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Report No: AUS0001830

Uganda

Natural Capital Accounting, Environment and Climate Change Programmatic ASA

Natural capital accounting: Informing policy decisions and management of Uganda's natural resources

October 2020

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ACKNOWLEDGEMENTS

This report was prepared by the World Bank team led by Ross Hughes and Sofia Ahlroth. The team included Lesya Verheijen and Moses Apollo Masiga, along with Michael Vardon and Steve Bass who authored the report.

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The team received expert advice from peer reviewers Raffaello Cervigni, Glenn-Marie Lange, Iretomiwa Olatunji, and Rachel Sebudde. Administrative support was provided by Damalie Nyanja. Sonu Jain and Leonah Mbonimpa led the communications work.

NCA work in Uganda is led by the Technical Working Group (TWG) composed of the MOFPED, NPA, UBOS, MWE, National Environmental Management Authority (NEMA), National Forestry Authority (NFA), and Uganda Wildlife Authority (UWA).

The document builds on work done under the Wealth Accounting and the Valuation of Ecosystem Services (WAVES) Partnership support to the government of Uganda between 2018 and 2020. We would like to acknowledge the financial support to WAVES from Denmark, the European Commission, France, Germany, Japan, The Netherlands, Norway, Switzerland, and the United Kingdom.

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Abbreviations

ANNI	Adjusted net national income
ANS	Adjusted net savings
GDP	Gross domestic product
GNI	Gross national income
GNS	Gross national savings
GoU	Government of Uganda
ILM	Integrated Land Management
InVEST	Integrated Valuation of Ecosystem Services and Trade-offs
IUCN	International Union for Conservation of Nature
MoFPED	Ministry of Finance Planning and Economic Development
MWE	Ministry of Water and Environment
NCA	Natural Capital Accounting
NCAs	Natural Capital Accounts
NDP	National Development Plan
NEMA	National Environmental Management Authority
NFA	National Forestry Authority
NPA	National Planning Authority
NP-AEEA	National Plan for Advancing Environmental Economic Accounting
ROAM	Restoration Opportunities Assessment Methodology
SDG	Sustainable Development Goal
SEEA	System of Environmental-Economic Accounting
SNA	System of National Accounts
TEMS	Tourism Expenditure and Motivation Surveys
TWG	Technical working group
UBOS	Uganda Bureau of Statistics
UGGDS	Uganda Green Growth Development Strategy
UNEDP-WCMC	UNEP World Conservation Monitoring Centre
UNSD	United Nations Statistics Division
UWA	Uganda Wildlife Authority
WAVES	Wealth Accounting and the Valuation of Ecosystem Services

Executive Summary

The Government of Uganda has been working to establish a new system of NCA. NCA is a standardised approach to measuring and valuing natural resources. It overcomes the limitations of traditional economic measurements, such as gross domestic product (GDP), that look primarily at income and not at wealth. It provides physical and monetary information about natural capital wealth as well as income and other benefit flows. As such, NCA is already helping to inform key policies and plans in Uganda.

The development of NCA in Uganda has been supported by various development partners, notably the World Bank's global programme, WAVES. This paper offers an independent synthesis of Uganda's work with WAVES from 2018 to 2020. It is based on programme documentation and a review of the accounts themselves, supplemented by interviews of key Ugandan officials involved in the process. The key messages to date are:

- *Uganda's development is highly dependent on the quantity and quality of its natural resources and their use.* The Ugandan National Constitution requires natural resources to be managed and used sustainably. Yet, until now, there has been no system that could adequately track their quantity, quality and use, and the impact of their use. This has often made it difficult to reach optimum decisions on natural resource allocation, use and management.
- *Uganda's NCA Program with WAVES aimed to mainstream natural capital information into development policy dialogue and planning*. It set out to produce natural capital accounts to inform the NDP III, as well as sectoral policies, about the contributions of natural capital to the economy and how the economy affects the natural asset base.
- *Within just two years, the Uganda NCA Program has established accounts for forests and land and took the first steps towards developing ecosystem services accounts*. These accounts have already revealed how:
    - Natural resources make up 38 percent of Uganda's wealth, notably cropland, pastureland and protected areas – and sustain almost every sector and livelihood
    - Deforestation levels are high – Uganda's forests declined by 23 percent and woodlands by a massive 70 percent between 1990 and 2015.
    - The average value of forest land increased by 2.5 times per hectare over this period – since forest land has become scarcer with deforestation.
    - The deficit of wood products will be severe by 2030 – woodfuel alone already accounts for 88 percent of energy used, and demand will double in the next 20 years.
    - Carbon capture and storage, which are needed to help with climate regulation, declined from 2005 to 2015 – principally due to deforestation.
    - The natural ecosystem service of sediment retention has also declined, contributing to increasing sedimentation in water bodies and severity of floods, as well as threatening soil fertility.
- *Uganda's continuing loss of forests, wetlands, fish stocks, biodiversity, soil, and land quality is, in some cases, among the highest in Africa*. This is alarming. Development cannot simply entail liquidating natural capital to purchase other assets. Rather, it demands efficient use and sustainable management of natural capital to meet changing

needs while reducing associated risks. In this urgent context, Uganda's work on NCA has begun to get a much better handle on the losses and the potentials.

- *A complementary study of adjusted macroeconomic indicators has offered new insights into how the economy and environment interact*. It shows that:
    - Since 2010, renewable natural capital has been depleted faster than it is being renewed. The contribution of forests to overall wealth is now especially low and constitutes only 0.7 percent of total natural capital wealth, due to excessive depletion and deforestation over the years.
    - Some natural capital losses will be irreversible. For example, much of the biodiversity lost in natural forests can never be replaced.
    - Other natural capital losses have been compensated to an extent by investments in other forms of capital, notably through expenditure on education (increasing human capital) and infrastructure (produced capital).
    - Macroeconomic indicators will be increasingly critical for assessing the sustainability implications of growing the agriculture sector, and developing new industries that use natural capital, notably ecotourism, oil and gas.
- *Credible and well-packaged information from the accounts has already proven to be influential in policy circles*. Stakeholders interviewed reported how the accounts – even though very new – are beginning to inform policy and planning discussions on issues as diverse as forestry grants, wetland budgets and environmental taxation. There are other sector potentials, too. For example, with World Bank support, new data on tourism has been collected to inform a statistical and economic analysis of the sector. This new data may enable estimates of recreational and cultural ecosystem services to be made and ultimately inspire full tourism satellite accounts. Moreover, the accounts are designed to inform major cross-sectoral decisions, notably the goal of sustainable industrialization and sustainable wealth creation of the NDP III, and implementation of the 2017 Uganda Green Growth Development Strategy (UGGDS).
- *The accounts have made good use of international and Ugandan data*. The data quality control procedures of the UBOS and Ugandan technical agencies were used well in establishing the accounts and were supplemented by international peer review. Although Ugandan data have some limitations, the WAVES process has shown what can be achieved quite rapidly with what is currently available. It has also encouraged stakeholders to consider how to better collect, integrate and use data. Reconciling different data sources (as was needed for wetlands) spurred discussion on the implications of not having regular reliable information, and how to improve.
- *The production of accounts has begun to be institutionalized*. A UBOS unit for satellite accounts is being established with a mandate for environmental accounting along with staff responsible for developing and managing NCA. Production of accounts is also being mainstreamed into relevant government agencies. The NEMA and NPA will provide staff to continue NCA in future. Engagement with WAVES other NCA support programmes has built significant capacity in UBOS and these agencies, and coordination between them.
- *The use of accounts is also becoming institutionalised, driven especially by its national development planning mandate.* NDP III anticipates the use of NCA to inform major cross-sectoral decisions. The UGGDS, too, includes a target to fast-track a roadmap for NCA so that key economic metrics take account of the environment. The MOFPED has also

decided to produce an annual update of adjusted macroeconomic indicators for strategic use in policy discussions. In these ways, Ugandan NCA is demand-driven, developing in a 'decision-centred' way.

- *The NCA work has been a Ugandan-led effort*. This means that sustaining NCA in future is not a question of 'handing over' something developed by outsiders. The positions of National Coordinator, Facilitator, and Consultant were held by Ugandans and became well-embedded in MOFPED, MWE, and UBOS respectively. Ugandan stakeholders interviewed believe that their awareness and openness to natural capital issues, and capacity for NCA and its use, have grown considerably through the program.
- *There is a clear national strategy for the continued development and use of NCA*. WAVES has helped to complete, adjust, disseminate and operationalize Uganda's National Plan of Action on Environmental Economic Accounting (NP-AEEA). This NCA is an important asset for Uganda. It provides a strategic, recognised 'roadmap' for systematic NCA development that meets international standards and Uganda's decision-making needs.
- *WAVES work has already demonstrated what NCA can do*. However, it has had only a 2-year period in which to prove itself. A third of this period fell during COVID-19 times, with unprecedented challenges for the work. Nevertheless, the good results to date are testament to the interest and commitment of Ugandan stakeholders and their belief that better natural capital information is critical for Uganda's future development.

There are also remaining challenges for Uganda if it is to realise the full potential of the NCA:

- *A full NCA 'cycle' has not yet been experienced*. The full NCA process – of identifying policy-relevant demand for evidence on natural capital, collecting the data, producing the accounts, interpreting them, modelling decision options using accounts data, using the results in planning and monitoring, and continuous improvement – has not yet fully gone through one cycle for any of the accounts. The short 2-year WAVES program produced much but could not have been expected to fully build and embed an NCA system in this time. Even in high-income countries, NCA institutionalisation has taken many years. Further experience is needed across the policy cycle.
- *Accounts interpretation is not yet complete*. The accounts can appear complex, and a lack of interpretation and assessment of their policy implications can be blocks to using NCA well. UBOS' mandate allows for presenting accounts information so that it is understood by various policy audiences but, as a statistical agency, UBOS does not interpret the accounts or offer policy implications. The Uganda NCA Program's TWG offered some interpretation, supported by individual experts. But a systematic, multi-disciplinary approach and capacity for interpretation is now needed, involving the policy and management agencies if NCA is to be well understood and used.
- *The concept and practice of NCA are not yet fully embedded in Uganda's institutions*. The Uganda NCA Program managed to break down some 'silos' between institutions with mandates for environment, development and statistics. Good understanding, relationships, and trust have been built up – key ingredients for the collaborative process of NCA development and use. But they are still fledgling. The next phase of NCA will need to embed NCA as a fully functioning *systemic* part of the government machine, and not simply continue the tasks of account construction.

