net National Income

54. **Adjusted Net National Income was calculated from the starting point of Gross National Income, as calculated by the World Bank.** From this MoFPED's estimation of consumption of fixed capital was deducted, just as for Net National Savings. This gave Net National Income. The same value for natural capital depletion was then deducted as was used for Depletion Adjusted Savings to give Adjusted Net National Income.

3.2 Comprehensive wealth

55. **No adjustments have been made to the World Bank methodology, or data for comprehensive wealth.** However, this is something worth considering for the future. Some changes were considered, but it was concluded that, at this point in time, any

[8] 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

modifications that could be made, would not lead to greater accuracy. This may change, for example, as natural capital accounts are developed further in Uganda.

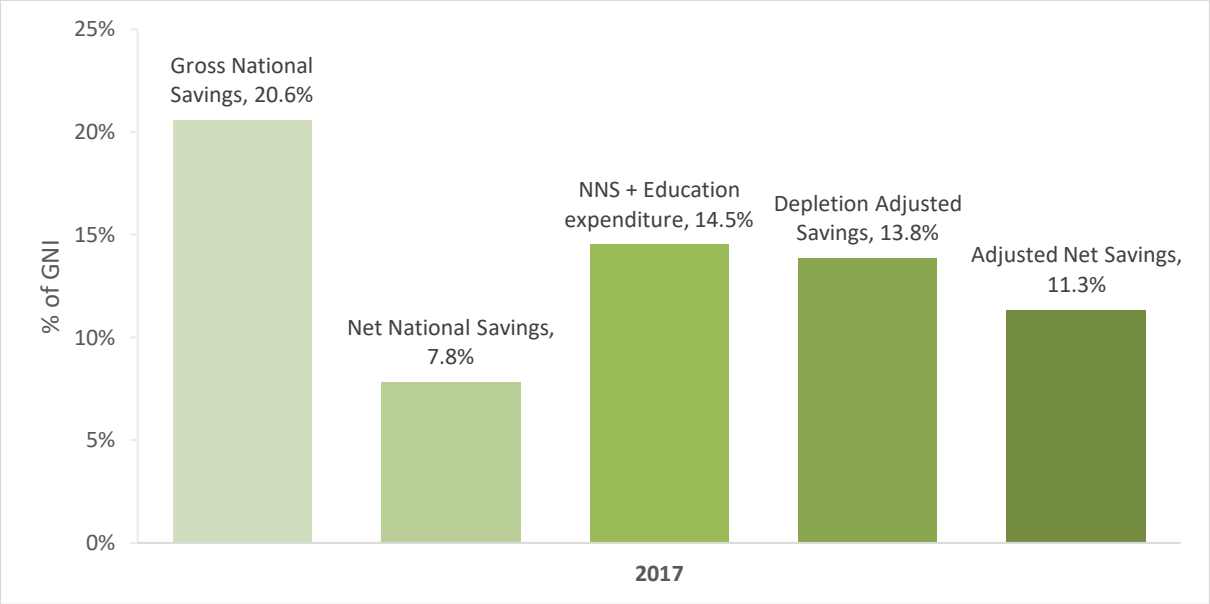
56. **The World Bank estimates human capital wealth based on an income method, which is a valid methodology.** Uganda's high proportion of non-government expenditure on education is not problematic here, as income-based measures of human capital capture all education, however obtained, by definition. Human capital was recalculated for Uganda, using an alternative, expenditure methodology, as part of the preparations for this paper. The World Bank's method was deemed to be more comprehensive, as the expenditure method delivered a very low value for human capital. This implies that either there is a lot of informal education of value in Uganda, such as learning on the job (a high productivity uplift), there is a lot of education and training completed abroad, or education expenditure is very good value for money in Uganda. Any combination of these could be true. The expenditure method therefore did not give better, or more believable numbers, so it was dismissed.

4.0 RESULTS

4.1 Adjusted macroeconomic measures

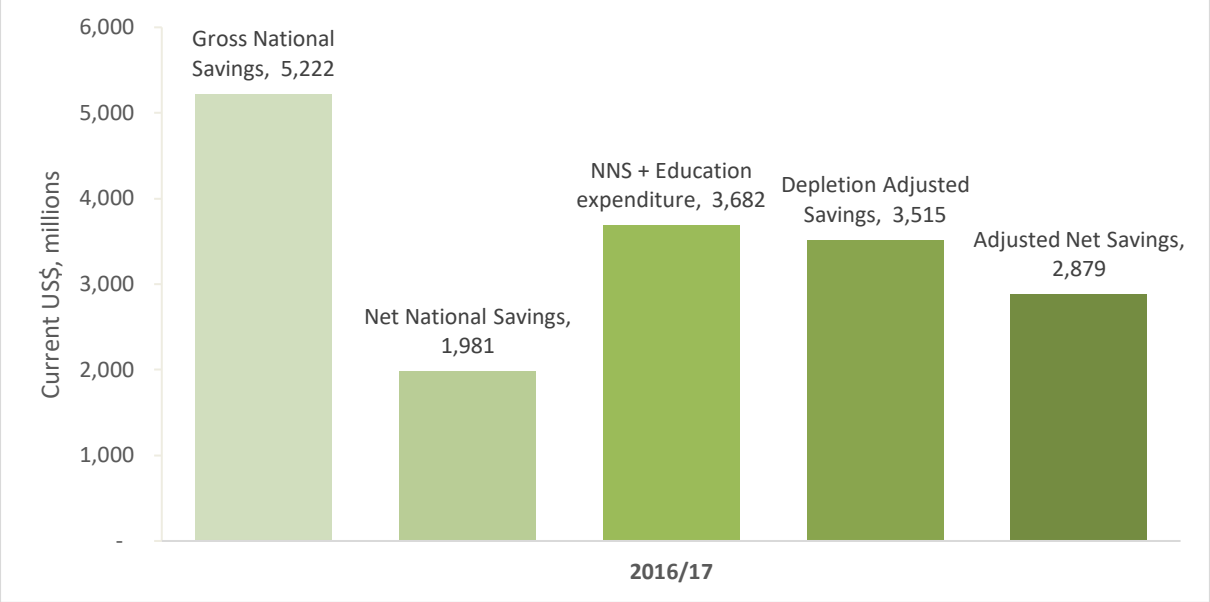
57. **From this analysis Uganda demonstrated a positive Adjusted Net Savings in 2017 (contrary to the World Bank results).** This is because education expenditure has increased, due to the addition of non-government spending, and the monetary value of net forest depletion has decreased, due to using local market prices of timber products which are lower than the World Bank estimates. The biggest negative impact comes from consumption of fixed capital, which may even be a low estimate[9].

Figure 5: ANS visualisation as a % of GNI (2017)



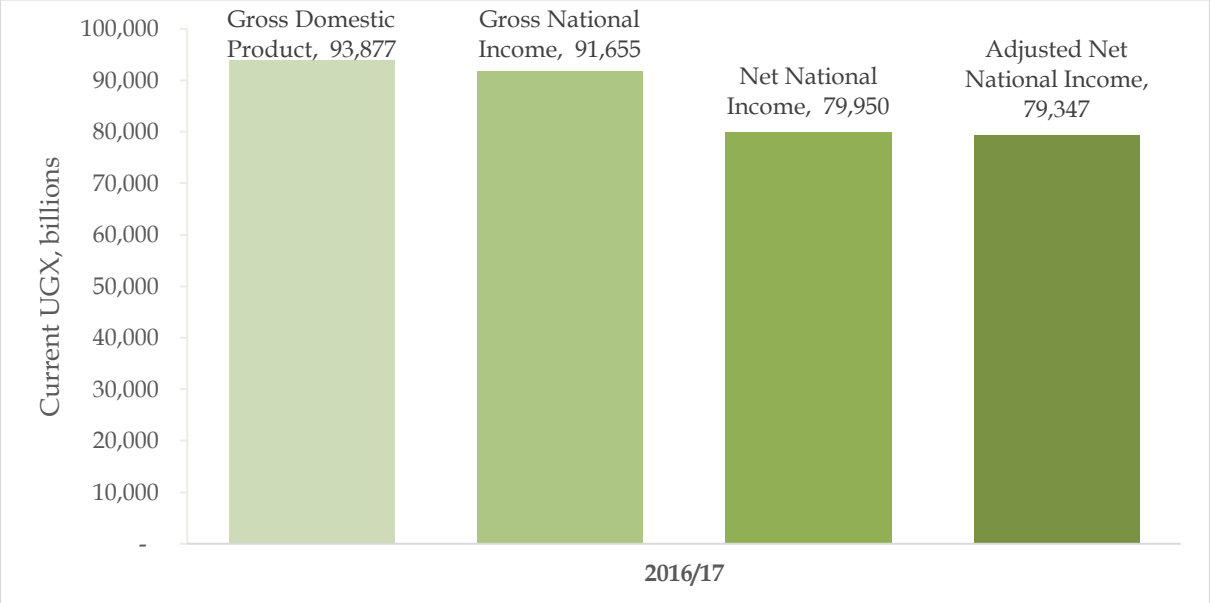
[9] The assumed rate for CFC of 5% of existing capital stock each year is low by international standards. Future research will aim to produce a more refined estimate, reflecting the expected service lives of different types of capital assets.

Figure 6: ANS visualisation in current Ugandan Shillings (2016/17)



58. **Adjusted Net National Income is also relatively high, as a result of a low net natural capital depletion.** Again, this is because timber products have such a low monetary value in Uganda, and consumption of fixed capital may be an underestimate.

Figure 7: ANNI visualisation in current Ugandan Shillings (2016/17)

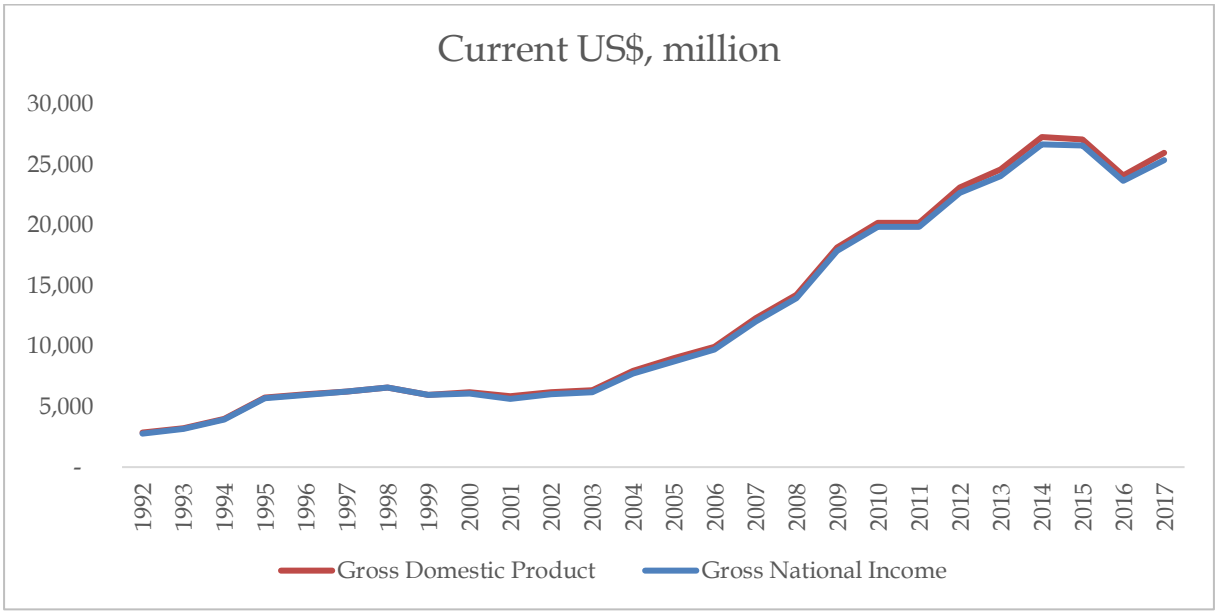


4.1.1 GDP and GNI

59. **Gross Domestic Product and Gross National Income (measured in US dollars) have been rising over time with a dip since 2015, and a dip in the early 2000's.** Changes in GDP have occurred due to a rebasing exercise of GDP which led to upwards revisions

in 2010 and 2014. The dip in 2016 may be related to the general election and exchange rate developments.

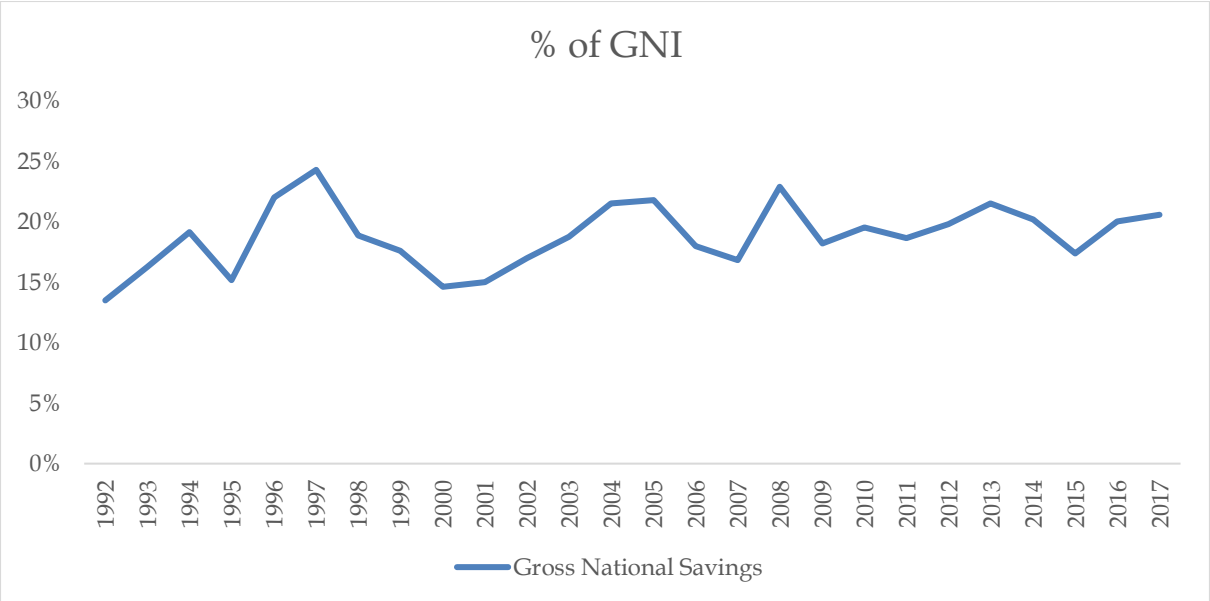
Figure 8: GDP & GNI over time



4.1.2 Gross National Saving

60. **Gross National Savings have remained steady as a proportion of GNI, despite targets to increase them. GNS** will be weighed down by budget deficits, which act as negative savings.