- *Embedding NCA in the machinery of government will take more time*. The expectation that a solid 'bridge' could be built between accounts and better policy decisions within two years has proven impossible. Ugandan stakeholders are keen to move forward with NCA but believe that institutionalising NCA might take at least a further three years.
- *There is scope to consolidate the accounts and develop further accounts to offer a comprehensive 'balance sheet' of Uganda's natural capital*. These further accounts will be demand-led, to meet priority decision-making needs. At present the coverage developed by Uganda's various NCA initiatives is as follows:

Box ES1. Uganda's NCA Initiatives

Asset (Stock)	Supported by	Goods and Services (Flows)	Supported by
Land	WAVES (2019)		
Water	UNSD (2019)	**Water**	UNSD (2019)
Forest	WAVES (2020)	**Wood** **Non-wood forest products**	WAVES (2020)
Ecosystems		**Ecosystem services**	
Extent	WAVES (2020)	*Carbon storage and sequestration*	WAVES (2020)
Condition	WAVES (wetlands) (2020) UNEP-WCMC (lakes and rivers) * UNEP-WCMC (soil) *	*Soil retention* *Water yield*	WAVES (2020) WAVES (2020)
Biodiversity	UNEP-WCMC (2017)	*Fish provisioning* *Crop provisioning* *Wildlife tourism*	UNEP-WCMC* UNEP-WCMC* UNEP-WCMC*
Energy		**Energy**	
Minerals		**Minerals**	
		Air emissions	
		Water emissions	
		Waste	

Key	* Expected completion 2020-1	Developed or under development	Not developed

Further work is suggested to institutionalise and expand NCA so that it meets future Ugandan policy and decision-making needs and builds on WAVES' legacy in Uganda. This paper introduces several areas for further work. These include:

1. Setting priorities, implementing the NCA roadmap (the NP-AEEA) as a principal guide, and keeping it under review
2. Developing the coordination and technical roles of UBOS
3. Consolidating the results from all NCA initiatives in Uganda
4. Developing the roles of other organisations and their collaboration in producing, interpreting, and using accounts
5. Developing tools to enable policy analysis and modelling using the accounts
6. Generating improved data and filling data gaps
7. Constructing new accounts to meet new demands, likely to cover non-renewable natural capital such as oil and gas
8. Refining accounting methodologies
9. Communicating the accounts and making them accessible
10. Sustainably resourcing the NCA process.

1 Introduction and Overview

The Government of Uganda has developed new Natural Capital Accounts (NCAs), with the aim to mainstream natural resource concerns into Uganda's development policy and practice.

The shortcomings of traditional economic information for steering development policy and practice, and in particular the indicator GDP[1], have been recognised for some time[2] and were famously highlighted in a speech by Robert Kennedy in 1968.[3] A major concern of the way national accounting is generally implemented and used is the heavy focus on income – rather than wealth – which fails to provide a full 'balance sheet' needed to inform good decisions. In particular, national accounting ignores the costs of depleting and degrading stocks, notably the ecosystems and natural resources that make up a large part of the wealth of most countries.

NCA has been developed to address this failure, providing a way to structure information on natural capital stocks as well as income, and to align it with the policy tools commonly used by governments. In recent years, increasing engagement of governments in developing NCA throughout the world has led to an international standard, the System of Environmental-Economic Accounting (SEEA)[4] and over 90 countries now produce NCAs.[5] Moreover, NCA has enabled assessments of the total wealth of countries as in *The Changing Wealth of Nations* (see Box 1.1).[6]

Uganda was an early pioneer of NCA in Africa with some pilot studies. A partnership with the World Bank's programme WAVES, has built on this previous work in much more systematic ways, concentrating on some of the natural resources that are critical to Uganda's development (see Box 1.2). Within two years, three new accounts were developed on critical natural resources and are now beginning to be used: (a) land accounts, (b) forest accounts, and (c) experimental ecosystem accounts. A fourth major product, a study of macroeconomic indicators, has drawn on these accounts and revealed ways in which the economy and environment are interdependent. Complementary issues papers have addressed policy concerns such as incorporation of NCA into the NDP III, development of woodfuels, and an economic analysis of the tourism sector. Moreover, in the process, Uganda has formed up a NP-AEEA as a recognised 'roadmap' for continuing to build NCA in a systematic way to address priority natural capital issues.

[1] GDP is short for gross domestic product and emerges from the System of National Accounts (SNA), available at https://unstats.un.org/unsd/nationalaccount/docs/sna2008.pdf.

[2] Nordhaus and Tobin. 1972.

[3] Robert Kennedy speech at the University of Kansas, 18 March 1968. Available at http://www.youtube.com/watch?v=77IdKFqXbUY.

[4] SEEA is available at https://seea.un.org/, while Box 1.2 of this report a brief introduction to NCA.

[5] https://seea.un.org/content/frequently-asked-questions#_How_many_countries.

[6] Available at https://openknowledge.worldbank.org/handle/10986/29001.

Box 1.1. Natural Capital Accounting (NCA) and the Wealth Accounting and the Valuation of Ecosystem Services (WAVES) Program

What is NCA?

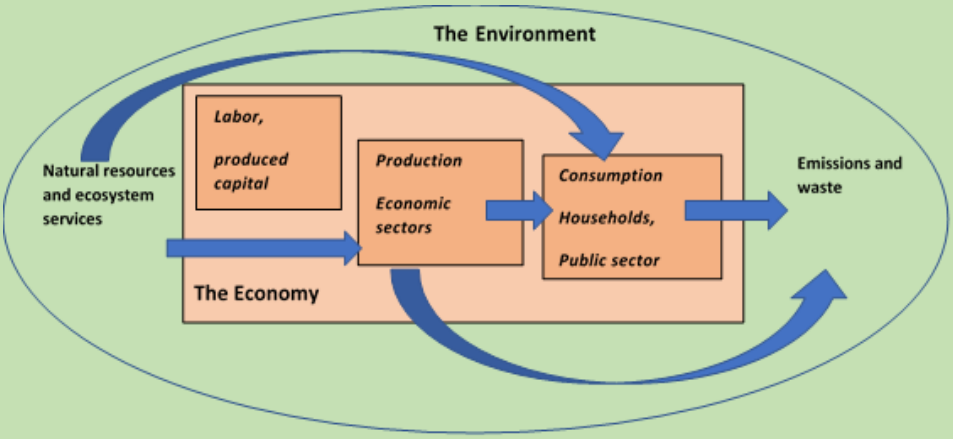
NCA provides countries with solid and standardized metrics on different types of natural capital, their quantities and qualities, where they are located, how they are being used, and with what impact. It allows countries to systematically measure and value them in both physical and monetary terms – for example, liters of water used, and the price paid for the water. By improving understanding, better-informed decisions can be made on policy and investments. When NCA becomes mainstreamed into decision-making, it allows governments, business, community organizations and others to better appreciate, understand, and manage natural resources and the goods and services that come from them. It also enables risks associated with natural capital to be better managed.

What practical experience has there been of NCA?

Pilot natural capital accounts have been developed and used since the late 1980s in numerous African countries.[7] This demonstrated that accounts can be produced with available expertise and information. However, early accounts used diverse concepts, data sources and methods and were not always comparable. Moreover, they were usually one-off, missing the huge potential that comes from regular accounting identifying trends.

What is best practice for NCA?

The standardization of NCA was agreed at UN level in 2012 through the System of Environmental-Economic Accounting (SEEA).[8] This provides a comprehensive set of concepts and tables enabling consistent and comparable accounts to be prepared, covering both assets and the goods and services that flow from the assets (see diagram). The SEEA accelerated international action on NCA, including establishing the WAVES program.



What is the WAVES Program?

WAVES is a World Bank-coordinated global partnership that promotes sustainable development by ensuring that natural resources are mainstreamed in development planning and national economic accounts. It supports countries to develop and implement NCA.

[7] Reuter et al. 2016. Pp. 188.

[8] See https://seea.un.org/content/homepage.

Box 1.2. Uganda's Economy and People Depend upon Natural Capital

Economic Development

Uganda is a low-income country with a gross domestic product (GDP) of US$ 33 billion[9] or US$ 770 per capita in 2018. The economic policy is to achieve middle-income status, in large part through natural-resource-based industrialisation. Industries' share of GDP is already 30 percent, while agriculture contributes 24 percent.

Risks and Instabilities

Uganda is vulnerable to regional instability, pandemics such as Ebola and Coronavirus global trade uncertainty, climate change and environmental degradation.[10] Natural resource and climate stresses and shocks could undermine production and exports with implications for economic growth, poverty reduction and debt repayment.

Poverty

Uganda has achieved remarkable results in reducing poverty, with a 38 percent reduction in the number of Ugandan households living in poverty reduced between 2000 and 2018.[11] This was helped mainly by agriculture in which more than 70 percent of Ugandans are engaged. However, the absolute number of poor people increased. While 700,000 young people reach working age every year (rising to an expected one million between 2030-2040), only 75,000 jobs are created each year.

People

Uganda's population of an estimated 43 million in 2020 is among the fastest growing in the world. At 3 percent per year, it is expected to reach 100 million by 2050.[12] Uganda includes refugees in its population statistics. It is the largest refugee host in Africa, with over 1.4 million in 2020.[13] While its open-door refugee policy is progressive (refugees enjoy access to social services and land and can move and work freely) continued influx is straining communities, the economy, and the environment.

Natural Capital

The importance of agriculture to GDP and employment highlights the importance of natural capital to Uganda, since agriculture depends fundamentally on water, soils and land. Uganda is covered by a range of ecosystems. Uganda's forests are some of the most biodiverse in Africa and are the backbone of a nature-based tourism industry, national energy supplies (fuelwood), rural livelihoods, and watershed protection. Wetlands are critical for agriculture, employment, and water filtration. They are also home to many important species, including Uganda's iconic bird, the Crested Crane (Uganda's national symbol), and the shoebill stork.

Natural Assets in Uganda's National Wealth

The World Bank calculates that Uganda's total wealth was US$ 13,732 million in 2014. Of this, *38 percent was made up of natural capital (US$ 5,269 million) – protected areas such as national parks, pastureland, cropland and forests* – alongside 50 percent human capital, 14 percent produced capital, and 2 percent net foreign assets.[14]

Planning for Better Use of Natural Capital

Although total wealth in Uganda has been growing over time, Uganda has not yet achieved a balanced portfolio of capital assets to sustain strong economic growth in the future. The historical trajectory from low-income to middle-income status starts with an abundance of natural capital and uses this (not always efficiently or sustainably) to invest in education and health that supports achieving middle-income levels. As a result, the share of natural capital in total wealth thus becomes proportionately low in high-income countries – *although the absolute value of natural capital is still higher than in low-income countries*. Thus, development is not simply about liquidating natural capital to purchase other assets. It is about efficient use and sustainable management of natural capital to meet changing needs while reducing associated risks. In this context, Uganda's continuing loss of forests, wetlands, fish stocks, biodiversity, soil and land quality is alarming and in some cases among the

[9] See World Bank country database.
[10] See https://openknowledge.worldbank.org/handle/10986/34078.
[11] According to the World Bank metric of US$ 1.90 per day https://data.worldbank.org/country/uganda.
[12] See World Bank https://data.worldbank.org/country/uganda.
[13] See https://ugandarefugees.org/en/country/uga.
[14] World Bank. 2018.

highest in Africa. Uganda's work on natural capital accounting (NCA) has begun to get a much better handle on the losses and the potentials.

This paper is an initial synthesis of what has already been achieved through the Uganda NCA Program, offering:

- *A 'reader's guide' to the new accounts* – clarifying their content and utility, and what the emerging policy messages are, to attract readers to explore and use the accounts. We cover the land accounts (Section 2), forest accounts (Section 3), experimental ecosystem accounts (Section 4) as well as the study of macroeconomic indicators (Section 5).[15]
- *An insight into why and how the accounts were developed* – describing how the accounts were designed to meet critical Ugandan needs, using Ugandan data and capabilities, with key lessons about the process (Sections 6, 7 and 8).
- *A forward-looking picture encouraging further account development and use* – with recommendations for further development and institutionalisation of accounts, and realisation of their potentials (Section 9).

Uganda's Economic and Social Development Depend on Its Natural Capital Base

The country's forests, wetlands, water bodies, soils, and other natural resources make up 38 percent of Uganda's wealth, according to World Bank calculations used by Ministry of Finance Planning and Economic Development (MoFPED) (see Box 1.2). These assets form the foundation for almost every livelihood and most sectors in Uganda. In turn, the productivity and sustainability of natural capital depend upon how well the Ugandan economy, Ugandan businesses, and Ugandan people manage and use it. This includes whether they remove it or degrade it through, for example, deforestation and destruction of wetlands, or if they nurture and grow it.

Better Information Is Needed on Natural Capital

Knowledge of the dynamic natural capital base and its use is therefore critical for shaping Uganda's national development decisions. But it has been lacking. This has meant that Uganda has been 'flying blind' towards its aspiration for middle-income status. To address this, the Uganda NCA Program built on previous experience of NCA in Uganda to establish a systematic approach. NCA provides countries with solid and standardised metrics on the types of natural capital, their quantities and qualities, where they are located, how they are being used, and with what impact. By improving understanding, better-informed decisions can be made on policy and investments.

Uganda's Policy Context for Natural Capital Is Evolving Continually

Uganda has a number of cross-cutting policy documents and commitments in place that place major hopes on better natural capital management. Their implementation and review will be aided by NCA – and some of them call for NCA as a continuing function:

- Vision 2040
- NDP III
- The Sustainable Development Goals (SDGs)

[15] See the relevant sections of this document for references to the complete reports.

- UGGDS
- The National Land Policy.

For readers unfamiliar with Uganda, these cross-sectoral policies – as well as several sectoral policies, laws and regulations that have major implications for natural capital – are summarised in Annex 1.

A Confluence of Drivers Explain Why Uganda Engaged with The WAVES Programme

Some longstanding reasons for adopting NCA were on the data *'supply side'*:

- Officials working in environment and natural resource sectors had long felt the need for the type of data that can more effectively 'mainstream' their concerns into economic and development policy. Stakeholders consulted said that available data had consistently underestimated the contribution of forests, biodiversity and water supplies to Uganda's economy. They wanted to be able to provide more relevant and compelling data on, for example, the costs, benefits and risks of natural capital, and on producers and users – rather than simply on areas and species as before. They also wanted a more systematic data format and means of data generation that make data more user-friendly for statistical, modelling, and planning procedures.
- UBOS, which has the mandate for national statistical collection, felt the need to improve its understanding and capacity in NCA. This would help it to take a lead in coordinating an NCA system, building on its emerging work on satellite accounts, including water accounts.[16]
- An NP-AEEA (see Box 1.3) had been drafted just prior to the WAVES work in Uganda. With United Nations Statistics Division (UNSD) support, it offered an initial 'road map' to establishing NCA firmly in the Ugandan institutional landscape. The WAVES opportunity and approach was ideal to take it forward.

On the *'demand side'*, the policy ambitions and commitments outlined above (and at Annex 1) provided a strong justification for signing up to WAVES – even if initially the relevant authorities were not the direct drivers of NCA development. Achieving middle-income country status requires a much better handle on how national wealth is growing and being deployed. Furthermore, the various environment and climate commitments to which Uganda is a signatory have specific targets and monitoring requirements.

Finally, Uganda's experience from various approaches to NCA in the past – even if one-off and at times not leading to policy change – conferred some familiarity with NCA (see Box 1.4). Along with inspiration from interacting with WAVES' work in other countries, notably Rwanda, this emboldened MOFPED, UBOS, NPA, MWE and NEMA to come together to form the Uganda NCA Program and seek the support of the World Bank's WAVES programme.

[16] GOU. 2019.

Box 1.3. Uganda's National Plan for Advancing Environmental-Economic Accounting (NP-AEEA)

The NP-AEEA aims to help Uganda to find answers to sustainability concerns, providing information on progress in the sustainable development goals (SDGs) and particularly those concerning the environment.

Drafted with United Nations Statistics Division (UNSD) support in 2017, it recognises that reporting on SDGs and other indicators requires cross-sectoral information, generated from multiple data sources. It offers a plan to develop a natural capital accounting (NCA) system, using the System of Environmental-Economic Accounting (SEEA), as the best way for Uganda to generate such information. It laid out a logical sequence of: awareness raising, establishing institutional mechanisms for NCA, general assessment of the data sources and methods, collection of available data, development of data sharing, data quality assessment, gap-filling, constructing the accounts, and ensuring continuous data collection, regular compilation of accounts and appropriate communication. The plan prioritises water accounts, forest accounts, energy accounts, land accounts, air emission and waste accounts, and ecosystems extent and condition accounts. The ultimate success of the accounts in Uganda will depend on how well information goes reliably and routinely to the right decision-making bodies.

The draft plan was not very actively pursued until the Uganda NCA Program revised it, aligned it with the Plan for National Statistical Development, and helped build consensus on it, after which it was formally launched in late 2019. It should guide further development of NCA following the Wealth Accounting and the Valuation of Ecosystem Services (WAVES) programme.

Box 1.4. Uganda's Previous Experience with NCA

Uganda has a longer history of natural capital accounting (NCA) than most African countries, even if it is a fragmented one:

- ***Wetland valuation studies*** were completed for several wetlands between 1999-2010.[17]
- ***The feasibility of integrating environmental sustainability in the System of National Accounts (SNA)[18] through environmental accounting*** was assessed by the Government's Environment and Natural Resources Sector Working Group between 2003 and 2005.
- ***The monetary value of the stocks and flows of Uganda's forest resources*** and their aggregate contribution to the national economy was assessed by National Environmental Management Authority (NEMA) in 2011.[19]
- ***Preliminary forest accounts*** were prepared by the Ministry of Water and Environment (MWE) in 2017, expanding on the above by including forest services in protecting water quality and soils.[20]
- ***The world's first species diversity accounts*** were published in 2017, as part of a broader suite of ecosystem extent accounts for Uganda.[21] These have a spatial basis. Stock accounts were made for economically important species – Gum Arabic, Shea butter nuts, *Prunus africana*), and two tourism flagship mammals (chimpanzees and elephants).

The species accounts have had more impact than earlier accounts. They have informed debates on the status of Uganda's protected areas, budget allocations for protected areas, monitoring ecosystem degradation, the relationship of biodiversity with economic growth, and progress towards international targets. They also directly informed a ban on cutting the *Prunus africana* tree and a quota on exporting its bark.

More recent work, including the current water accounts, has built on the System of Environmental-Economic Accounting (SEEA). However, almost all of it was led by institutions with an environmental mandate and took place outside the main planning and statistical frameworks. Moreover, the work was one-off. Although the statistical, economic and development authorities were consulted by some accounting initiatives, it was only with Wealth Accounting and the Valuation of Ecosystem Services (WAVES) that involvement of mainstream authorities became central and an ongoing accounting capacity began to be established.

[17] Emerton et al., 1990; Karanja et al. 2001; Kakuro et al. 2013.
[18] See: https://unstats.un.org/unsd/nationalaccount/docs/sna2008.pdf.
[19] Glenn-Marie Lange et al. 2005.
[20] UN-REDD Programme. 2017.
[21] UNEP-WCMC and IDEEA. 2017.

Uganda's Choice of Land, Forest and Ecosystem Accounts

Ugandan authorities chose to prepare land and forest accounts primarily because land and forests are fundamental to the performance of many sectors, and forest-based economic growth is a priority in Vision 2040. The NP-AEEA had established land and forests as accounting priorities, along with water and energy. However, their selection was also for pragmatic reasons. It was felt sensible to work on accounts for which there is regular data collection. The regular National Biomass Surveys provide this.

The WAVES program also operated at the same time as other internationally supported work on accounts for other themes. Most notable are the production of water accounts[22] aided by the United Nations and Statistics Netherlands, and new ecosystem accounts with UNEP World Conservation Monitoring Centre (UNEP-WCMC) (informing ecotourism, fisheries and land degradation). The interactions between the various groups producing and using these accounts were fruitful (Section 8). Together, they have meant that NCA in Uganda now covers a wide range of natural capital, if not yet non-renewable natural resources like oil and gas and minerals, or accounts for waste and pollution. The eventual need for other accounts is also noted in the NP-AEEA.

How the Uganda NCA Program Worked

The Uganda NCA Program programme was launched in October 2018 by the MoFPED Permanent Secretary and Secretary to the Treasury. The process involved:

- **Inception workshop**: Ensuring stakeholders on both the data supply side and the policy demand side appreciated the purpose of NCA and the value of collaboration.
- **Mandate**: Working with UBOS' established role, to improve networking and access to data and to coordinate statistics production.
- **Technical coordination**: Establishing a TWG to lead NCA preparation and implementation, combining data and policy expertise[23], along with specialist groups under the TWG to work on individual accounts and macroeconomic indicators. Fourteen TWG meetings were held.
- **Oversight**: Initially making provision for a Steering Committee – superseded by making use of UBOS's established mandate for coordinating statistics and by the TWG.
- **Key staff**: Embedding an expert consultant within UBOS – working alongside two UBOS staff. Appointing a National Technical Coordinator, as an independent facilitator working across the whole process to bridge accounts producers with prospective accounts users.
- **Decision-centred**: Developing key policy questions to frame the accounts – notably in support of the NDP III's drive for sustainable natural resource-based industrialization.
- **Developing capacity**: Formal training on SEEA, Adjusted Macro Economic Indicators, and the Integrated Valuation of Ecosystem Services and Trade-offs (InVEST) model by international experts, plus hands-on training by the national consultant.
- **Ensuring quality**: Inviting and responding to peer reviews from the statistical agencies of Australia, Canada and the Netherlands.

[22] See https://www.wavespartnership.org/en/knowledge-center/uganda-water-accounts-report-2015-2018.
[23] TWG members were: MOFPED, NPA, UBOS, MWE, NEMA, NFA, and UWA.

- **Exchanging experience internationally**: Study tour to the Netherlands by teams from Uganda and Zambia hosted by Statistics Netherlands, participating in WAVES Global Partnership meetings and Global NCA Policy Forum, and hosting the 2019 NCA Policy Forum in Kampala which led to an active African NCA Community of Practice.[24]
- **Engaging decision-makers throughout**: Keeping policymakers in the loop – to smooth the path to data access, to raise decision-makers' anticipation of receiving accounts and considering their policy implications, and to secure final approval of the accounts.
- **Adaptive strategy**: Refining the NP-AEEA 'roadmap' so that it sets out a clear path for institutionalising the accounts, informed by the practical experience of WAVES, and the needs of decision-makers in both public and private sectors.

The full process of preparing, interpreting, using, and refining the accounts has not yet been through in its entirety. However, in just over two years (2018-20), the Uganda NCA Program has already produced accounts for land and forests, and experimental ecosystem accounts, as well as a macroeconomic indicators study. It has communicated the accounts and associated issue papers through a high-profile national launch. It has begun to use the accounts to inform debate, policy and investment. And, it is institutionalising NCA through formalising key agencies' roles and UBOS coordination and staffing.

> *"Natural Capital Accounting can inform policy and sustainable management of our natural resources leading to sustainable development. The Government of Uganda is determined to take the lead in measuring our country's Natural Capital extent, condition and function; and in turn using the results to inform policy at every level."*
>
> Uganda's Minister of Tourism, Wildlife and Antiquities, Ephraim Kamuntu,
> on behalf of H.E. President Museveni,
> on opening the 4th Policy Forum on Natural Capital Accounting in Kampala, 2019.[25]

[24] See: https://www.wavespartnership.org/en/africa-natural-capital-accounting-community-practice.