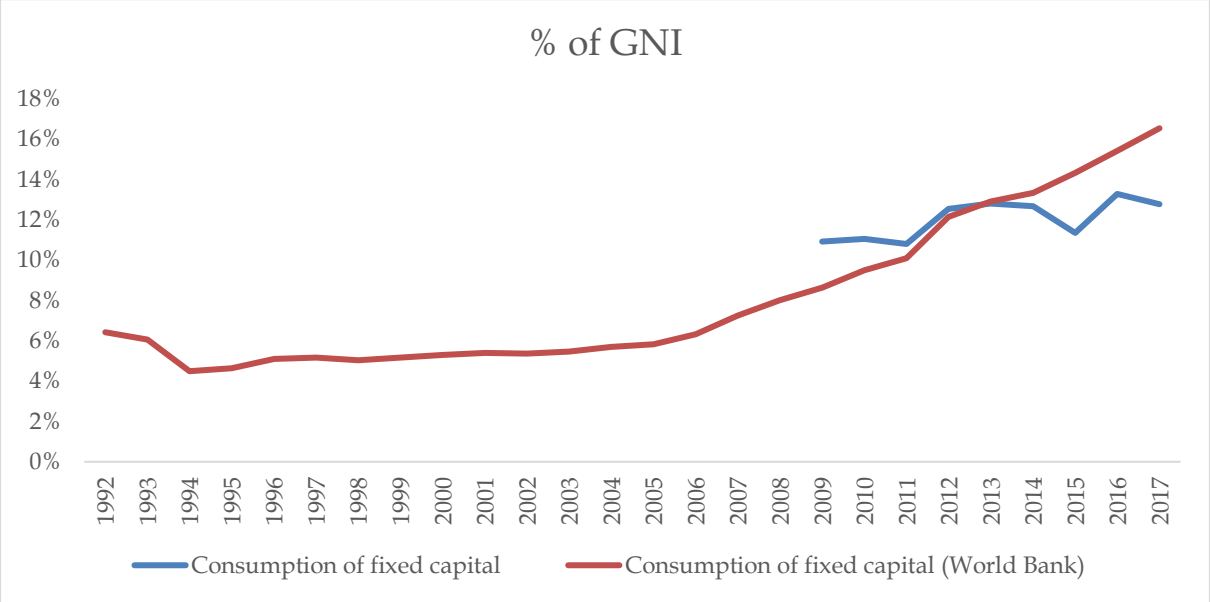
Figure 9: Gross National Saving over time as a % of GNI



4.1.3 Consumption of fixed capital

61. **MoFPED's data on consumption of fixed capital (CFC) used in this report has had a steady trend at around 12% of GNI.** However, it should be noted that this trend, resulting from a 5% depreciation rate, is low by international standards[10] and is flatter than that of the World Bank.

Figure 10: Consumption of fixed capital over time as a % of GNI

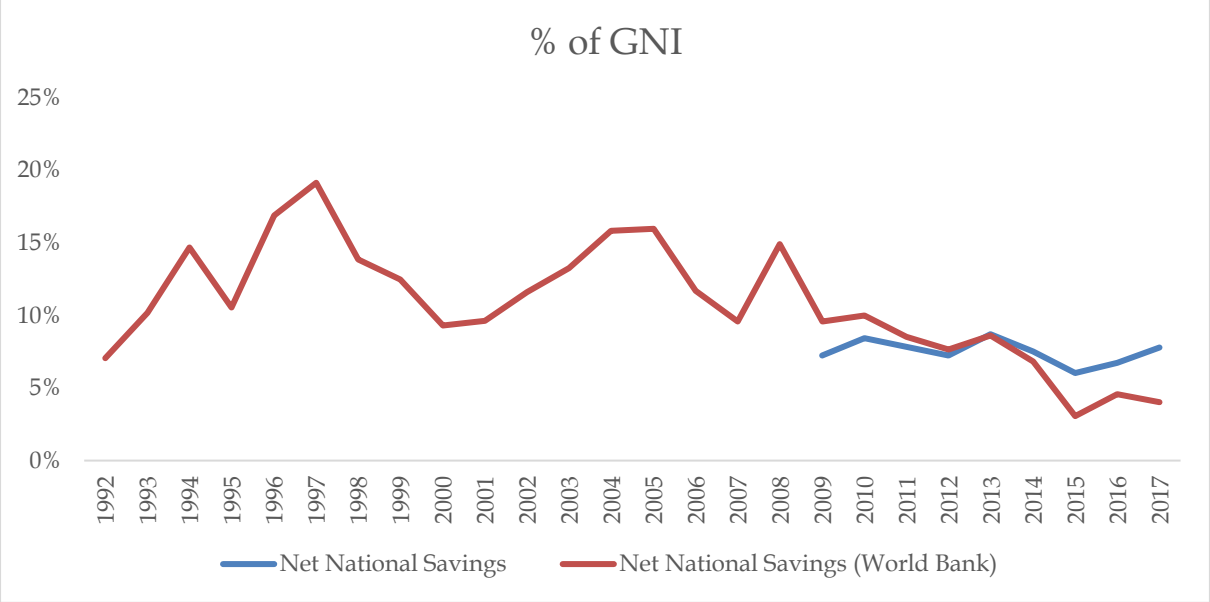


4.1.4 Net National Savings

62. **Net National Savings remain steady at around 7% of GNI.** This differs from a declining rate observed in the World Bank data.

[10] The production of an accurate data series for CFC requires an accurate data series for the stock of fixed capital. However, data on Uganda's capital stock is not (yet) published by UBOS. The value used here is estimated as part of MoFPED's macroeconomic modelling exercise. The divergence between the World Bank CFC series and the one used here most likely reflects a different capital stock estimation (the World Bank figures use the estimates contained in the Penn World Tables). As a general rule, it would be expected that the ratio of CFC to GNI would rise over time in a country experiencing a high level of investment (and hence an increasing ratio of capital stock to GNI).

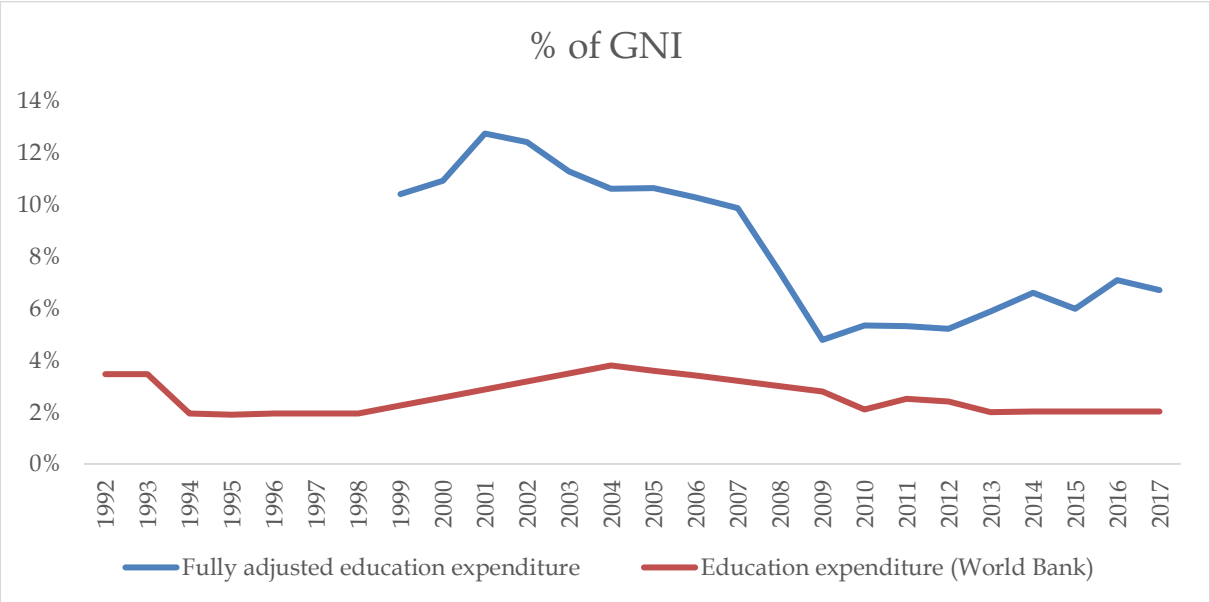
Figure 11: Net National Saving over time as a % of GNI



4.1.5 Education expenditure

63. **Education Expenditure, as expected, is much higher using our calculations than those of the World Bank.** That is because we include private expenditure on education. It has, however, declined over time, as education spending has grown more slowly than GNI. It is rising in recent years; however, it has seen a significant decline since the early 2000's.

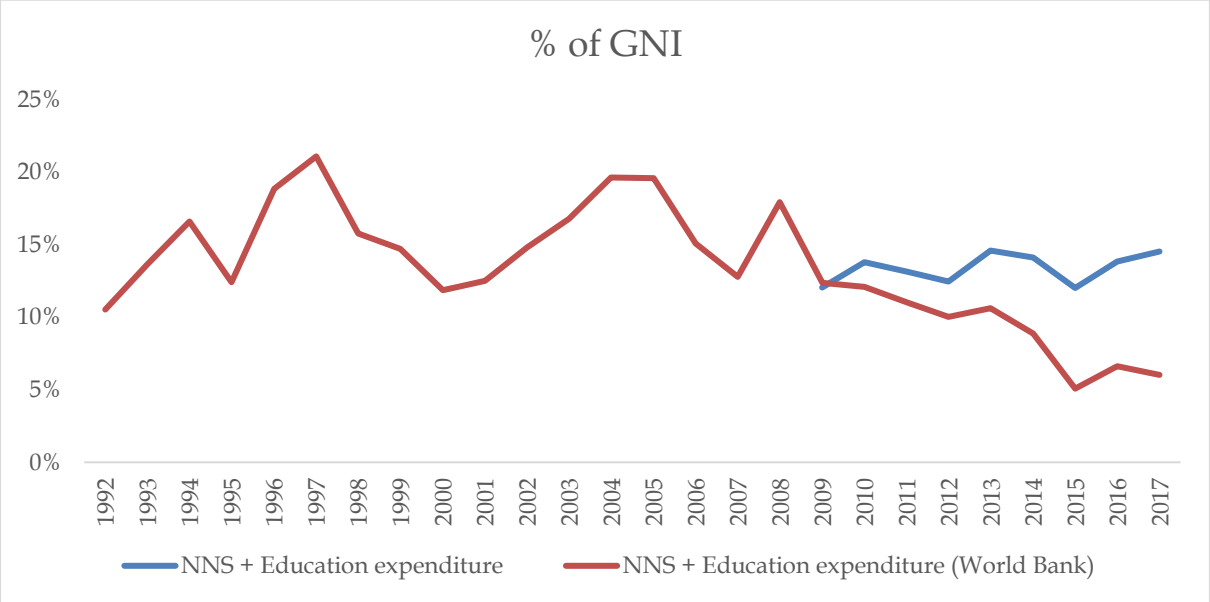
Figure 12: Education expenditure over time as a % of GNI



4.1.6 NNS + education expenditure

64. **NNS + Education Expenditure is higher than the World Bank in our calculations, due to higher education expenditure.** It remains flat as a proportion of GNI, at roughly 13%.

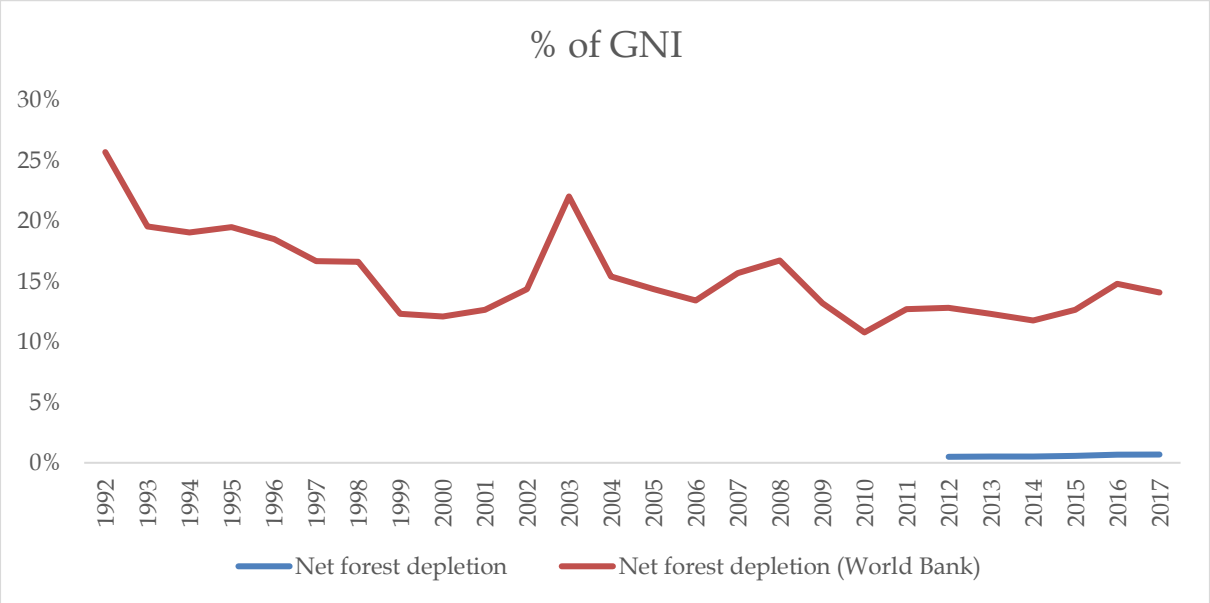
Figure 13: NNS + education expenditure over time as a % of GNI



4.1.7 Net forest depletion

65. **With new assumptions on the price of timber products, net forest depletion is very small compared to the World Bank's estimate.** It is however, increasing, suggesting it is becoming more of a problem, and should be addressed.