[25] See:https://www.wavespartnership.org/sites/waves/files/documents/Second%20Partnership%20Meeting/OPENING%20REMARKS%20final.pdf.

2 Land Accounts

Uganda has prepared physical asset accounts for land spanning 1990 to 2015 and covering the whole country. They were published in a technical document[26] accompanied by a briefing note highlighting the key findings.[27]

Why Land Accounts?

The land accounts were designed to contribute to the goals of Uganda's National Land Policy of 2013[28] which aims to ensure the efficient, effective and optimal utilisation and management of land resources for poverty reduction, wealth creation and socioeconomic development. Chapter 8 of the policy specifically calls for institutionalized monitoring and evaluation, development of indicators and tools for policy refinement and review.

Process and Methods for Land Accounts

The development of land accounts was led by UBOS, with assistance from other agencies through the TWG, along with technical data and policy expertise brought in mostly from further government agencies. In all, 30 people were part of the group.[29]

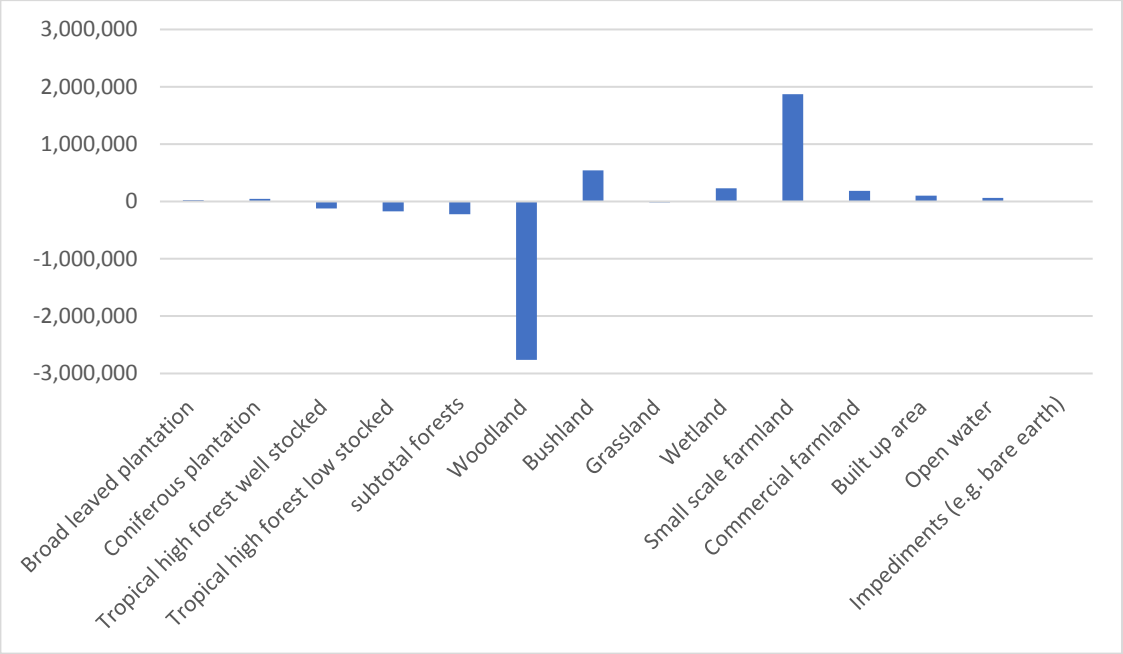
The accounts used an adaptation of the SEEA classification combining land cover and land use. They used data on land cover collected by the NFA through the National Biomass Surveys. These were prepared by the NFA and based on data for 2000, 2005, and 2015 in 2002, 2009, 2015 respectively) and national forest inventories.

Results from The Land Accounts

The land accounts offer both a new baseline and a time series on land assets. They help Ugandan decision-makers to answer key questions for NDP III implementation, such as 'what land do we have, how much is it worth, what is affecting it, how sustainable is its use, and how does it contribute to the economy?' The technical document presents a suite of accounts with maps and diagrams for 14 categories of land cover for the nation as whole, and all four regions and 112 districts[30] as well as agroecological, water management and climatic zones. Physical land cover accounts were produced for the years 1990, 2000, 2005, 2010 and 2015.[31] They reveal changes in all land cover types (Figure 2.1).

[26] See https://www.wavespartnership.org/en/knowledge-center/uganda-land-accounts-report-1990-2015.
[27] See https://www.wavespartnership.org/en/knowledge-center/land-physical-asset-accounts-uganda-brief.
[28] See http://extwprlegs1.fao.org/docs/pdf/uga163420.pdf.
[29] See Annex 1 of Technical Report, p. 254.
[30] The 112 districts were those that applied in July 2010, covering all of Uganda (one of them being Kampala municipality). By July 2018 this had increased to 127 (see p. 134 of Land Account Technical Report 2019).
[31] The stock of different land covers is assessed as at 1st January of each year in the series.

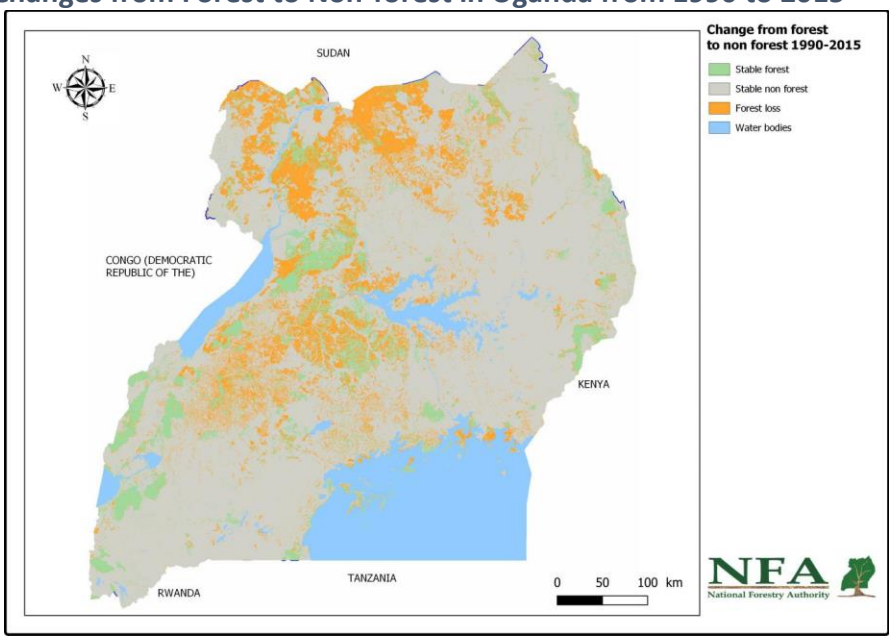
Figure 2.1. Changes in Land Cover Area – Uganda 1990 to 2015 in Hectares



Forest Loss

The most striking change was the loss of forests and woodlands. Between 1990 and 2015, 23 percent of Uganda's forests[32] and nearly 70 percent of Uganda's woodlands were lost. This deforestation was due mostly to a large increase in clearance for small-scale farmland. Figure 2.2 shows how most forest has been lost in Northern Region: 1.54 million hectares were deforested since 1990, leaving just 0.34 million hectares in 2015.

Figure 2.2. Changes from Forest to Non-forest in Uganda from 1990 to 2015



[32] There are five categories of forest and woodland. Forests include broad leaf plantations, coniferous plantations and tropical high forest. Woodlands are 'woody areas' and 'open high trees'. See Annex 2 of the Technical Report for numbers.

Wetland Dynamics

Wetlands are highly biodiverse areas and produce a wide range of ecosystem services such as ensuring reliable supplies of water for agriculture and regulating floods, as well as providing opportunities for eco-tourism. Wetlands have been contentious for some time. They are held in trust by the government, but many people have treated them as free resources, encroaching on them so much that the area of wetland declined by around 30 percent between 1994 and 2008.[33] The land accounts now offer clear, time-based and meaningful figures to bring sense to the wetland debate, putting wetlands into a more objective land cover and land use context. They showed that permanent wetlands actually increased from 484 thousand hectares to 715 thousand hectares between 1990 and 2015[34], that is, from 2 to 3 percent of total land cover. Yet at the same time the area of wetlands fluctuated over this period, and in 2010 it was as high as 3.5 percent of land area.

The production of a land cover change matrix could establish how far the changes to wetlands were due to natural or human factors. The accounts could also help to distinguish between permanent wetlands, and seasonal and semi-seasonal wetlands. And, although these are not published separately, the data behind the accounts can be used to do this. As such, the accounts can help to get an insight into rates and locations of wetland degradation and could monitor the important restoration efforts that are now being promoted.

Policy Implications of Land Accounts

The loss of forests and woodland to the development of small-scale farmland could be said to support the immediate needs of Uganda's growing population and the policy goal of reducing poverty. However, it also leads to environmental problems such as the loss of biodiversity and ecosystem services that will undermine future poverty reduction. The land accounts provide information that can assist strategic land use planning and management, such as examining the efficiency of land use with respect to income from agriculture, grassland or woodland.

The physical land accounts enable land use policies and targets to be reviewed. A key example is the size and representativeness of Uganda's protected area network.[35] This currently covers 16 percent of the total area of Uganda.[36] This now includes very significant areas of tropical high forest, which have increased greatly and in 2015 accounted for 43 percent of the PA. Conversely the amount of bushland within protected areas has decreased. The accounts can be used to explore the drivers of change behind such figures, and the likely benefits and costs of expanding the protected area network.

Moving forward, the land accounts may be used in association with ecosystem service accounting, with further analysis, to identify areas outside the protective area network where payments for ecosystem services or other market instruments could have the largest impacts.

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[33] The Uganda Wetlands Atlas. Vol. II, see: https://www.ug.undp.org/content/dam/uganda/docs/UNDPUg17%20-%20Uganda%20Wetlands%20Atlas%20Volume%20II_Popular%20Version.compressed.pdf.

[34] See Annex 2 of technical report.

[35] Uganda's protected areas network includes national parks, wildlife reserves, community wildlife reserves, and wildlife sanctuaries, all under the mandate of UWA; central forest reserves under the mandate of NFA; dual joint management zones, managed by UWA and NFA; and local forest reserves, under the mandate of district local governments.

[36] See World Bank https://data.worldbank.org/country/uganda.

For example, market incentives for agroforestry within small-scale farmlands to reduce the pressure on forests, and for woodlands to produce woodfuel, in ways that maximise the economic benefits along the value chain (that is from trees in the landscape to the retail sale of charcoal). Woodfuel is discussed in more detail in Section 3 below.

'The land accounts can show us what wetlands can do for the economy, and what we lose if we don't take care of them. We finally have dynamic information that justifies active wetland management and investment – and provides a solid basis for monitoring.'
(Lucy Iyango, Assistant Commissioner, Wetlands Management Department)

3 Forest Accounts

Uganda published its forest accounts in June 2020.[37] The accounts span the years 1990 to 2015, as with the land accounts. The accounts are in physical and monetary terms, covering not only the area of forests and woodlands but also wood assets and selected wood products. Although such accounts do not usually include future predictions, the publication also projected an increasing demand for forest products and an increasing supply gap.

Why Forest Accounts?

Uganda's forests are an important and treasured natural asset that provides multiple environmental, social and economic benefits. They meet the country's needs for woodfuel, timber and poles. They provide habitats for flora and fauna. And they help to regulate water flows, control sediment, and mitigate climate change.