Figure 14: Net forest depletion over time as a % of GNI



4.1.8 Energy & mineral depletion

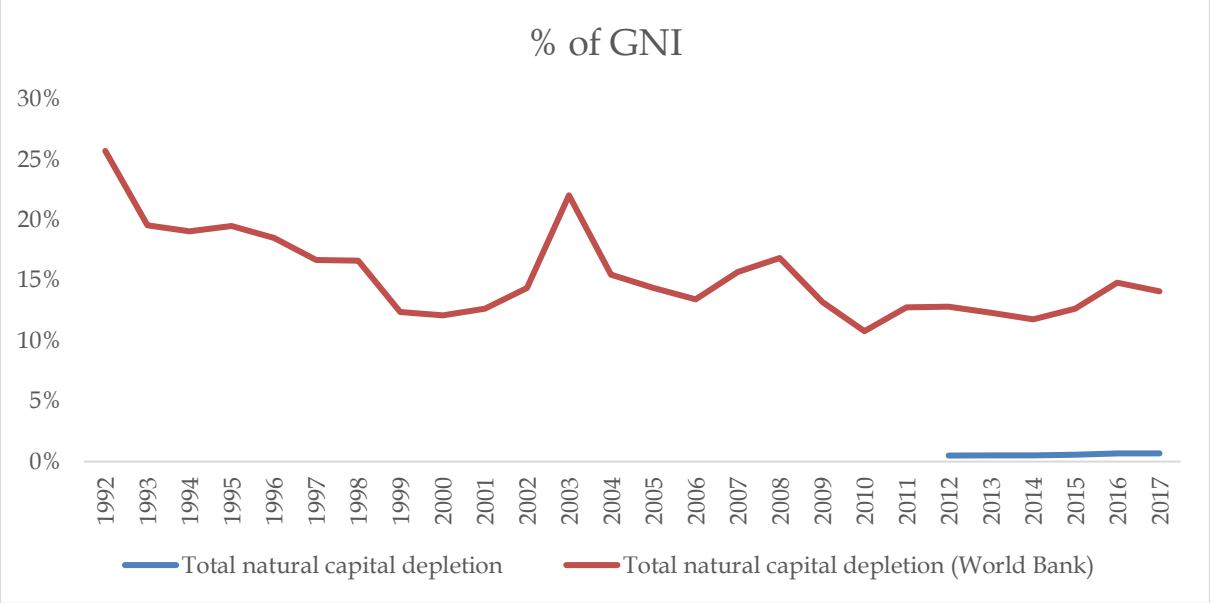
66. **The World Bank reports zero depletion of energy assets for Uganda, in all years, so we have assumed the same.** This reflects the fact that Uganda does not currently produce oil, gas or coal. However, this will change in future as oil and gas production comes on stream, and future estimates of ANS will need to incorporate energy depletion.

67. **Mineral depletion in Uganda is very small, less than 0.02% of GNI in most years, and less than 0.14% of GNI in all years.**

4.1.9 Total natural capital depletion

68. **Total natural capital depletion therefore mirrors net forest depletion almost exactly.**

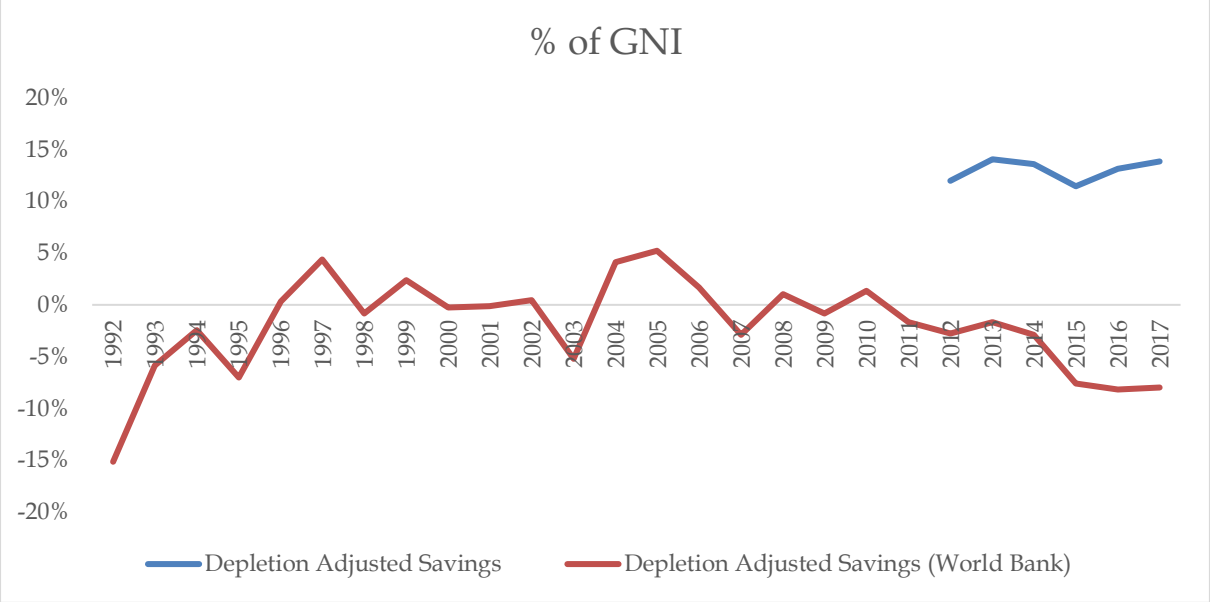
Figure 15: Total natural capital depletion over time as a % of GNI



4.1.10 Depletion Adjusted Saving

69. **Depletion Adjusted Savings are, as a result of lower forest depletion, positive for Uganda, remaining around 13-14% of GNI.** This contrasts against the World Bank estimates which put Depletion Adjusted Saving as negative from 2011 onwards.

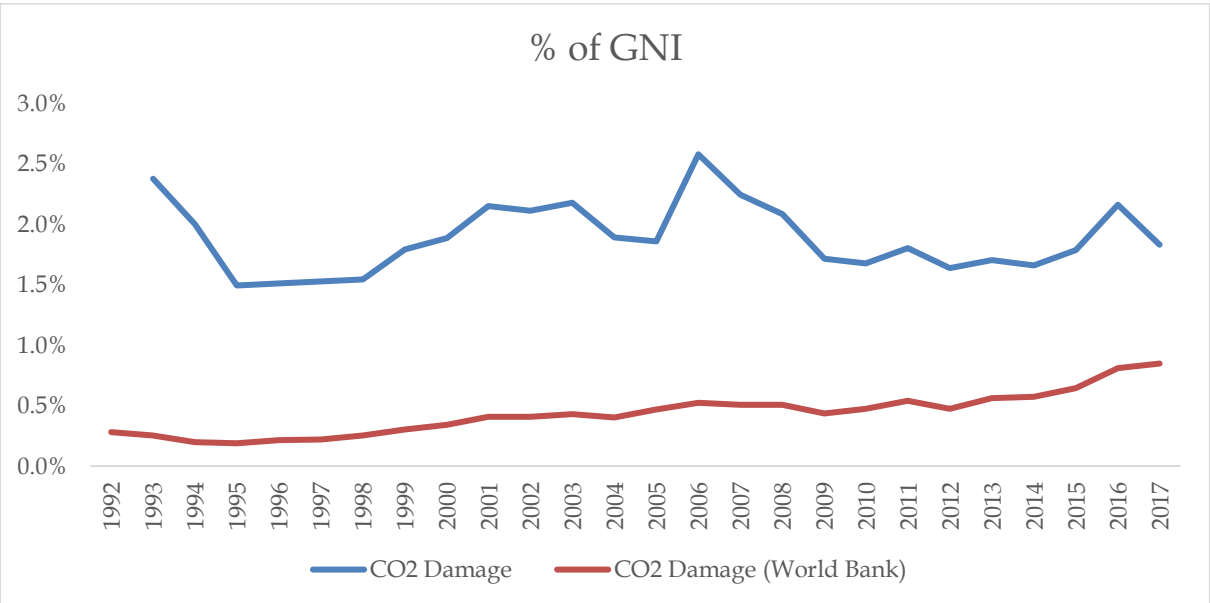
Figure 16: Depletion Adjusted Saving over time as a % of GNI



4.1.11 CO_2 damage

70. **CO_2 damage is roughly twice as high under our estimates than World Bank ones, due to the inclusion of emissions from deforestation.** They are roughly 2% of GNI in the later years.

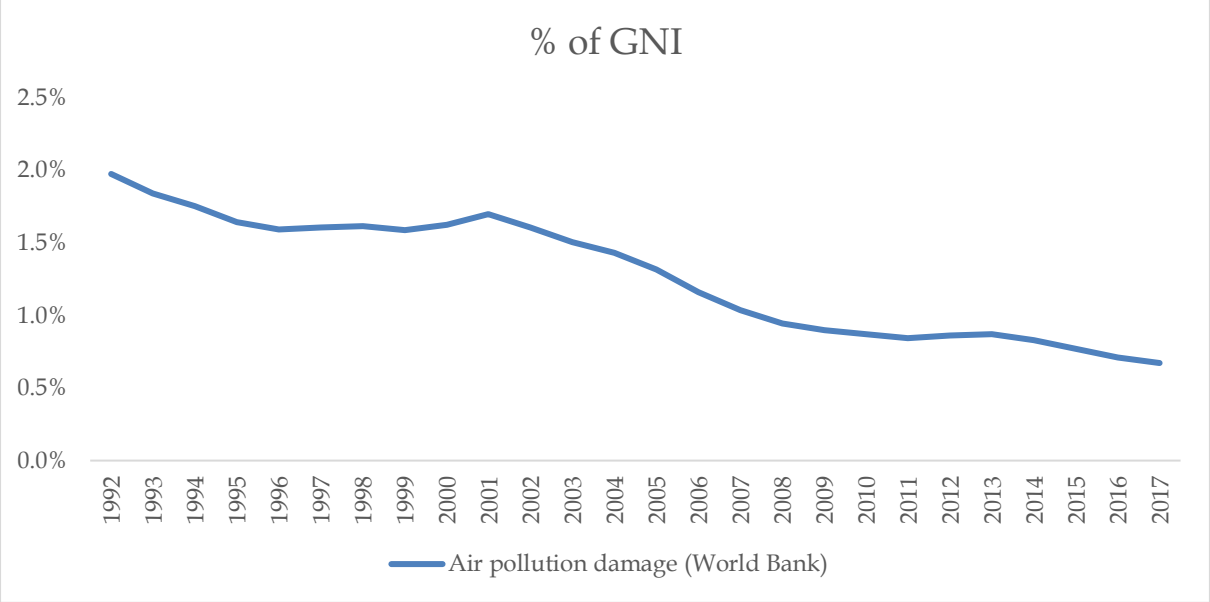
Figure 17: CO_2 damage over time as a % of GNI



4.1.12 Air pollution damage

71. **Air pollution damage, whilst rising in Uganda, has fallen as a % of GNI.** It is slightly smaller than CO_2 damage.

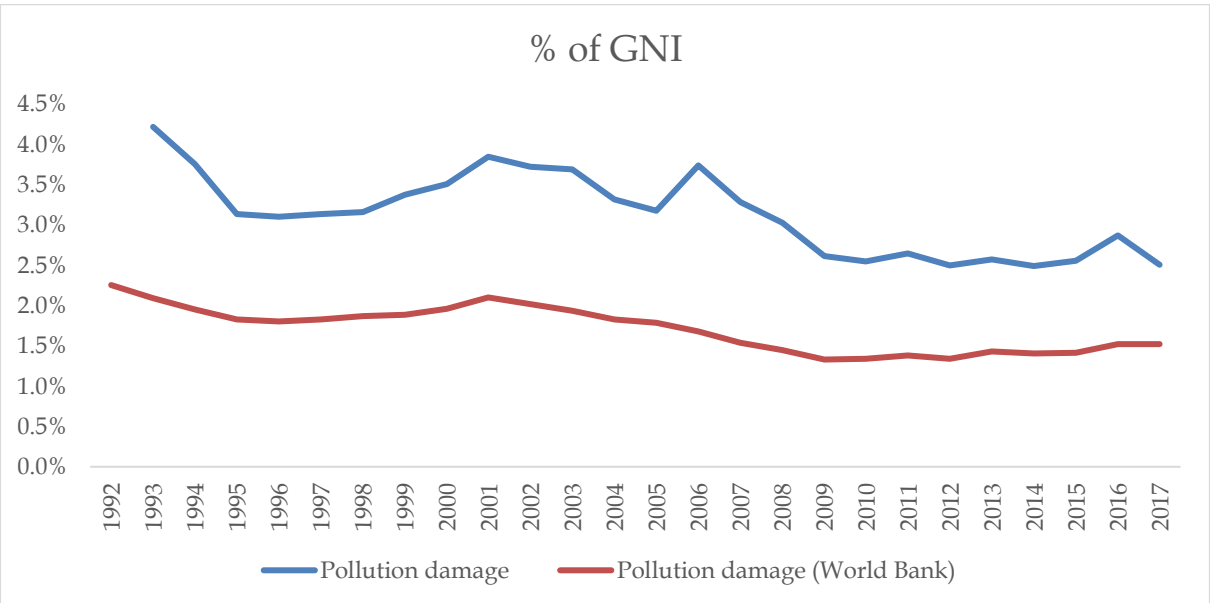
Figure 18: Air pollution damage over time as a % of GNI



4.1.13 Total pollution damage

72. **Pollution damage has been steady since 2011 at just under 3% of GNI.** This is higher than the World Bank estimate by about 1%, due to the introduction of deforestation emissions.

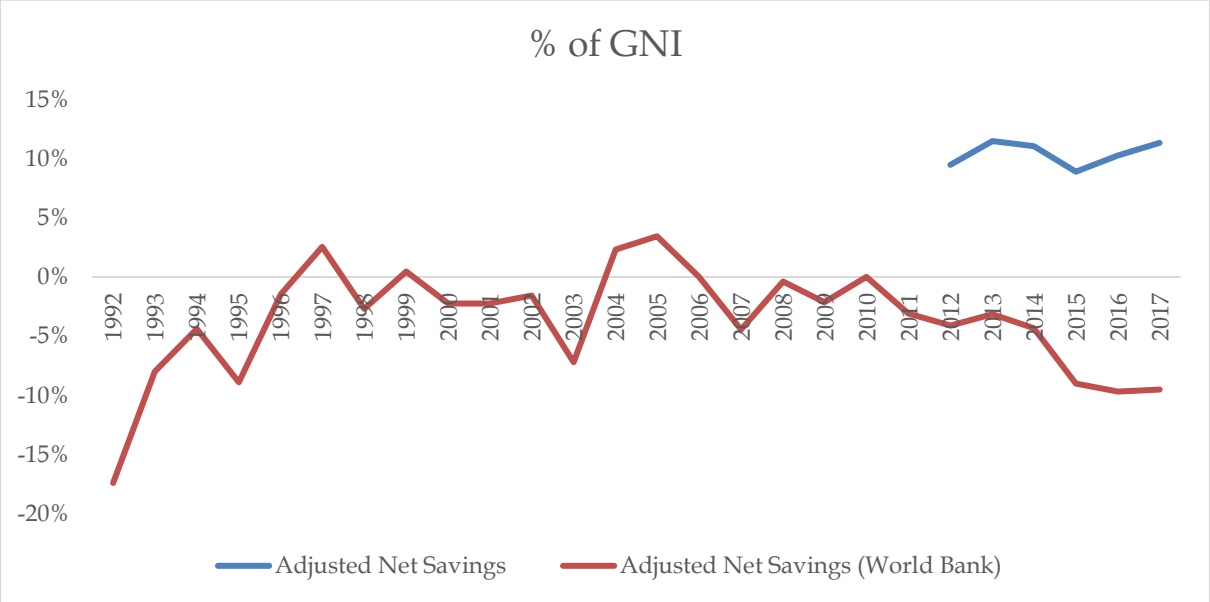
Figure 19: Total pollution damage over time as a % of GNI



4.1.14 Adjusted Net Savings

73. **Adjusted Net Savings remain positive for Uganda, again contrasting the results of the World Bank.** There are too few data points to observe a long-term trend, but it seems to be fluctuating around 9-11% of GNI.

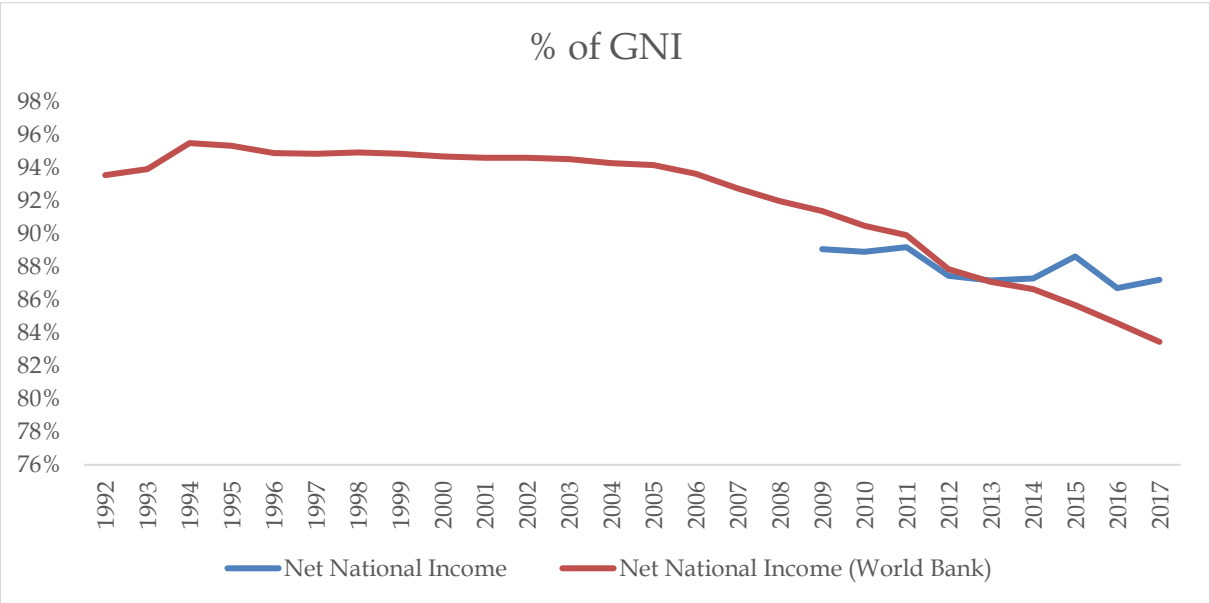
Figure 20: Adjusted Net Saving over time as a % of GNI



4.1.15 Net National Income

74. **Net National Income is higher than the World Bank's estimate, reflecting differences in consumption of fixed capital assumptions.** Consumption of fixed capital may be a low estimate in the data used here.

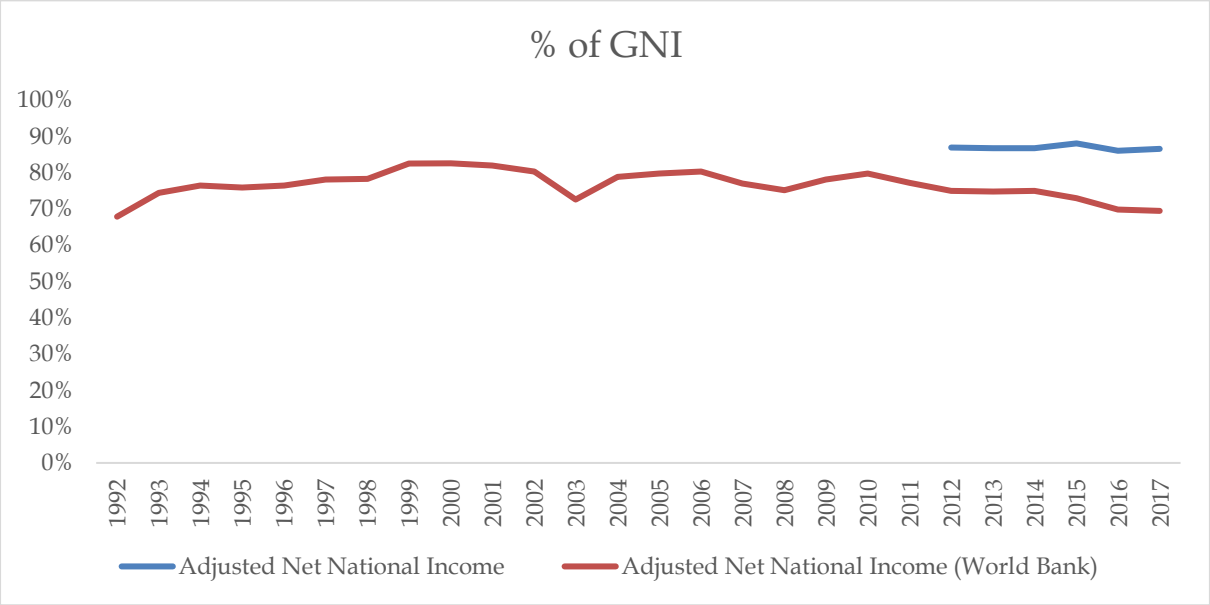
Figure 21: Net National Income over time as a % of GNI



4.1.16 Adjusted Net National Income

75. **Adjusted net national income barely differs from Net National Income, due to the small values for net natural capital depletion.** The World Bank estimate is much lower, due to their higher value of net natural capital depletion.

Figure 22: Adjusted Net National Income over time as a % of GNI



4.1.17 Concluding remarks

76. **The data suggests that Uganda is not currently growing at the expense of running down its capital, since Adjusted Net Saving is positive.** Two main adjustments in the calculation have contributed to this. The first one is high investment in human capital in form of education expenditure (both public and private) which has adequately compensated for natural capital use. The second is the low market prices attached to wood which drastically reduces the loss in natural capital compared to the World Bank estimates.

77. **For example, we can observe that forests are being depleted.** This does not have a big effect on the ANS results as the market values of products from the forests (primarily fuelwood and charcoal wood) are low. However, we may argue that market prices do not reflect the full economic costs of forest depletion, which are likely to be much higher. For example, the standing or fallen timber that is obtained from forests and other woodlands for the fuelwood/charcoal value chain is often treated as a free resource, as it is not paid for, so its economic value is not reflected in the cost of production or the market price. Beyond the value of timber, forests in Uganda are home to many rare and endangered species, such as gorillas and chimpanzees.

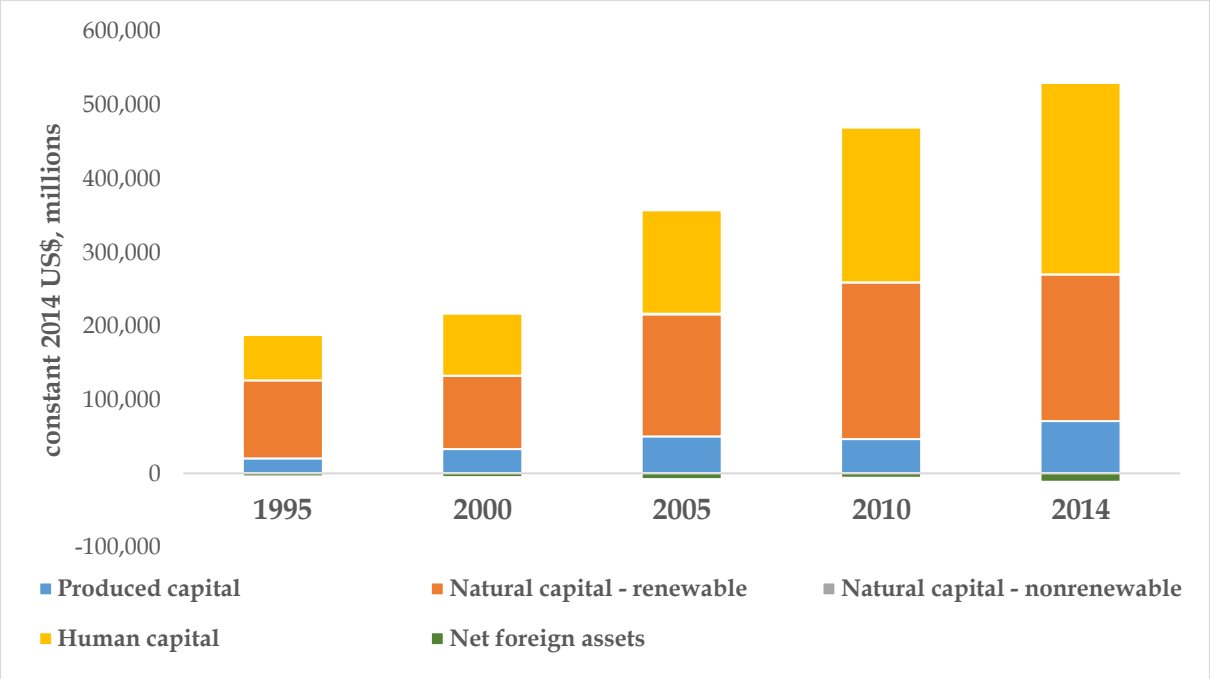
Deforestation surely impacts on the value of the forest as a habitat, but the loss of those additional services is not captured within this analysis.

4.2 Comprehensive wealth

78. **The Comprehensive Wealth of a nation comprises of four broad categories:** Produced Capital, Natural Capital, Human Capital and Net Foreign Assets.

- Produced Capital includes buildings, machinery, equipment and urban land
- Natural Capital includes forests, protected areas, cropland, pastureland, fossil fuel energy, minerals.
- Human Capital is the value embodied in the working population and is estimated directly as a discounted value of earnings over a person's lifetime.
- Net Foreign Assets (NFA) refer to the value of overseas assets owned by a nation, minus the value of its domestic assets that are owned by foreigners, adjusted for changes in valuation and exchange rates. The IMF also provides data on NFA.