Effective forest policy has been an area of concern for some time in Uganda. With forest-based economic growth becoming a recognised priority in Vision 2040, being emphasised as a driver of national development in all three National Development Plans (NDPs) to date, indications of drastic reductions in wood stocks between 2000 and 2005 are worrying. They point to a lack of effective forest legislation and management. It has generally been recognized, for example, that the Uganda Forestry Policy (2001) and the National Forestry Policy and Tree Planting Act (2003) did not adequately ensure good management of forests on private lands. Addressing this oversight in private lands is a critical need, along with ensuring the sustainable management of public forests in the face of growing demand for wood and especially fuelwood. The forest accounts were designed to provide the information needed to target localities or sectors for special attention by forest policy and management.

Vision 2040 includes targets to restore Uganda's forest cover to its 1990 extent of 24 percent of land area.[38] In 2015, Uganda made a commitment to restore 2.5 million ha of land and forest under the international Bonn Challenge.[39] Studies have shown that additional information is needed to support and track private and public investments in forest restoration.[40]

[37] Wood Asset and Forest Resources Accounts: https://www.ubos.org/wp-content/uploads/publications/09_2020Report_2020_Uganda_Wood_&_Forest_Resources_Accounts.pdf.

[38] GoU. 2013.

[39] The Bonn Challenge is a global initiative aligned with the United Nations Framework Convention on Climate Change, the United Nations Convention to Combat Desertification, and the Convention on Biological Diversity. Globally the aim is to restore 150 million hectares of deforested and degraded land by 2020, and 350 million hectares by 2030.

[40] IUCN. 2018.

Process and Methods for Forest Accounts

The forest accounts were developed following the concepts and methods of the SEEA and followed on from land accounts.[41] Data were sourced from the responsible ministries, departments and agencies, and compiled by UBOS with support from the World Bank. The TWG supported data quality assessment and technical review, with WAVES facilitating an international peer review by experienced statistical offices (Statistics Netherlands and Statistics Canada). The prime source of data on forest land and wood stocks was the National Biomass Survey database covering 1990, 2000, 2005, 2010 and 2015. A combination of satellite imagery and ground surveys underpins this. Data on wood products and prices came from a wide variety of sources, mostly from within Uganda. However, it was not possible to compile data on the condition of forests within the life span of the program although some steps were made in the working on ecosystem accounting (see Section 4). In the future, information on the ecosystems services from forests would be particularly useful for assessing condition.

Results from The Forest Accounts

Table 3.1 shows the change in area of five types of forests included in the forest accounts. There have been small increases in broadleaved and coniferous plantations and larger declines in tropical highland forest, but a massive decline in woodland. The account also shows changes in different types of land management, namely private land, national parks and wildlife reserves, dual joint management zones, and central forest reserves.

Table 3.1. Uganda Physical Asset Account for Forest and Woodland – 1990-15 in Hectares

	Broadleaved Plantation	*Coniferous Plantation*	*THF Well-stocked*	*THF Low-stocked*	*Woodland*	***Total***
1990 – 2015						
Opening stock (1 Jan 1990)	18,682	16,384	651,111	273,062	3,974,523	**4,933,762**
Additions	42,210	54,478	111,899	75,158	507,067	**790,812**
Reductions	16,656	7,376	233,885	246,355	3,268,638	**3,772,910**
Net change	25,554	47,102	(121,986)	(171,197)	(2,761,571)	**(2,982,098)**
Closing stock (1 Jan 2015)	44,237	63,486	529,124	101,864	1,212,951	**1,951,662**

Note: THF = Tropical High Forest

The monetary forest accounts showed that, while forest area in Uganda declined by 60 percent from 1990 to 2015, the total value of Ugandan forest land increased by 26.7 percent. Moreover, the average price per hectare of forest land increased even further – by 2.5 times. This was because forest land was becoming scarcer with deforestation. The land value varied across regions, with the 'Central 1' region having the highest land value at nearly US$130,000 per ha and accounting for 62 percent of total value in 2015. These dramatic changes were driven by infrastructure development and large-scale agricultural projects which triggered actual and perceived higher returns from land investment.[42]

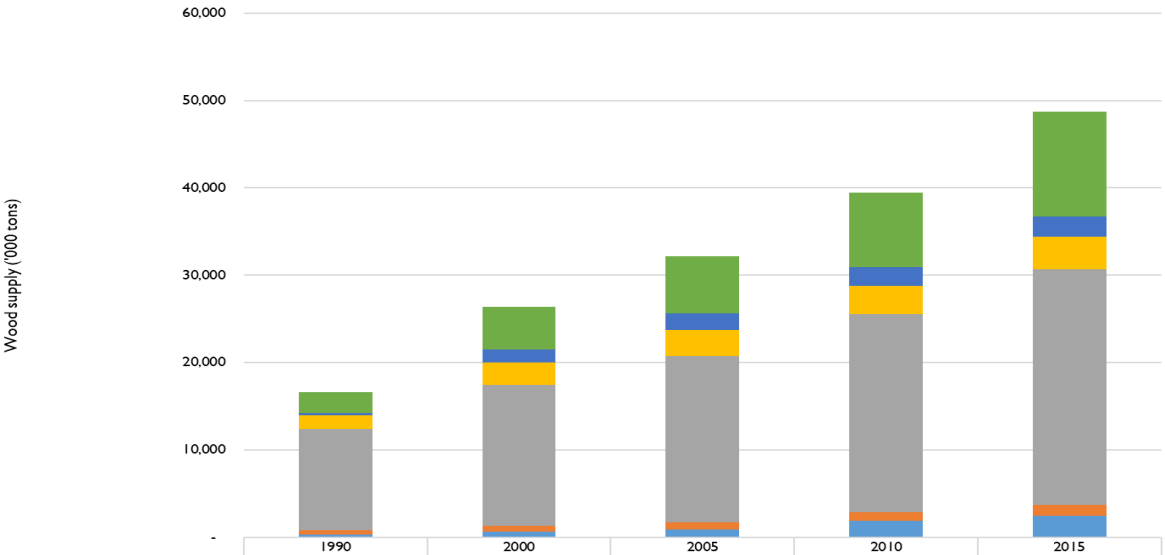
[41] UBOS. 2019c

[42] Tumushabe and Tatwangire. 2017.

The wood products accounts include tables explaining the supply and use of sawn timber, poles, charcoal and commercial, industrial and household firewood, as well as their Import and export. The supply of selected forest products in physical terms is shown in Figure 3.1 and the equivalent monetary information in Figure 3.2.

The wood products supply and use tables also show that Uganda's wood product trade deficit (that is the difference between exports and imports) reduced between 2000 and 2015. While overall there was a reduction in the deficit, the value of particular exports fell. For example, the combined value of shea oil and *Prunus africana* bark exports fell from US$ 7.0 million to US$ 4.8 million between 2010 and 2015.

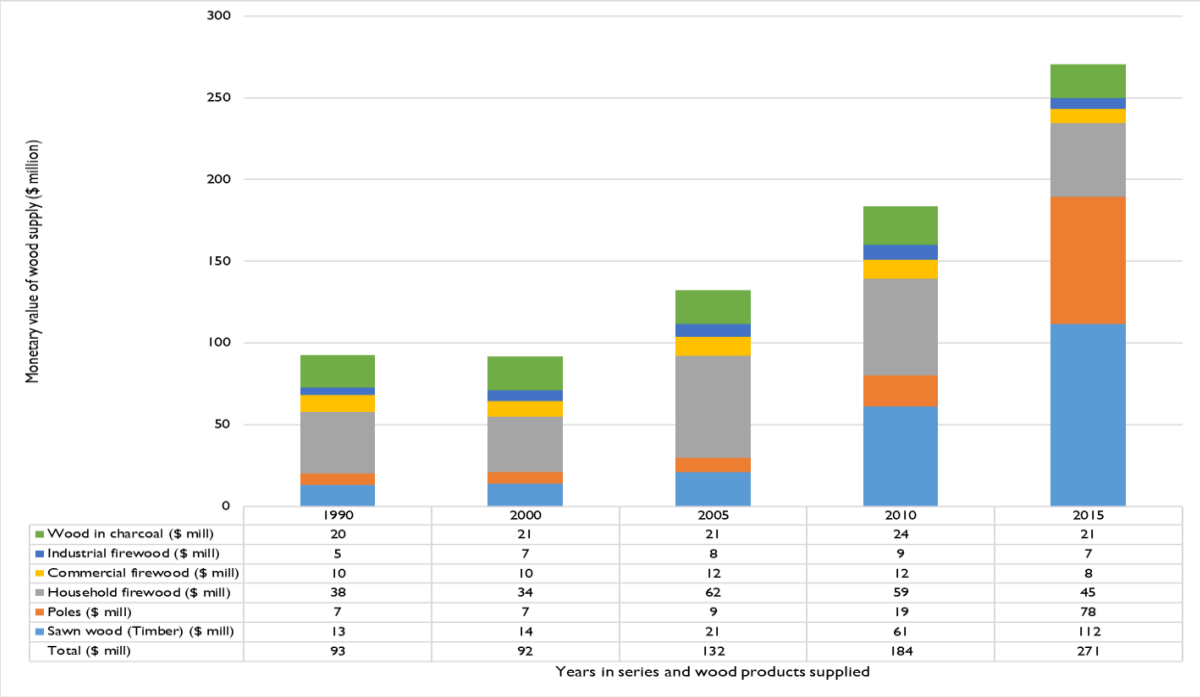
Figure 3.1. Uganda – Physical Supply of Wood Products, 1990 to 2015 (thousands of tonnes)



	1990	2000	2005	2010	2015
Wood in charcoal ('000 tons)	2,396	4,880	6,506	8,535	11,962
Firewood Industrial ('000 tons)	253	1,569	1,949	2,126	2,364
Firewood Commecial ('000 tons)	1,534	2,550	2,993	3,256	3,656
Firewood Household ('000 tons)	11,654	16,100	19,021	22,692	27,024
Poles ('000 tons)	431	659	808	1,013	1,247
Sawn wood ('000 tons)	324	652	902	1,847	2,453
Total ('000 tons)	16,592	26,410	32,179	39,469	48,706

Years in series and wood products supplied

Figure 3.2. Uganda – Monetary Supply of Wood Products, 1990 to 2015 (US$ Millions)



Policy Implication of Forest Accounts

Charcoal and firewood are key wood products and, together with residue from agriculture and forest product processing, make up Uganda's woodfuel. Charcoal and firewood constitute the largest percentage of wood products in monetary and physical terms (Figure 3.1 and Figure 3.2) while woodfuel accounts for the highest percentage (88 percent) of energy used in Uganda.[43] The vast bulk of woodfuel (87 percent) is consumed by households. The national demand for wood products is projected to more than double from 2015 to 2040, from 48 million tons to 105 million tons per annum[44], based on Ugandan population growth. The forest accounts forecast a deficit in wood products by 2030. In other words, to meet expected demands Uganda will need to import wood products – or alternatively increase the supply of wood products, limit population growth or find substitutes for wood products.