Figure 23: Comprehensive wealth of Uganda



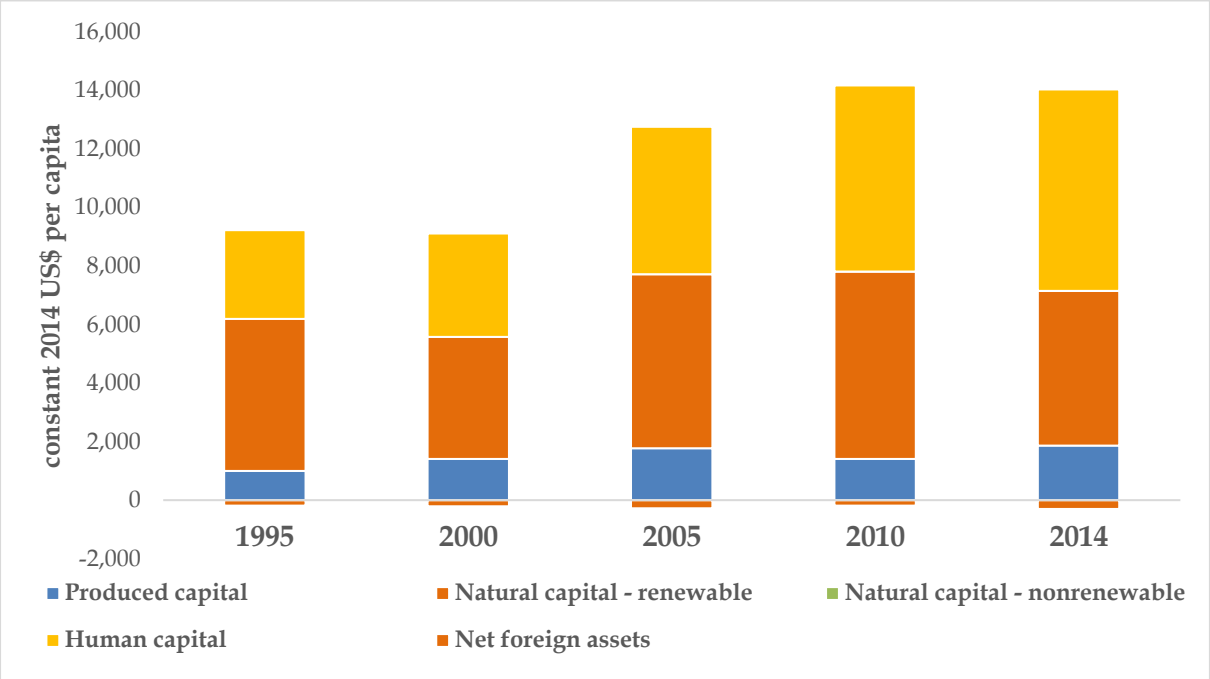
Source: WDI (World Bank)

79. **Uganda's Total Wealth increased by 182.1% to US$ 518,839 million in 2014 from US$ 183,930 million in 1995.** The main contributor of wealth to the country in 2014 was Human Capital, with a share of 50.2% of total wealth, followed by renewable[11] Natural

[11] Renewable includes forests, protected areas, and crop and pasture land.

Capital (38.4%), Produced Capital (13.6%), non-renewable[12] Natural Capital, while Net Foreign Assets (NFA) reduced it by 2.2%, as they were negative.

Figure 24: Per capita wealth of Uganda



Source: WDI (World Bank)

80. **Per capita wealth of Uganda slightly declined by 1.8% to US$ 13,732 in 2014 from US$ 13,979 in 2010, as shown by *Figure 24*.** There was also a slight decline in 2000, by 1.1% to US$ 8,907 from US$ 9,010 recorded in 1995, while there were increases in wealth per capita by 39.8% and 12.3% for 2005 and 2010 to US$ 12,453 and US$ 13,979, respectively. In some periods the population growth rate is higher than the rate of wealth accumulation, so per capita wealth declines.

81. **In 2014, human capital per capita was US$ 6,889.** Renewable Natural capital per capita was US$ 5,269. Produced capital per capita was US$ 1,872. Non-renewable Natural capital was US$ 1[13] and Net Foreign Assets per capita was US$ -299.

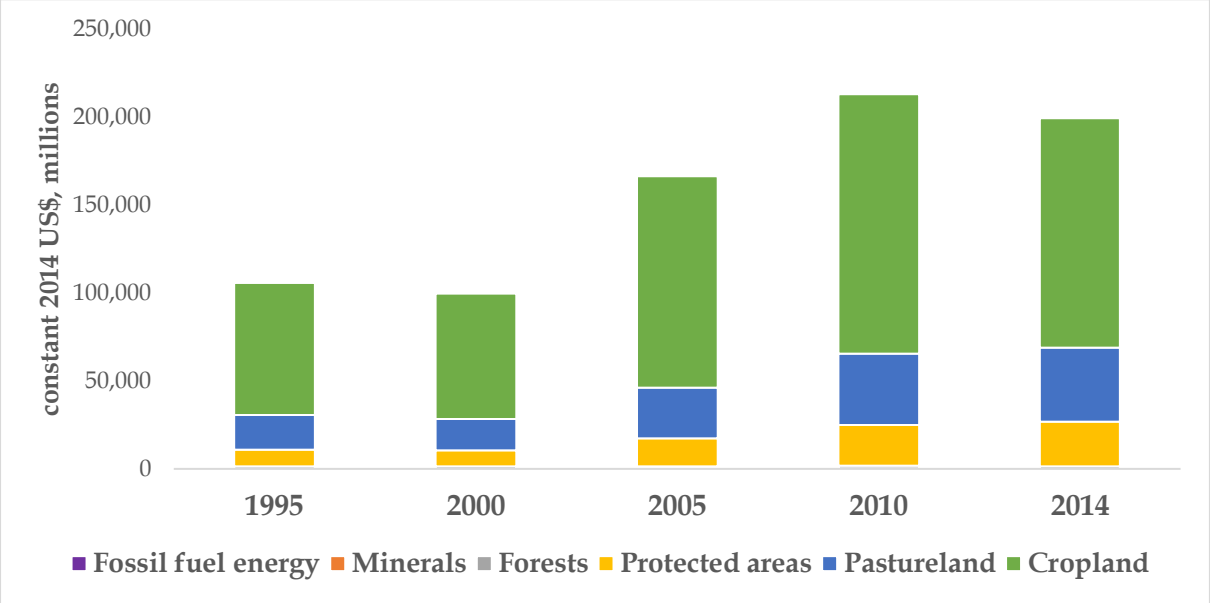
82. **Natural capital increased by 88.4% to US$ 199,092 million in 2014 from US$ 105,668 million in 1995.** The main components of natural capital in 2014 was cropland with a share of 65.4%, followed by pastureland (21.1%), protected areas (12.7%), forests

[12] Non-renewable refers to subsoil assets (oil, gas, coal, metals and minerals).

[13] Although Uganda has identified significant deposits of oil and gas, these are not yet included in the valuation of non-renewable natural capital. They will be included in future, when there is sufficient information regarding production costs, prices, and likely production volumes, all of which are required to derive an economic valuation of unexploited mineral and energy resources.

(0.7%), minerals and fossil fuel energy (0.1%). The very low value of forest wealth may seem surprising, given the importance that forest have in national discussions of land use. As noted above, the valuation of natural capital is derived as the net present value of future rental streams to be derived from the asset (whether renewable or non-renewable). The fact that forests are being depleted so rapidly means that their estimated lifespan is relatively short, resulting in a low valuation. However, there are some inconsistencies with the timber production and forest depletion calculations that need to be addressed, and which could potentially lead to a change in valuations in future.

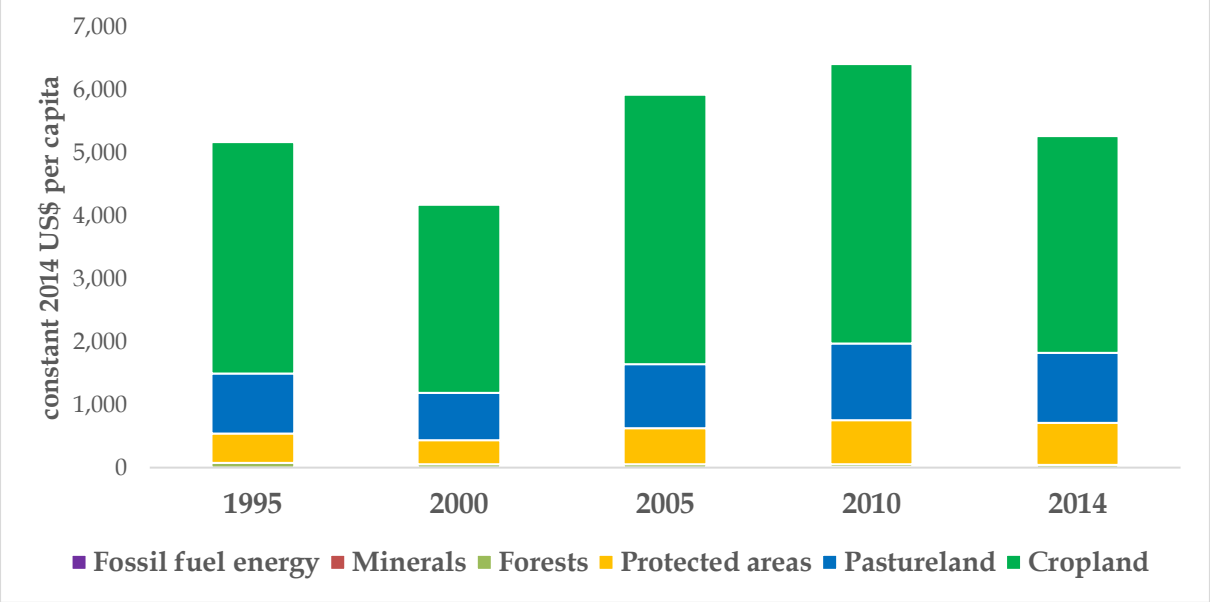
Figure 25: Natural capital wealth of Uganda



Source: WDI (World Bank)

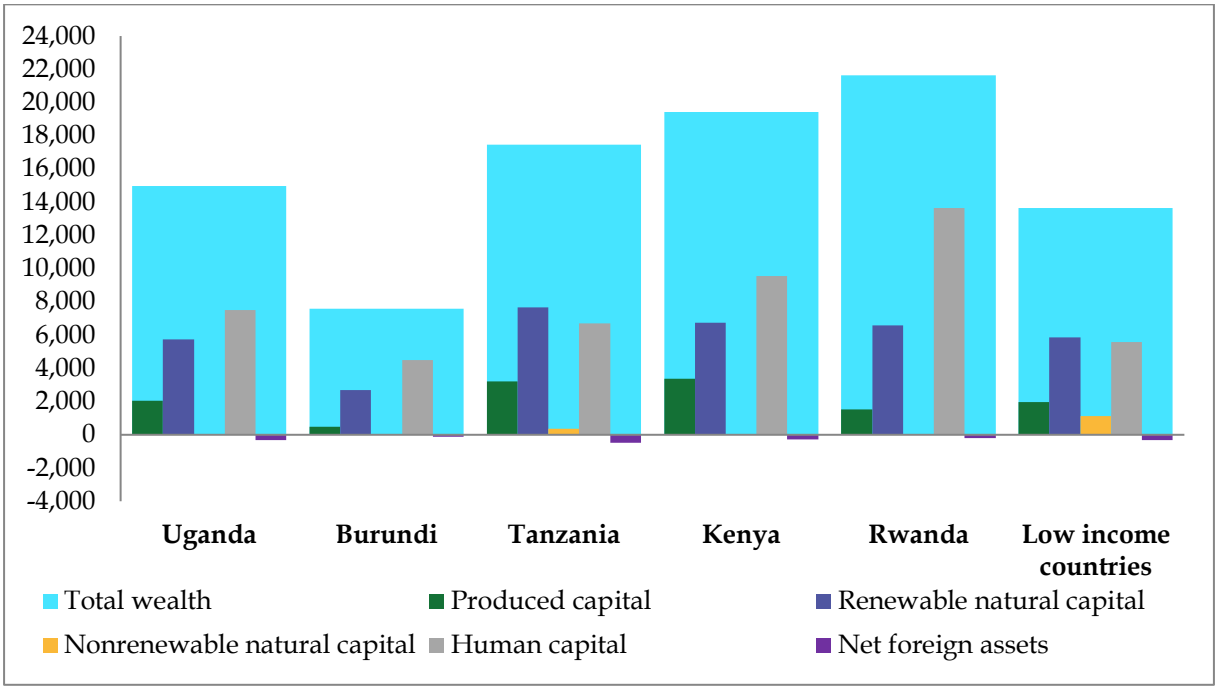
83. **Natural capital per capita of Uganda declined by 17.8% to US$ 5,269 in 2014 from US$ 6,412 in 2010.** Cropland was the main component with per capita value in 2014 being US$ 3,449, followed by pastureland (US$ 1,111), protected areas (US$ 671), forests (US$ 38) and minerals (US$ 1). The decline reflected both lower total natural capital and the increasing population.

Figure 26: Natural capital wealth per capita of Uganda



Source: WDI (World Bank)

Figure 27: Per Capita Wealth of East African Countries - Constant 2014 US$



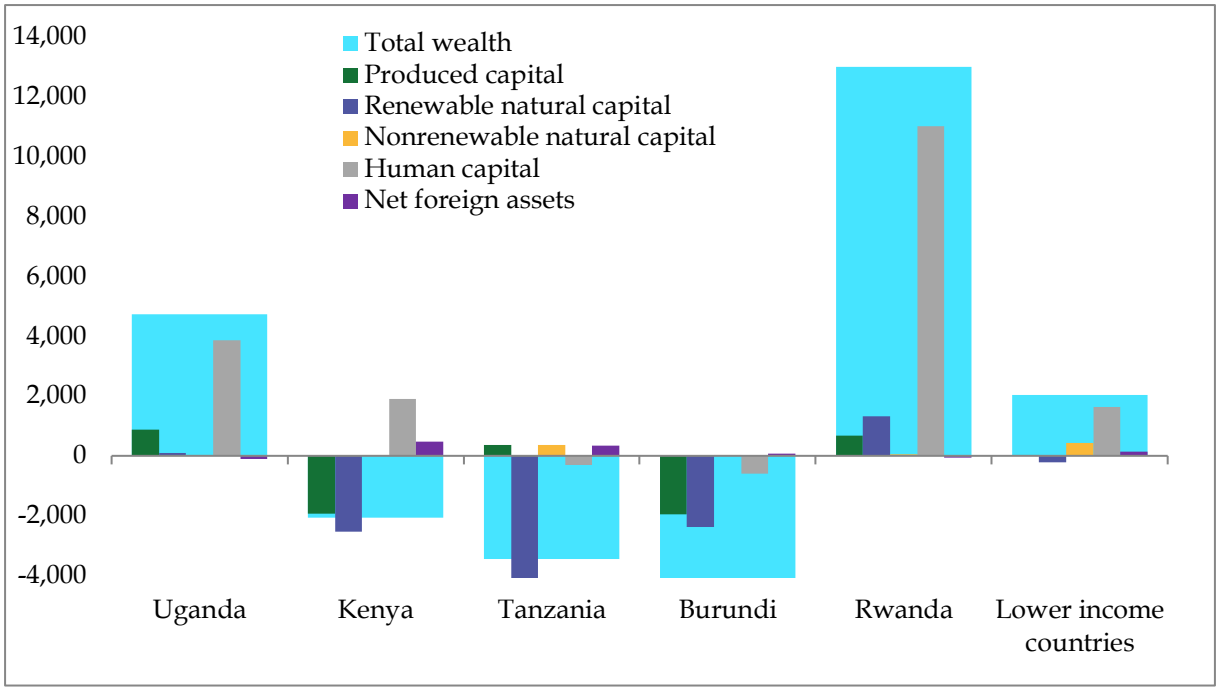
Source: WDI (World Bank)

84. **Per capita wealth for Uganda stood at US$ 13,732 in 2014, which was a decline by 2% from that recorded in 2010 of US$ 13,979.** The main contributors to wealth were human capital with a share of 50% (US$ 6,889) and natural capital with a share of 38% (US$ 5,269) as shown in *Figure 26*.

4.2.1 Comparison with other EAC countries

85. **Uganda's per capita wealth is greater than that of Burundi (US$ 7,579) and low-income-countries as a whole (US$ 13,629).** In the EAC, it is less than that of Tanzania (US$ 17,451), Kenya (US$ 19,412) and Rwanda (US$ 21,619). Human Capital and Natural Capital were the main contributors of Wealth in EAC as shown in
86. *Figure* 27.

Figure 28: Change in wealth per capita, 1995 to 2014: Uganda and other EAC countries



Source: WDI (World Bank)

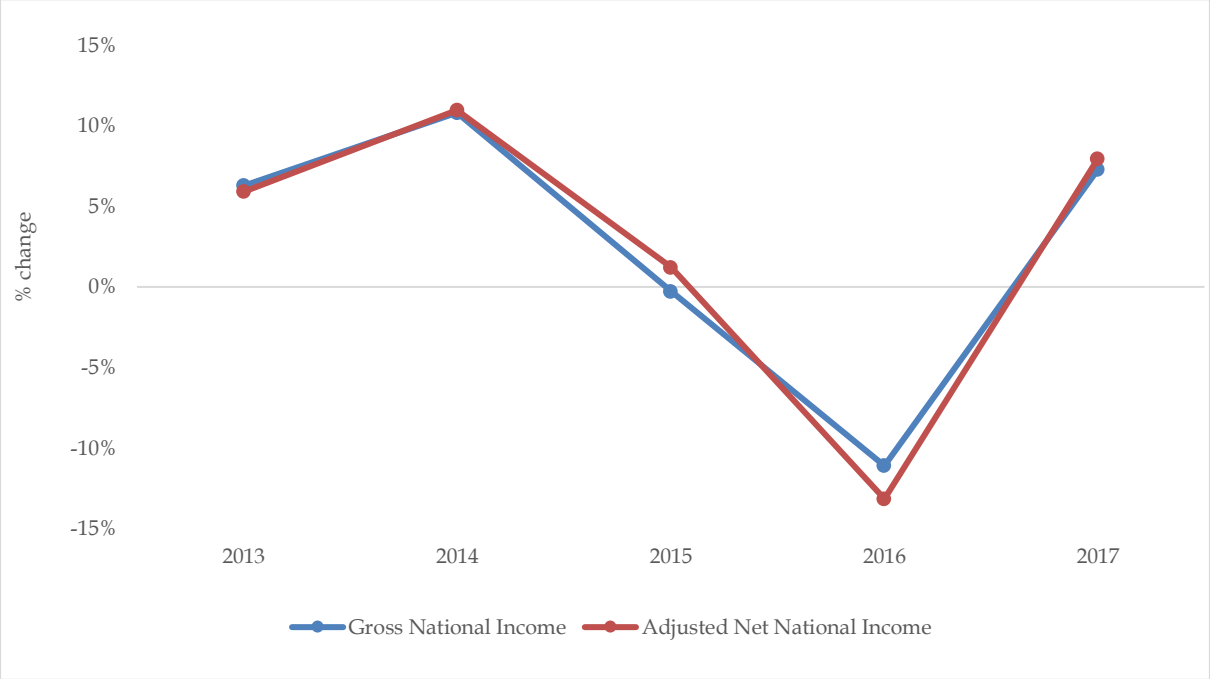
87. **Uganda's change in per capita wealth between 1995 and 2014 of US$ 4,722 was higher than that of Kenya (US$ -2,059), Tanzania (US$ -3,450) and Burundi (US$ -4,831), but below Rwanda's US$ 12,996.** It also had a better performance than the lower income countries' average. The main triggers of Uganda's change were human capital, which increased by US$ 3,863 (81% share), and produced capital which increased by US$ 868 (18% share). Rwanda's change in per capita wealth performance from 1995 to 2014 was the best in the EAC, mainly due to the change in human capital development. Human capital development is based on education expenditure and productivity gains. Recent investments in education programmes may be the reason for greater improvements in Uganda.

5.0 POLICY IMPLICATIONS

5.1 Adjusted Macroeconomic Indicators

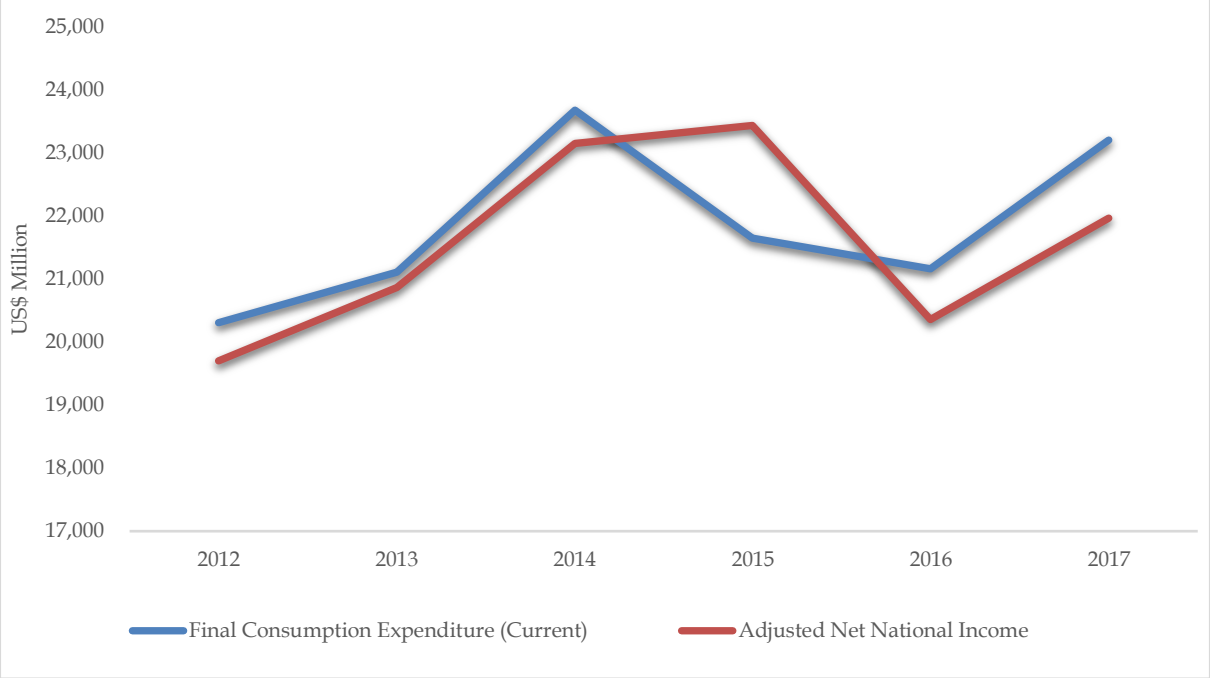
88. **National income has grown at a similar rate to adjusted net income over the past five years (Figure 31).** However, the growth in ANNI was lower that GNI growth in 2016, implying that growth during this period was partly as a result of resource depletion. Nonetheless, 2017 was marked by an improvement with the GNI growth rising slightly above ANNI growth, indicating that there was an accumulation of assets in this period. Notwithstanding the accumulation of wealth indicated by the higher growth in ANNI, Figure 32 points towards a widening negative gap between consumption expenditure and the ANNI in 2016 and 2017 which is an indication that consumption in the economy is being maintained by depletion of capital and hence unsustainable. The government should henceforth continue to improve the implementation of policies aimed at increasing the national income as espoused in the National Development Plan, develop and enforce existing policies aimed at reducing the depletion of non-renewable resources like forests as well as promote the sustainable extraction of non-renewable resources like oil and gas. To attain a sustainable growth path, the NDP III should target a growth rate in Adjusted Net National Income that is similar to GDP growth for the NDP III period. This in turn implies that ***ANNI should be one of the measures included in the NDP III Monitoring and Evaluation (M&E) framework.***

Figure 29: ANNI growth and GNI growth



Source: UBOS

Figure 30: ANNI and final consumption expenditure



Source: UBOS

5.1.1 Savings and the financial sector

89. **Higher savings can facilitate higher levels of investment in the economy, by providing enhanced access to credit or forms of finance for investment.** Consequently, productivity rises as does growth in the long run. Also, as the country is getting close to oil production, savings will be very important to keep the country's wealth balanced. In Uganda, growth in national savings remains low. The ratio of national savings to GDP rose from 15.4% in 2012/13 to 16% in 2017/18, against the NDP II target of 35% by 2019/20. Nonetheless, there have been improvements in the mobilization of savings by, for instance, the National Social Security Fund (NSSF), which has resulted in total savings held by the NSSF amounting to over UGX 9.98 trillion, which is equivalent to 9.9% of GDP. Additionally, remittances from Ugandans working abroad have increased significantly from USD 819 million in FY2010/11 to USD 1.4 billion in FY17/18, further boosting the national savings pool available for investment. However, bank lending rates remain high, averaging 20%. To increase access to affordable finance, government will act to deepen and broaden formal savings and investment channels, and reduce its own domestic borrowing, which crowds out other borrowers.

90. **In 2017, gross national savings increased to US$ 5,221 million from US$ 4,733 million in 2016.** Taking into account the depreciation of capital, depletion of renewable and non-renewable resources, and investment in human capital, the adjusted savings reduced to US$ 2,592 million. As a percentage of GNI, gross national savings was 20% whereas the various adjustments discussed above reduced ANS to

10.2% of GNI (See *Figure 32*). However, as ANS is still positive, this implies that the country is accumulating assets and building up its wealth. To increase real savings further, government should put in place more innovative strategies to promote savings in the economy, for instance to allow interest payments to mobile money savers. ***The NDP III target for the adjusted net savings should therefore follow the same trend as the national savings target.***

91. **Depreciation of fixed capital, carbon dioxide emissions, air pollution and deforestation are all high leading to reduction in the income and savings, according to the adjusted, sustainability, measures presented here.** Accordingly, we propose that in NDP III and its corresponding expenditure frameworks, government should invest in reducing fixed capital depreciation, carbon dioxide emissions, air pollution and deforestation as a strategy to increase savings and hence the nation's wealth. This could be through routine maintenance of fixed assets like roads to reduce depreciation, put in place more stringent measures to reduce deforestation and promote afforestation as well as implement interventions to reduce pollution and carbon dioxide emissions which have a negative impact on climate.