Despite woodfuel's apparent importance to the economy, it is not yet an area of focus in national planning. To address this, a technical report on woodfuels was produced as part of the Uganda NCA Program.[45] It showed that the annual value of traded woodfuels is an estimated US$ 810 million. While this is a small fraction of total economic activity as measured by GDP[46], the production, transport and sale of woodfuel is also estimated to employ 870,000 people on a full-time equivalent basis – and up to 60 percent of employment and value added is likely to be generated in rural areas. While the value of woodfuels is included in Uganda's GDP estimates (they are assigned a positive value based on total demand and average price), GDP estimates do not reflect the cost of depletion, nor the unpriced ecosystem services that the forests and woodlands provide. Thus, their net

[43] https://www.ubos.org/uganda-wood-asset-and-forest-resources-account-report-2020/.
[44] https://www.wavespartnership.org/en/knowledge-center/uganda-woodfuels-overview.
[45] Uganda Woodfuels Overview: https://www.wavespartnership.org/en/knowledge-center/uganda-woodfuels-overview.
[46] GDP at current prices was UGX 128,499 billion in 2018-19, approximately US$ 35 billion. See Annual GDP Publication Tables Uganda https://www.ubos.org/wp-content/uploads/statistics/AGDP_Publication_Tables_21_Oct_Revised-final.xls.

economic benefit may be negative. Moreover, the government captures little revenue from the woodfuel industry while bribes ('private taxes') could be worth US$ 146 million each year.[47]

A further complexity is that, despite the current scale of woodfuel production and its projected growth, production remains largely informal. This hampers the investment needed for modernisation and ensuring environmental and social safeguards. Formalization of the woodfuel industry will require governance reforms. To achieve this, improvements to data on forest timber extraction, values and stocks need to be made. This is where a continuing NCA system can help – regularly accounting for the wood resource, its gains and losses, its uses, and its added value.

[47] Data on non-enforced licenses, uncollected fees and 'private taxation' are not available for Uganda, though a study from Malawi suggests that 12 percent of the retail price of charcoal represents bribes to police, forestry and local council officials (Kambewa et al. 2007), while research in Kenya has recorded equivalent figures of 15 percent and 26 percent (Bailis. 2005; Camco Advisory Services. 2013).

4 Experimental Ecosystem Accounts

Uganda has begun the ambitious task of creating ecosystem accounts, using data, modelling tools and capacity that was readily available. While a full set of ecosystem accounts was not possible to produce in the short time available, much progress was made, with some experimental accounts produced and a path for their production outlined in the 2020 report *Towards Ecosystem Accounts for Uganda*.[48]

Why Ecosystem Accounts?

The objective of the report on ecosystem accounting was to assess if ecosystem accounts could be developed for Uganda, putting in place what basic building blocks of the accounts could be developed in the relatively short term with available data. This was to demonstrate the general set-up of ecosystem accounts, determine the feasibility of their production, and assess their policy relevance – particularly for key ecosystems of interest like forests and wetlands.

Process and Methods for The Experimental Ecosystem Account

The report draws on the land accounts and uses the land cover data to create accounts for each of the eight river basins that together comprise the large majority of Ugandan territory. As noted in the SEEA–Experimental Ecosystem Accounting framework, land cover can be used as an initial proxy for ecosystems. The Uganda report also drew on other existing data, for example, from the Uganda Wetlands Atlas. The data on wetlands from this Atlas, where the definition of wetlands was aligned with the Ramsar Convention on Wetlands of International Importance, had to be reconciled with the Ugandan data on land cover, which used a different definition of wetlands.[49]

Some of the data underpinning the land cover accounts were used in the InVEST modelling platform[50] to generate estimates of physical flows that provides the four wetland ecosystem services which were mapped. This in turn enabled an experimental ecosystem service account to be designed and populated for the supply side for each of the eight major watersheds, for the year 2015. The work demonstrates that, while there are challenges, the data sources, methods and capacity currently available to Uganda could be used to produce ecosystem service accounts in the coming years, although it will need work in identifying the users of the services.

Results from The Experimental Ecosystem Account

The report provided estimates of physical measures for carbon storage, carbon sequestration (the process of capturing atmospheric carbon dioxide), water yield and sediment retention in eight river basins and by land cover type. For example, the amount of carbon sequestered is

[48] UBOS. 2020.

[49] By comparing the two data sources, it could be seen that much land defined as wetland in the Atlas was also recorded as wetland in the land cover account. However, much of the wetland in the Atlas showed up as bushland, grassland or small-scale farmland in the land cover account.

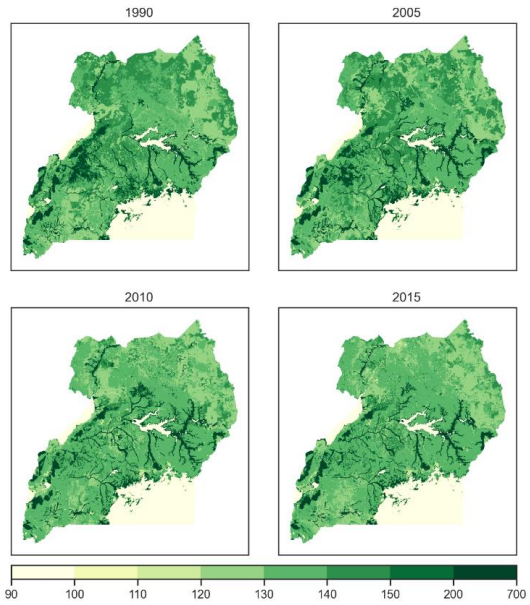
[50] InVEST is a suite of free, open-source software models used to map and value the goods and services from nature that sustain and fulfill human life. See: https://naturalcapitalproject.stanford.edu/software/invest.

shown in Figure 4.1. The estimates were made for the years matching the land cover accounts, that is 1990, 2005, 2010, and 2015. The changes in these four physical measures were related to changes in land cover and in particular the loss of forests and its conversation to farmland.

From the estimates of physical measures, a national experimental ecosystem service account was designed. The supply of ecosystem services is defined as the physical flows that have a corresponding user. Therefore, the experimental accounts developed for Uganda show only the supply or potential supply of ecosystem services. Since carbon storage and carbon sequestration both contribute to climate regulation, which is of benefit to all people, all of the carbon stored and sequestered could be considered a use of an ecosystem service by government, signifying that these services are a collective benefit. The ecosystem services providing climate regulation increased between 1990 and 2005 but declined in the period 2005 to 2015 – again caused, in particular, by deforestation.

While there were no estimates of the use of the ecosystem services of water provisioning and erosion control, the report's information on the physical flows of water yield and sediment retention is useful and indicative of changes in related ecosystem services. These flows were thus shown in the supply side of the experimental account. This showed that the water yield increased over time, meaning that more rainwater ends up in rivers (although changes in rainfall patterns also need to be considered when interpreting the results).[51] In addition, the report showed that soil retention declined over time – also related to the conversion of forests and woodlands into farmland. Farmlands are more prone to erosion than forests and woodlands, especially in the beginning of the growing season when there is not yet full ground cover in the fields.

Figure 4.1. Carbon Sequestration (Tonne Carbon per Hectare Per Year) for Years 1990, 2005, 2010 and 2015



[51] Previously compiled water accounts (GOU, 2019) may be able to provide some context for further analysis and help to convert estimates of water yield into estimates of the use of the water provisioning service, at least at the national level.

Policy Implications of The Ecosystem Accounts

While the ecosystem accounts are experimental, they already indicate how information in ecosystem accounts could be used to support policymaking and managing ecosystems. In principle, they can support land use planning, climate change mitigation, biodiversity conservation, water supply and agricultural policies. Their utility would be considerably improved if monetary measures related to ecosystem assets and services were also developed. As such, economic valuation of ecosystem services is a critical next step and will require greater integration with both Uganda's land accounts and national economic accounts. Previous Ugandan work on the valuation of ecosystem services from wetlands is a useful starting point.

As the Government of Uganda continues to develop and implement successive policies to meet the Vision 2040, it is clear that ecosystem accounts could help set realistic baselines, track progress, demonstrate trends, quantify trade-offs, and ensure the most effective synergies between environmental, social and economic policies. Going forward, extending the ecosystem service accounts into cultural and recreational services is an attractive idea. The report on tourism expenditure and motivation in Uganda, supported by the World Bank, could provide a good starting point for this (See Box 4.1).

Box 4.1. Cultural and Recreational Ecosystem Services in Uganda

The Government of Uganda recognizes tourism's potential and continues to prioritize tourism as one of the country's growth sectors. Uganda is renowned for its wildlife. Uganda's national parks contain 1,082 species of birds, 38 carnivores and 29 antelope species. Uganda is the only country in the world that contains both the 'Big 5' (lions, leopards, rhinos, elephants, and buffalos) and gorillas. Uganda's most-visited wildlife destinations are Queen Elizabeth National Park and Murchison Falls National Park, but excellent game viewing is also available in others.

To better understand the tourism development potential and to monitor changes in tourism, Tourism Expenditure and Motivation Surveys (TEMS) were conducted in 2012 and 2019, and a statistical and economic analysis of the tourism sector based on the 2019 TEMS was supported through Wealth Accounting and the Valuation of Ecosystem Services (WAVES).[52] The data from these surveys, along with existing information on wildlife, the land accounts, and the System of National Accounting (SNA) could readily be used to estimate values for the eco-tourism, recreational and cultural ecosystem services provided by the conservation estate. The survey data could also be used to produce full tourism satellite accounts.

[52] World Bank. 2020.

5 Macroeconomic Indicators

Around the world, greater attention is being given to enhancing the range of economic indicators that can help to assess the long-term sustainability of national economies. Two new and important sets of economic indicators have been developed:

- Adjusted macroeconomic measures of national income and savings, to reflecting a wider range of changes in assets than conventional measures, such as environmental damage and income saved for investment in human capital.
- Information on national wealth, to give a comprehensive measure of different types of assets, including renewable and non-renewable natural capital, produced capital, human capital and financial assets. This is known as comprehensive or total wealth.

The two sets of indicators are complementary. Adjusted net national income (ANNI) measures the degree to which income is sustainable in the short term, while wealth indicates the prospects for maintaining that income in the long term. Adjusted National Savings (ANS) provides the link between income and wealth. Some of this information falls within the SEEA framework and is complemented by work carried out by the World Bank through its *Changing Wealth of Nations* assessments.[53] To date, most of that work on these metrics has been done using internationally sourced data.

Why A Report on Macroeconomic Indicators?

Uganda's economy is highly dependent on natural capital for production and economic growth. High GDP growth rates are expected in the production of agricultural commodities, minerals, oil and gas, as well as service delivery and tourism – all sectors that depend on the effective management of natural capital. To this end, adjusted macroeconomic indicators and measures of wealth for Uganda have been produced under the Uganda NCA Program.