Figure 31: Composition of Adjusted Net Savings

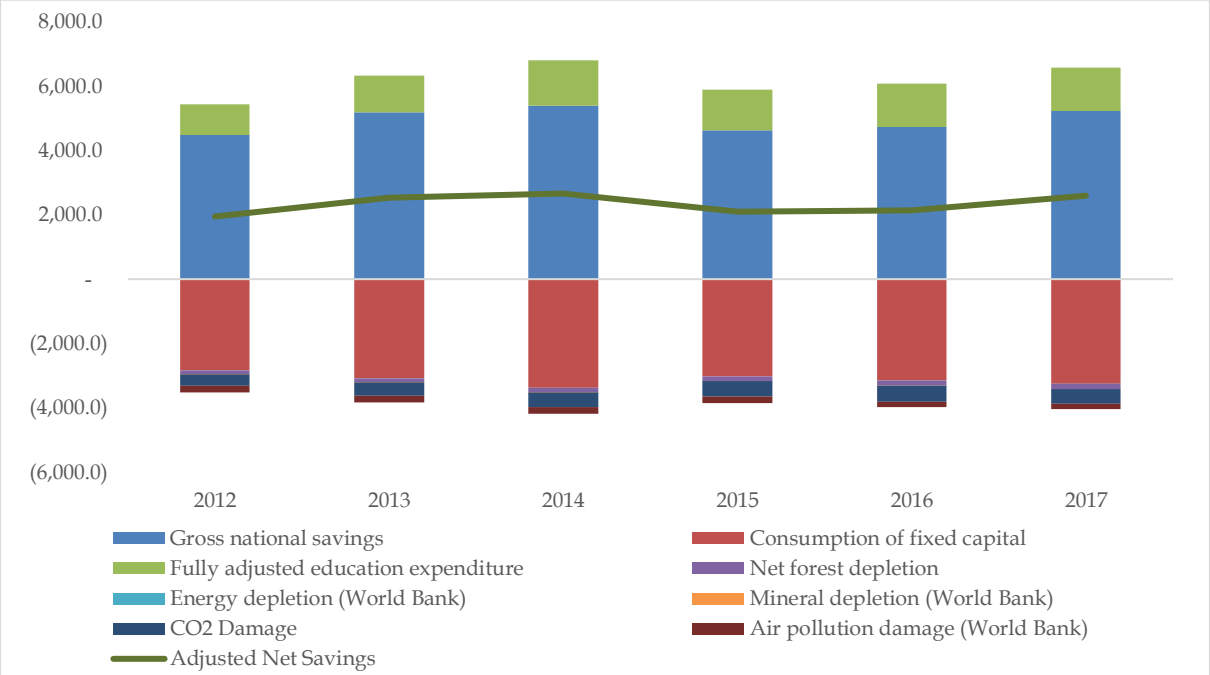
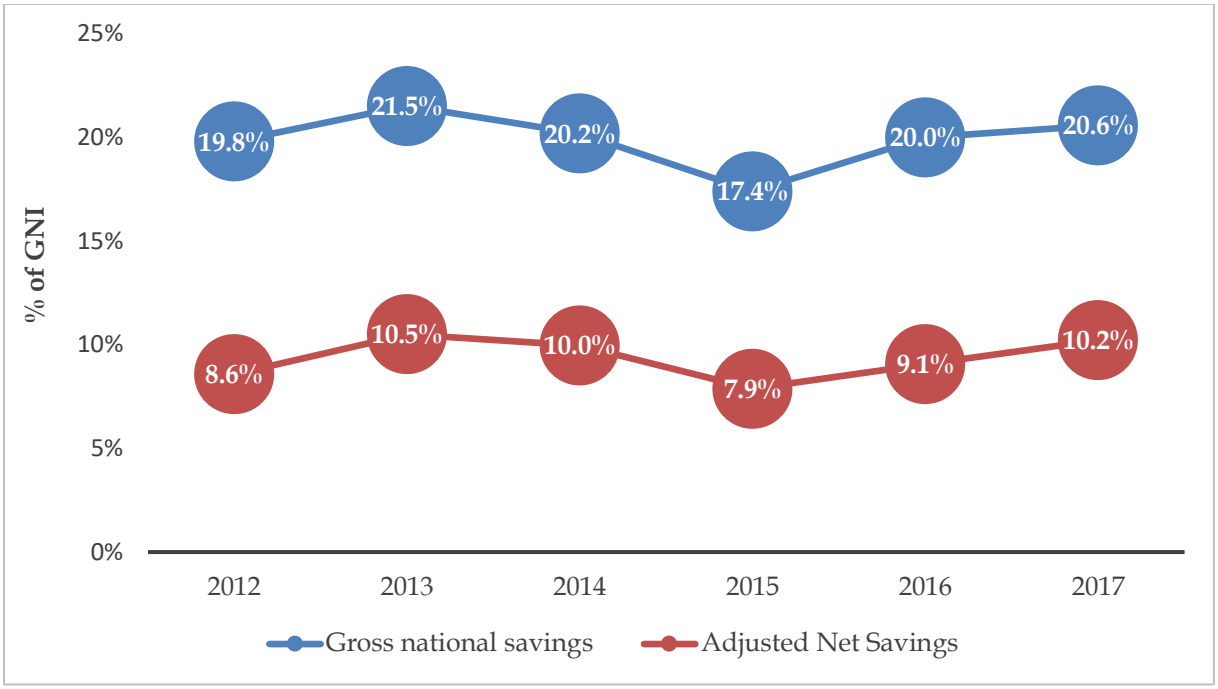


Figure 32: Comparison of Gross National Savings and Adjusted Net Savings



Source: MoFPED and World Bank

5.1.2 Fiscal sustainability

92. **The natural capital accounts indicate a rise in CO_2 emissions and air pollution (***Error! Reference source not found.***).** This is likely to increase further as the country embarks on exploitation of oil and gas, industrialization, urbanization and the continued rise in deforestation. Fiscal policy could play a role, for instance taxes on polluting sectors could compensate for, and discourage, negative externalities.

5.2 Comprehensive Wealth

93. **The results of this work show that Uganda's total wealth has been on an upward trend since 1995.** Nonetheless, in per capita terms, total wealth recorded a 1.8% drop from the wealth recorded in 2010 at the beginning of the NDP I (*Figure 24*) mainly as a result of an increased deficit in the per capita net foreign assets (62%) and a 17.8% depletion in natural capital. The fall in per capita wealth is also explained by the high growth rate of Uganda's population.

94. **To balance the twin goals of wealth creation and sustainability, we propose that *NDP III should target to achieve annual growth in real wealth per capita of 2.4% throughout the NDP III period.*** The targets are derived by extrapolating the average rate of growth of comprehensive wealth per capita over the period 1995 to 2014 (see *Figure 33*). The assumption is that this rate of growth should, as a minimum, be maintained in the coming years. The overall target does not specify the composition

of wealth. However, it does imply that any depletion of natural capital (minerals and energy resources, croplands, forests and suchlike) must be compensated by building up other forms of wealth (produced capital, human capital, net financial assets).

Figure 33: Comprehensive wealth target projections (in 2014 US dollars)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
CW per capita	14,980	15,333	15,693	16,063	16,441	16,827	17,223	17,628	18,043	18,468	18,902	19,347

5.2.1 Human capital

95. **The NDPIII notes that industrialization requires a skilled, innovative and healthy labour force**. Studies have shown that there is a significant gap between the requirements of industry and available skills. The focus under this will therefore be on fostering a skilled, innovative and healthy population through; improving access and quality of social services including the delivery of specialized medical care; institutionalizing human resource planning for the economy; enhancing skills and vocational development; increasing access to social protection; and promoting science, technology, engineering and innovation.

96. **The analysis shows that human capital is the main contributor towards Uganda's total wealth, accounting for 50%.** However, we propose increased public spending in education both in development and recurrent activities to cater for depletion and use of natural capital.

5.2.2 Natural capital

97. **It is important to track where the decline in natural capital is happening and be able to direct capital development appropriately.** This calls for strict implementation of the existing policies and laws to reduce unnecessary declines in natural capital. Therefore, preparation of natural capital accounts, such as forest accounts, lands accounts and minerals accounts, is very important.

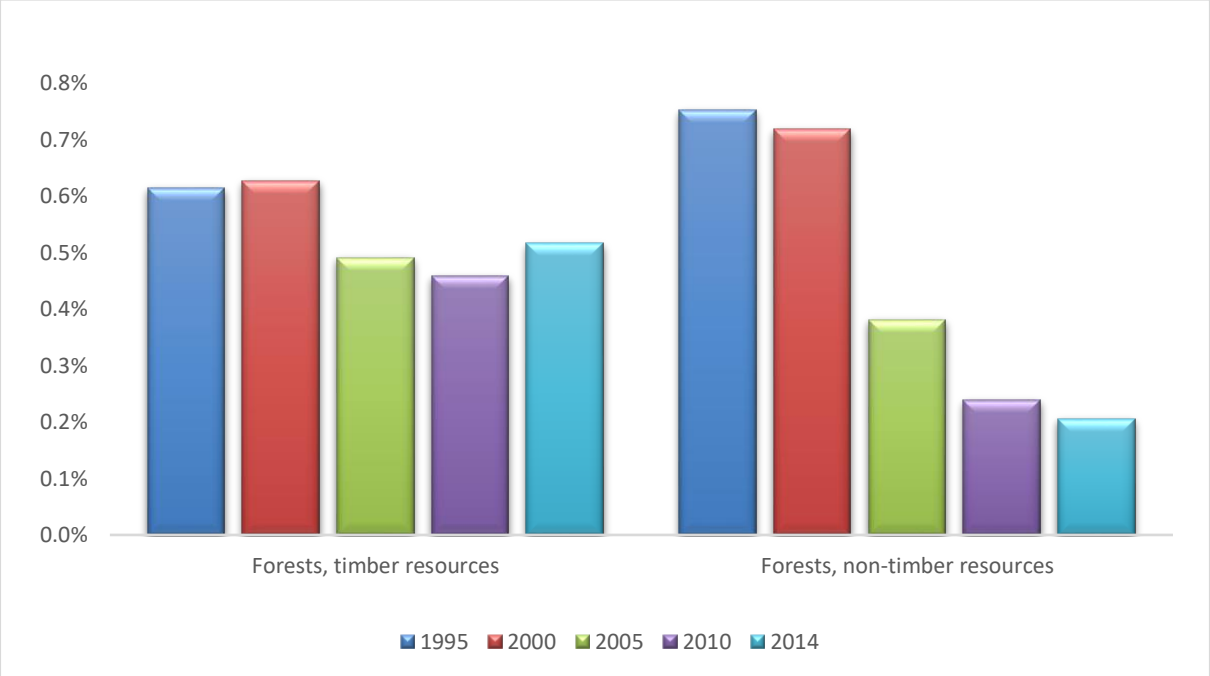
98. **Mineral beneficiation is key to unlocking wealth from the mineral resources that Uganda is endowed with, which will then be re-invested in other parts of the economy**. Strategic and targeted exploitation of these resources is not only good for income generation but can also produce inputs for other industries. For instance, processing of phosphates, limestone, and iron ore into fertilizers, cement and steel provides inputs to commercial agriculture and the construction industry. Therefore, NDP III will prioritize processing oil and gas as well as the mining and beneficiation of seven minerals; iron ore, phosphates, copper, marble/limestone, gold, dimension stones, and sand/aggregates.

99. **In 2014, metals and minerals contributed a share of 0.01% to total wealth, whereas oil and gas contribution was negligible.** However, with the plan to extract oil and gas in the NDP III, as well as minerals including iron ore, gold and phosphates, there will be a considerable increase in the shares of these items in total wealth. Government will therefore have to take precautionary steps to ensure that these non-renewable resources are extracted in a sustainable manner so as to reduce the impact on the country's wealth accumulation. Additionally, to ensure that comprehensive wealth is not depleted, the extracted minerals and assets must be replaced by accumulation of human capital and produced capital.

5.2.3 Forest resources

100. **The Comprehensive Wealth accounts indicate that the shares of timber and non-timber forest resources reduced from 0.61% and 0.75% in 1995 to 0.52% and 0.21% respectively in 2014 (*Figure 34*).** We therefore recommend that NDP III emphasizes efforts to increase forest cover from 9.5% to 18% during the plan period to reverse some of the negative impacts of wealth depletion, and to increase the share of forest resources in total wealth. Specifically, more effort should be geared towards increasing forest cover, which is decreasing at a very fast pace. The government should put in place policies that ensure that the extraction of these renewable resources does not exceed renewal.

Figure 34: Timber and non-timber forest resources



Source: World Bank CWON 2018

101. **While the country is set to make use of its abundant natural resources, wetland and forest cover - which are important for the ecosystem - have been declining.** The NDP III strategic direction highlights that in the last decade, climate change effects manifested through noticeable changes in rainfall patterns and changes in total annual rainfall amount is forecast to worsen in the near future. The changes in the climate system are already contributing to increased food insecurity; higher incidence of tropical diseases and pests in humans, livestock and crops; soil erosion and land degradation; flood damage to infrastructure and settlements and shifts in the productivity of agricultural and natural resources. While climate change is mainly attributable to global developments, the significant reduction in Uganda's forest cover from 15% in 2010 to 9.5% in 2017 is also likely to be a contributing factor.

102. **In conclusion we note that sustainable growth will require resource revenues to be spent on wealth enhancing development.** This is well demonstrated in countries such as Norway and Botswana that have used revenue from their mineral resources to accumulate wealth.

Figure 35: Sustainable Budget Index

Sustainable Budget Index

The analysis in this report suggests a potential fiscal rule that could be incorporated into the formulation and execution of fiscal policy as Uganda steps up resource-based industrialisation, and in particular the exploitation of oil and gas resources. One of the principles of mineral and energy resource taxation is that mineral and energy rents should be taxed at a high rate (close to 100%)[14]. However, a sustainable fiscal policy needs to also include a rule for the expenditure of those mineral and energy fiscal revenues.

There are several potential rules that could be employed, one of which is the Hotelling Rule. This requires that all fiscal mineral revenues (derived from the depletion of an asset) are invested in other forms of capital. The simplest version requires that all mineral revenues are used to fund government development (capital) spending, for example, on public sector produced capital.

However, the comprehensive wealth approach takes a broader view of capital, and in particular includes human capital. The rule can therefore be broadened to include recurrent spending on education in the definition of public capital spending.
Any mineral or energy revenues that are not used to finance development spending or education spending should be saved (in other words, used to accumulate financial assets, which are also part of comprehensive wealth).

A version of this rule is in use in Botswana, termed the "Sustainable Budgeting Rule", and is monitored through the Sustainable Budget Index, defined as the ratio of government

[14] The calculation of resource rents includes "normal" profit (including a reward for risk) as part of the cost of production. This allows the providers of capital to earn an adequate return, while the rent component of mineral / energy income is akin to "windfall" profit.

non-investment spending to recurrent fiscal revenues. An SBI value of more than 1 means that non-investment spending is being financed in part from mineral (non-recurrent) revenues; a value of less than 1 means that mineral revenue is either being saved or spent on public investment, while recurrent spending is being financed from non-mineral (recurrent) sources, which is interpreted as being sustainable. Investment spending includes education spending for the purposes of this rule.

6.0 FUTURE ACTIONS

103. **This has been a preliminary exercise into adjusted macroeconomic indicators and comprehensive wealth.** There will be many improvements that can be made in future years. A few suggestions and guidance on the next steps are highlighted here.

6.1 Technical improvements

104. **Before this exercise is repeated next year, a thorough quality assurance process would be desirable.** This would test both the methodology and theory of the calculations as well as the mechanics with which they were done. As part of the process the validity of the data inputs should also be questioned. This process will surely inspire some improvements.

105. **It would also be good to revisit some of the assumptions made in this work, to see if they can be strengthened.** For example, the adjustments made to education expenditure to incorporate private spending could be more data driven. Fixed capital consumption is low by international standards, so it may be worth investigating the validity of those assumptions. Disaggregated data on the capital stock would allow for a more precise estimate.

106. **There is also a need for better information on forest depletion.** Data on the volume of timber consumption is uncertain, especially as a large proportion of fuelwood use does not flow through the monetary economy. Similarly, there is a lack of accurate information on the sources of fuelwood, in particular regarding whether it is sourced from forests, other woodland, or farmland. This is important as it influences the rate of sustainable extraction and hence the lifespan of existing timber resources. Wood prices are also a hugely uncertain part of this analysis. It is hoped that the forest accounts can help improve information on the volumes and values of timber production. The same is true of deforestation emissions.

6.2 Utilising this report

107. **The analysis in this report suggests that several innovations can be made in terms of the policy framework and the monitoring and evaluation framework for government plans and budgets.**

108. **First, the level of Adjusted Net Savings (ANS) and Adjusted Net National Income (ANNI) should be calculated annually.** This can be done on the basis of data generated domestically, combined with data from the World Bank (World

Development Indicators), which is usually available with a one-year delay[15]. Key monitoring targets are that:

- The annual growth rate of ANNI should be at least as high as the growth rate of gross national income (GNI); if not, it means that part of the growth in recorded national income is derived from the depletion of assets;
- The rate of ANS should be maintained at a positive level and should increase over time.

109. **Second, the total level of comprehensive wealth per capita (measured in real US dollars) should increase by at least 2.4% annually, so that past trends are at least maintained.** Preferably, it should increase at a faster rate than this, given that Uganda is starting from a level of comprehensive wealth per capita that is lower than most other EAC countries.

110. **Some policies that will help to achieve objectives geared at increasing countries wealth include:**

- Increasing the rate of domestic financial savings;
- Ensuring that domestic financing, in the context of increased savings, is used as far as possible to finance domestic investment (using foreign borrowing to finance investment does not lead to an increase in national wealth, as increased produced capital is offset by reduced net financial assets);
- Reducing (preferably reversing) the rate of net forest depletion;
- Reducing pollution from CO_2 and related emissions and particulate emissions damage;
- Ensuring productive assets are properly maintained so as to extend their lifespan and reduce annual consumption of fixed capital;
- Increasing (public and private) education spending;
- Increasing the productivity of farmland (hence increasing its capital value from higher future earnings);
- Shifting the balance of government spending towards capital and education spending (both of which are investment and add to capital), while ensuring that investment spending is prioritised on high-return projects;
- Minimising recurrent budget deficits (which reduce Adjusted Net Savings);
- Considering the adoption of a 'Sustainable Budgeting Rule' and accompanying measures to ensure that future fiscal revenues from minerals and energy are spent only on public investment (including education spending).

[15] In mid-2019, WDI data is available up to 2017.

7.0 REFERENCES

Lange, G-M., Q. Wodon & K. Carey (eds) (2018) The Changing Wealth of Nations, 2018: Building a Sustainable Future (Washington DC: World Bank)

United Nations (2014) System of Environmental-Economic Accounting 2012— Central Framework

World Bank (2011) The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium (Washington DC: World Bank)

World Bank (2006) Where is the Wealth of Nations? Measuring Capital for the 21st Century (Washington DC: World Bank)

8.0 ANNEX I: NET NATURAL CAPITAL DEPLETION METHODS AND ASSUMPTIONS

111. **This annex contains further information on the methodologies used for net forest depletion, energy depletion and mineral depletion.**

8.1 Net forest depletion

112. **The valuation of forest timber resources forms and important component of natural capital accounting in Uganda.** We approach this from the perspective of NCA-related macroeconomic indicators and measurement of comprehensive wealth. Forest timber valuation is important for both of these:

- In the calculation of Adjusted Net Savings (ANS), net national savings are adjusted to account for (inter alia) the depletion of renewable and non-renewable natural capital, including forest timber resources.

- In the calculation of comprehensive wealth, natural capital includes the valuation of forest timber (as well as non-timber) capital.

113. **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 far 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, D, is calculated as:

$$D = (Q\text{-}N).\pi$$

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

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

- Woodfuel
- Industrial roundwood (coniferous)

- Industrial roundwood (non-coniferous)

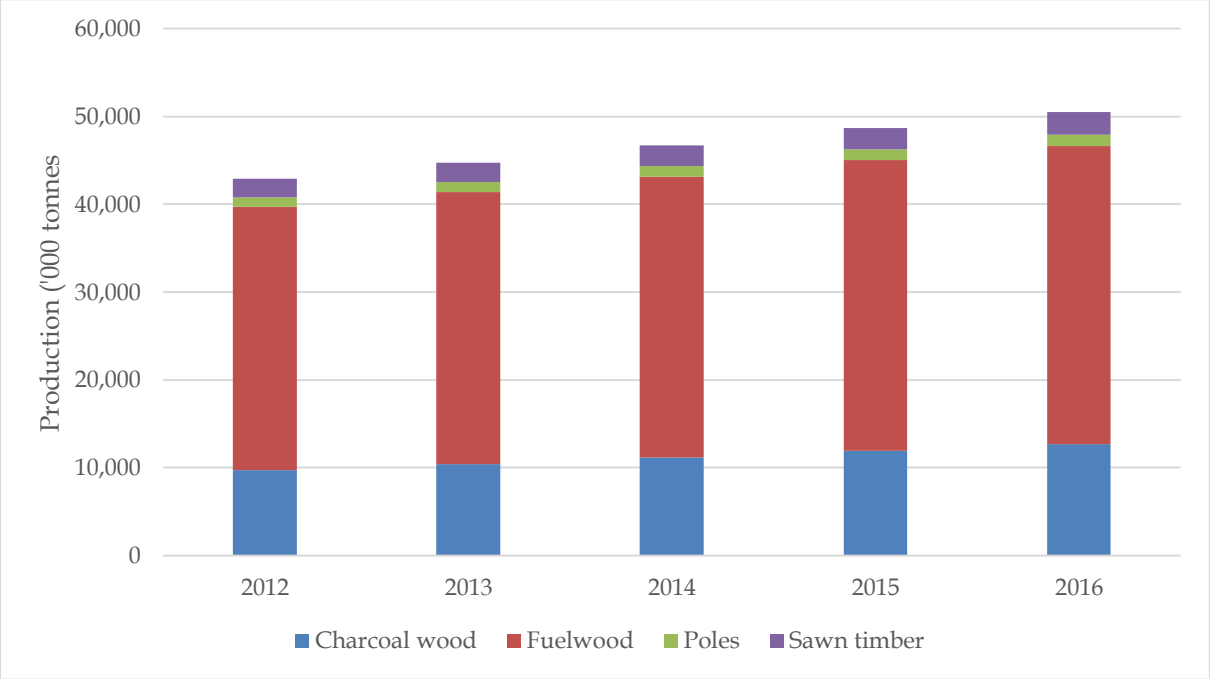
115. **Production and rental values are derived from export unit values for each of the three categories.** However, the use of export unit values may not be appropriate, when the vast majority of timber resources are sold domestically, and are not exported or competing with imports. Production figures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

116. **Alternative data sources for timber production and valuation are available in Uganda.** The starting point is the UBOS Annual Statistical Abstract (Table 1.3), which provides data on timber production (in '000 tonnes) and valuation (in UGX million) for several different categories of timber:

- Sawn wood
- Poles (construction, utility)
- Fuelwood (household, commercial, institutional)
- Wood for charcoal production

Production figures (volumes) for the different categories for the period 2012-16 are shown in *Figure 36*.

Figure 36: Production of timber by category ('000 tonnes)



Source: UBOS Statistical Abstract, Table 1.2 A,B

117. **The FAO/World Bank data is presented slightly differently, in cubic metres (m3) rather than tonnes.** The link between the two is the density of wood. By making

assumptions of wood density for the different categories (default assumption is 720 kg per m3), the volume of timber production can be estimated, and compared with the FAO/World Bank numbers.

118. **There are, however, some concerns about the reliability of the Uganda data on timber production, which could be too high.** The largest component of production is non-monetary domestic fuelwood consumption, for which data is subject to considerable uncertainty. The recorded production levels are extremely high relative to estimates of the standing stock of timber. For instance, the FAO FRA 2015 (*Table 2*) records total growing stock of 92 mcm of timber stock on forest land, and 21 mcm of timber stock on other woodland, making a total of 114 mcm. With annual production estimated at 48,000t in 2016, or approximately 69,600 mcm, the entire existing growing timber stock of Uganda would be depleted in less than two years. This is unlikely, and suggests that either the growing stock is underestimated or the or the rate of production is overestimated (or both). The only other available data source on domestic fuelwood consumption, the 2016 National Charcoal Survey, has a consumption estimate that is less than half that of the UBOS data.

8.2 Fuelwood/charcoal wood valuation

119. **Unit valuations can also be obtained from the UBOS data, based on density assumptions and UGX/USD exchange rates.** The resulting valuations, and their comparison with the FAO/WB data, are shown in *Table 2* below.

Table 2: Timber valuations, USD/m3

UBOS	**2012**	**2013**	**2014**	**2015**	**2016**
Charcoal wood	3.31	3.20	3.08	2.38	2.18
Fuelwood	3.41	3.28	3.21	2.52	2.36
Poles	62.22	71.90	76.03	65.02	59.00
Sawn timber	51.14	70.95	86.67	85.86	94.43
World Bank/FAO	**2012**	**2013**	**2014**	**2015**	**2016**
Wood Fuel	134.71	138.89	141.08	161.92	178.23
Industrial Roundwood (C)	69.28	74.88	75.35	71.29	51.35
Industrial Roundwood (NC)	391.09	384.82	391.18	389.70	350.30

Source: UBOS, FAOSTAT

120. **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 (USD) values of wood for charcoal and fuelwood, which needs explanation.

121. **Both sets of data show that the use of timber for fuelwood and charcoal is by far the main usage in Uganda.** As a result, changes in the valuation are likely to have a dramatic impact on the valuations of net forest depletion and forest timber asset value. An alternative valuation can be derived from the information in the Uganda National Charcoal Survey, 2016. This provides the following information that can be used to calculate the valuation:

Table 3: Calculation of implied value of wood used for charcoal production

	Per bag	Per tonne	Source of information
Average weight of a bag of charcoal (Uganda) (kg)	61		Table 11-4
Average farm-gate price for a bag of charcoal (UGX)	18,500	303,279	Para 13.1.2
Wood proportion of charcoal production costs	34%		Table 7-5
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/m3)	0.72	0.72	Forest Research UK
Wood input volume (m3)	0.47	7.67	Calculated. NB PROFOR 2014 uses a conversion factor of 6
Wood input cost (UGX/m3)	13,395	13,395	Calculated
Exchange rate (UGX/USD)	3,420	3,420	BoU
Wood input cost (USD/m3)	3.92	3.92	Calculated

122. **The calculated value of wood inputs to the charcoal value chain is US$3.92 per m3, which is broadly consistent with, but somewhat higher than, the values derived from the UBOS data.**

8.3 Energy and mineral depletion

123. **For energy and mineral depletion, World Bank data was used, as we had no strong belief that these would be inaccurate (and are relatively small).** These were added to our calculation of net forest depletion to give net natural capital depletion.

9.0 ANNEX II: ADJUSTED MACROECONOMIC INDICATOR RESULTS

Calendar Year (% of GNI)	2012	2013	2014	2015	2016	2017
Gross National Savings	19.8%	21.5%	20.2%	17.4%	20.0%	20.6%
Consumption of fixed capital	12.5%	12.8%	12.7%	11.4%	13.3%	12.8%
Net National Savings	7.3%	8.7%	7.5%	6.0%	6.7%	7.8%
Fully adjusted education expenditure	4.3%	4.9%	5.5%	5.0%	5.9%	5.6%
NNS + Education expenditure	11.6%	13.6%	13.0%	11.0%	12.6%	13.4%
Net forest depletion	0.5%	0.5%	0.5%	0.6%	0.7%	0.7%
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	0.5%	0.5%	0.5%	0.6%	0.7%	0.7%
Depletion Adjusted Savings	11.1%	13.1%	12.5%	10.4%	11.9%	12.7%
CO2 Damage	1.6%	1.7%	1.7%	1.8%	2.2%	1.8%
Air pollution damage (World Bank)	0.9%	0.9%	0.8%	0.8%	0.7%	0.7%
Pollution damage	2.5%	2.6%	2.5%	2.6%	2.9%	2.5%
Adjusted Net Savings	8.6%	10.5%	10.0%	7.9%	9.1%	10.2%
Net National Income	87.5%	87.2%	87.3%	88.6%	86.7%	87.2%
Adjusted Net National Income	87.0%	86.7%	86.8%	88.1%	86.0%	86.6%

Calendar Year (Current UGX, billions)	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Gross National Savings	60,744	67,297	79,465	85,255	88,213	93,877
Consumption of fixed capital	59,500	65,838	77,882	83,648	86,289	91,655
Net National Savings	12,312	13,702	14,515	15,610	17,525	18,857
Fully adjusted education expenditure	7,544	8,391	9,310	10,285	11,228	11,705
NNS + Education expenditure	4,768	5,311	5,205	5,325	6,296	7,153
Net forest depletion	2,754	3,435	4,053	4,528	4,938	5,104
Energy depletion (World Bank)	7,522	8,746	9,258	9,854	11,234	12,257
Mineral depletion (World Bank)	306	350	426	513	573	601
Total natural capital depletion	0	0	0	0	0	0
Depletion Adjusted Savings	0	2	2	1	1	1
CO2 Damage	307	352	428	514	574	603
Air pollution damage (World Bank)	7,215	8,394	8,831	9,340	10,660	11,654
Pollution damage	994	1,106	1,348	1,647	1,715	1,679
Adjusted Net Savings	516	560	621	620	596	616
Net National Income	1,510	1,666	1,968	2,267	2,310	2,295
Adjusted Net National Income	5,705	6,729	6,862	7,073	8,350	9,359