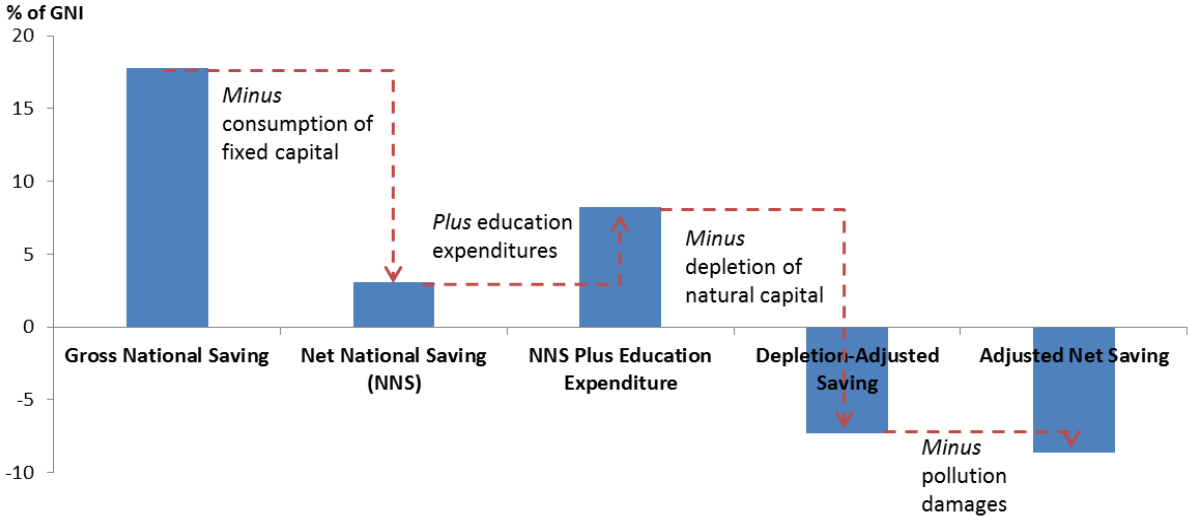
Process and Methods for Macroeconomic Indicators Report

The macroeconomic indicators report draws on the concepts and data used by the World Bank in the *Changing Wealth of Nations* and related indicators sets.[54] Country data on ANNI and ANS are published annually by the World Bank and are included in the World Development Indicators database.[55] The data used is from global sources, in part to use data derived in similar fashions to ensure comparability between countries. To get a more accurate picture of the situation in Uganda for use nationally, the indicators were re-estimated with local data.

ANNI takes the conventional measure of gross national income (GNI) and deducts the value of depletion of assets, including produced capital (called consumption of fixed capital) and natural capital. ANS takes the conventional measure of gross national savings (GNS) and adds the value of education expenditure (an investment in human capital), deducts the value of depletion of assets (as for ANNI), and deducts the value of pollution damage (Figure 5.1).

[53] World Bank. 2018.
[54] See https://openknowledge.worldbank.org/handle/10986/29001.
[55] World Development Indicators database https://databank.worldbank.org/source/world-development-indicators.

Figure 5.1. The Chain of Adjustments from Gross National Savings (GNS) to Adjusted Net Savings (ANS)



Comprehensive (or total) wealth accounts include four types of assets: produced capital, natural capital (with a range of subdivisions), human capital, and net financial assets.[56] Natural capital is split into two main types:

- **Non-renewable resources** – minerals and energy resources below the ground. Energy resources include coal, oil and gas, while minerals include the ten major commodities mined globally.
- **Renewable** – above-ground resources are agricultural land (cropland and pastureland), forests and protected areas.[57]

Results of Uganda's Macroeconomic Indicators Report

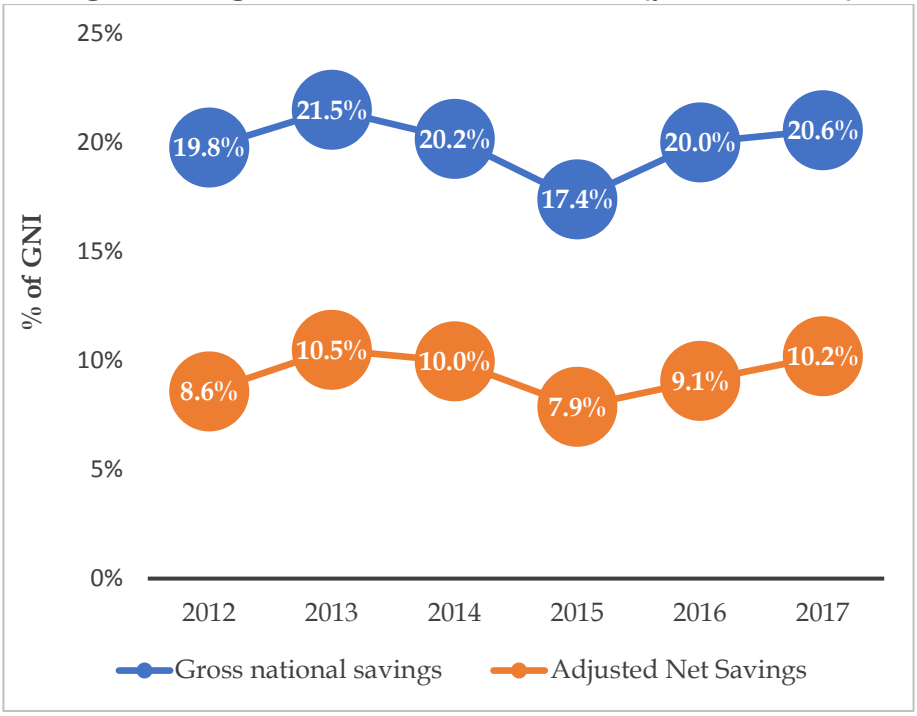
Uganda's accounts for comprehensive wealth reinforce other work that shows that, since 2010, renewable natural capital has been depleted. In other words, renewable resources are being exploited faster than they are being renewed – and possibly irreversibly. However, this depletion of renewable natural capital is being compensated by investments in other capital, through expenditure on assets such as education and infrastructure.

Uganda demonstrated a positive ANS in all years between 2012 and 2017, peaking at 10.5 percent in 2013 and at its lowest in 2015 at 7.9 percent (Figure 5.2). The movement of ANS and GNS are aligned, but with ANS lower by around 10 percent in all years. This indicates that the consumption of produced and natural capital and the damage caused by pollution are less than investment in education (the latter a proxy for human capital).

[56] *Produced capital* is also referred to as capital stock and includes buildings, machinery, equipment and urban land. *Financial capital* (or net financial assets) refers 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. *Human capital* is the value embodied in the education, training and skills of the population – as important an input to the production of economic value as the produced capital stock conventionally measured. (World Bank, 2018).

[57] Some renewable energy resources (such as hydroelectricity, wind and solar) are not currently included for Uganda or elsewhere in the world owing to questions about valuation. However, for the purpose of adjusting macroeconomic indicators this valuation is unnecessary as there is no depletion and minimal pollution, if any.

Figure 5.2. Uganda GNS and ANS – 2012-17 (percent of GNI)



The composition of Uganda's comprehensive wealth (total wealth) is shown in Figure 5.3. The largest single contribution comes from human capital, which in 2014 amounted to half of Uganda's wealth and reflects Uganda's high level of investment in education. This is followed by some natural capital (cropland and pastureland), reflecting the importance of agriculture, and by produced capital (such as buildings and infrastructure). Net foreign assets were US$ 11,279 million, meaning that foreigners owned more assets in Uganda than Ugandans owned in other countries.

Figure 5.4 illustrates how cropland, pastureland and protected areas make up most of Uganda's natural capital wealth. The contribution of forests to overall wealth is low, at just 0.7 percent of total natural capital in 2014. This low level is due to the rapid depletion and deforestation over many years. And, even though the price of forest land has increased in a way that other land prices have not, this does not outweigh the decrease in forest area. At present, subsoil energy resources (such as fossil fuels) are not included in measures of total wealth in Uganda, while minerals made up only a tiny fraction (US$ 30 million) in 2014.

Figure 5.3. Uganda's Composition of Comprehensive (or Total) Wealth – 1995 to 2014

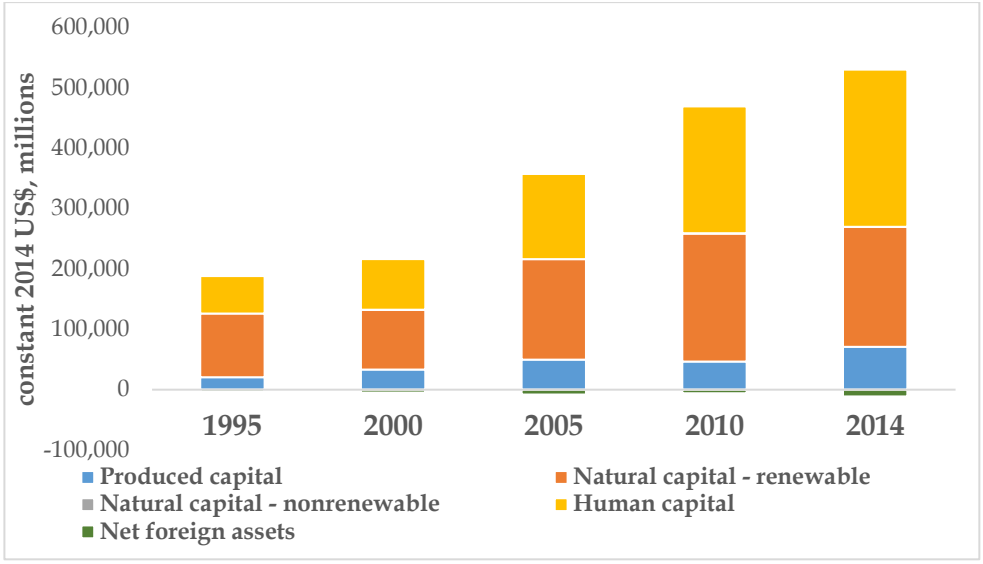
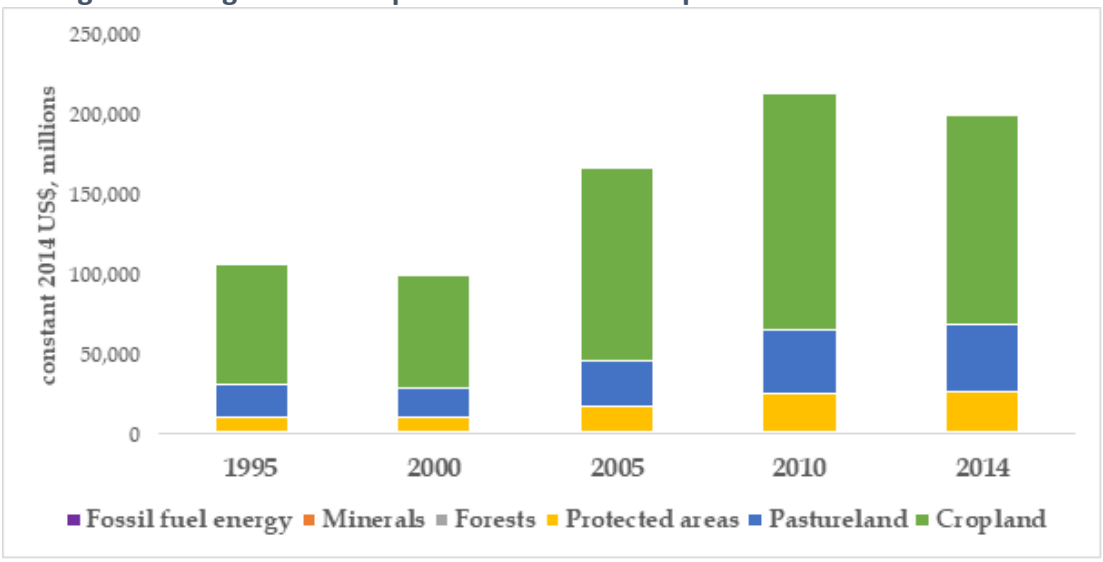


Figure 5.4. Uganda's Composition of Natural Capital Wealth – 1995 to 2014



Policy Implications of The Macroeconomic Indicators

Uganda's per capita wealth increased by an average 2.4 percent per year in real terms between 1995 and 2014, despite the population growing at 3 percent per year. However, per capita wealth fell slightly between 2010 and 2014[58], indicating that recent population growth (including resident refugees) has outstripped wealth accumulation. Compared to neighbouring countries, in 2014 (the most recent data available), Uganda had lower per capita wealth than Kenya, Tanzania and Rwanda, although it was above the average for low-income countries as a whole.[59]

As ANS is positive, it can be said that Uganda's current growth does not come at the expense of running down its total capital base. Two main factors contributed to this:

[58] Macroeconomic indicator report Fig 26, p. 23.
[59] Macroeconomic indicator report Fig 27, p. 24.

- High investment in human capital in the form of education expenditure (both public and private) has provided some compensation for natural capital draw-down.
- Low market prices attached to wood means that the value that forests contribute to total wealth is also low, since the value is based on the expected flow income from the sale of forest products. The low market price means that the physical loss of forest has neither impacted on ANS nor on the value of natural capital.

However, it is important to stress that some losses cannot be compensated e.g. much of forest biodiversity is irreplaceable by other forms of capital. In Section 7, we raise the need to address issues of 'critical natural capital' and 'hard and soft sustainability'.

Uganda is also likely to increase commercial production of oil and gas as well as other minerals – in other words, running down non-renewable natural capital. It will then be useful to incorporate these non-renewable natural capital assets in estimates of total wealth. It is therefore clear that NCA will become increasingly important for decision-making on ways to manage diverse forms of capital – so as to ensure net positive and sustainable contributions to wealth. In Section 7 we discuss how NCA can contribute.

6 Accounts are Already Informing Government Analysis and Decisions

Uganda's NCAs were produced with a view of informing and implementing national development visions and frameworks. In other words, the design of each account was 'decision-centred' and began with an assessment of policy or management questions such as:

- What natural resources are available, and what do they contribute to the economy?
- Is natural resource utilization sustainable?
- How far have natural resources been depleted, and what impact does this have on the economy and investments?
- Is the environment budget allocated optimally by, for example, return per unit of natural capital?

Because the Ugandan process of preparing the accounts involved both data providers and policy authorities, it generated a high degree of stakeholder engagement and 'ownership'. This has led to good familiarity with the land and forest accounts, as well as the report on macroeconomic indicators. And, they are already beginning to inform decisions in Uganda.

This is a significant achievement, given the short time since their completion. During account preparation, the implications of some emerging findings were promptly integrated into relevant policy discussions by TWG members. Several examples from our consultation with stakeholders illustrate the breadth of early use of the accounts. They are just a beginning and a more systematic use of the accounts can be expected in future:

- In a recent period of heavy flooding, *wetland management* became a hot policy issue. Information from the land accounts supported the decision to increase funding for wetland management, with a seven-fold increase in budget.
- The forest accounts showed that wood stocks outside forest reserves and protected areas, particularly on private land, are important yet not fully recognized and integrated in policy and regulation. This has inspired criteria and targets for a potential *grants programme for farmers* to incentivize them to grow trees.
- There is much discussion of how to use the accounts in designing and using the *NDP III results framework, targets and indicators* – as well as for associated sector plans. NDP3 III's goal of *Sustainable Industrialization for Inclusive Growth, Employment and Sustainable Wealth Creation* has huge implications for the natural capital base. A paper addressing the question of how NCA can best support the NDP III has been produced.[60]
- The Macroeconomic Policy Department was able to use the Macroeconomic Indicator Study to present *options for potential taxes and subsidies* for MoFPED senior management. This could inform how to meet the target of raising tax levels from 12 percent to 16 percent while also contributing to sustainable development. It could also advise on who and what to tax, and how to avoid taxation that might harm the environment.
- The opportunity is being taken to *design improved data collection into new initiatives*. The process of preparing the accounts, with agencies being asked "do you have data on a, b and c?" has helped MWE to think through how to improve data collection.

[60] Natural Capital and NDP III 2021-2025: https://www.wavespartnership.org/en/knowledge-center/natural-capital-and-ndp-iii-2021-2025.

- In general, the early impact of all the accounts has been to improve *awareness* of natural capital contributions beyond their respective line agencies, and to give a greater sense of the *dynamics* associated with each type of natural capital. The involvement of MoFPED, in particular, has encouraged many agencies to become more open to natural capital issues and engage in them.

7 Accounts can Generate Evidence needed for Upcoming Policy Decisions

Section 6 has provided insights into how Uganda's new forest and land accounts and macroeconomic indicators reports are already being used. However, there is even more potential that comes from NCA's systematic, evidence-based approach, especially if the work on ecosystem accounting is continued. In general, NCA can support:

1. *Regular government policy and planning processes.* Table 7.1 provides an overview of how the different accounts can be used to support policies throughout the 'policy cycle' including: problem identification; design and analysis of policy options; implementation of chosen policy option; regular monitoring of policy, and policy review.
2. *Major integrated and comprehensive plans*, such as the NDP III and the UGGDS. Below we introduce how NCA offers an organised approach to handling the synergies and trade-offs involved in Uganda's sustainable development aspirations.
3. *Handling major 'hot issues'.* NCA offers a structured and authoritative way to explore the many contentious issues which might otherwise paralyse decision-makers by their complexity or because of data disputes. Below we introduce how NCA could help with upcoming decisions on *energy* and on *integrated land management*.

Table 7.1. Current Ugandan policies – Potential Uses of NCA

	Account			
Policy	**Land**	**Forest**	**Experimental Ecosystem**	**Macroeconomic indicators**
The Uganda Forestry Policy (2001) and National Forestry Tree Planting Act (2003)	The accounts can be used to put forestry into a broader land use context	The accounts could be used to review the policy, identify problems, design and analyse policy options, and monitor progress	Implementation of chosen policy option	The accounts can be used to determine the contribution of forests to the economy of Uganda
National Forest Plan 2011/2012-2021/2022 (2013)		Assist with the implementation, monitoring and review of the policy	Monitoring of the design and analysis of policy options	Mining and Minerals Policy [draft] National Energy Policy [draft]
State of Uganda Forestry 2016		In the future the accounts could be used to report on the State of Uganda's forests in physical and monetary terms	Accounts could be used to report on the ecosystems services that are produced by the country's forests	The accounts can be used to determine the contribution of forests to the economy of Uganda
National Biodiversity Strategy and Action Plan II (2015-2025) (2016)	Assist with the implementation and monitoring of the policy. In the longer term used to review Strategy and Action Plan, identify problems, and the design and analysis of policy options	Assist with the implementation and monitoring of the policy.	Monitoring of the design and analysis of policy options, including biodiversity conservation and payment for ecosystem services	
National Environment Act (2019)	Assist with the implementation and monitoring of the Act. In the long-term assist in the review of the effectiveness of the Act	Assist with the implementation and monitoring of the Act and review its effectiveness.		

	Account			
Policy	**Land**	**Forest**	**Experimental Ecosystem**	**Macroeconomic indicators**
Rural Development Strategy 2005-2030 (2006)	The accounts could be used to review the policy, identify problems and identification, and design and analysis of policy options			Going forward the addition of a spatial component could help with the review of the policy
Agricultural Sector Development Strategy (2013)	The accounts could be used to review the policy, identify problems and identification, and design and analysis of policy options			The indicators can be used to determine the contribution of agriculture to the economy of Uganda
Agriculture Sector Strategic Plan (2016)	The accounts could be used to review the policy, identify problems and identification, and design and analysis of policy options		Comprehensive accounts could be used to, identify the ecosystem services likely to be used by agricultural and how changes land use changes to agriculture might impact on other services	The indicators can be used to determine the contribution of agriculture to the economy of Uganda
National Land Policy (2013)	The accounts could be used to review the policy, identify problems and identification, and design and analysis of policy options	Forest accounts could be used to identify forest-related problems, design and analyse policy options	Comprehensive accounts could be used to review the policy, identify problems and identification, and design and analysis of policy options for biodiversity conservation and payments for ecosystem services on private	The indicators could be used to review the policy, identify problems and identification, and design and analysis of policy options
Mining and Minerals Policy – draft (2018)	The accounts could be used to, identify areas likely to impacted by mining and design and analysis of policy options to limit or compensate for this impact		Comprehensive accounts could be used to, identify the ecosystem services likely to be impacted by mining and design and	The indicators can be used to determine the contribution of mining to the economy of Uganda

	Account			
Policy	**Land**	**Forest**	**Experimental Ecosystem**	**Macroeconomic indicators**
			Analysis of options to limit or compensate for this impact (such as pricing the value of the services lost and the payment for the loss of these)	
National Energy Policy – draft (2019)	The accounts could be used to identify areas that could increase supply of woodfuels	Accounts have already been used to identify the reliance on woodfuels	Comprehensive accounts could be used to, identify the ecosystem services likely to be useful (such as water provisioning for hydro-electric power)	The indicators can be used to determine the contribution of energy production to the economy of Uganda.

Note: This table is illustrative: Empty cells do not imply that NCA is irrelevant.

Sustainable Development

The theme of NDP III is 'Sustainable Industrialization for Inclusive Growth, Employment and Sustainable Wealth creation'. NDP III's focus on resource-led industrialization will involve growing industries such as agriculture, forestry, fisheries and ecotourism and associated value chains based on *renewable natural resources*. Unless interventions to ensure sustainability are undertaken (reducing levels of natural capital depletion to match natural regeneration), current trends suggest that renewable resources may be exhausted and unable to sustain the industries that rely on them. To track this will entail new metrics that NCA can provide. Currently available metrics of performance of the economy do not adequately cater for sustainability. They also do not account for welfare changes or the environmental and social externalities of growth.

Resource-led industrialization will also involve the use of *non-renewable natural resources* like oil, iron ore and phosphates. Given their non-renewable nature, this means that any increase in GDP associated with their use is likely to cause their depletion (only so much can be achieved by efficiency measures). Moreover, depending upon the production process, the use of non-renewable resources frequently harms renewable resources through air and water pollution, tree clearing and land degradation. NCA will be extremely valuable for keeping track of the quantities and qualities of non-renewable natural capital, the flows of benefits and generation of wastes from use of the capital, helping Uganda to find the right path to sustainable development. While the adjusted macroeconomic indicators report covers non-renewable natural capital, at present there are no values for oil and gas and only a very small value for minerals. Going forward, it will be important to have such information if (as planned) these non-renewable resources are to be exploited. With such information, both the total wealth and the indicators ANNI and adjusted net savings (ANS) for the country will be more accurately reflected. It will also provide key information that can inform the debate on best use of non-renewables and ensure that the appropriate amount of revenue is captured by government.

A key debate on sustainable development is about where natural capital plays a unique and *non-substitutable* role – what is known as 'strong sustainability' as opposed to 'weak sustainability' where it can be compensated by other forms of capital. Strong sustainability requires the identification and tracking of 'critical natural capital' like unique biodiversity and ecological functions (Box 7.1). The economic concept of maintaining 'critical natural capital' is related to the environmental concept of maintaining 'ecological function' and is much the same as maintaining 'ecological integrity'. Regardless of the terms used, the underlying idea is that sustainability requires us to maintain the most essential attributes of nature, so that nature can continue to do for society what it has always done – that is, support not only life itself, but quality of life, for present and future generations.

Box 7.1. Keeping Track of Critical Natural Capital

A key debate in the literature on sustainable development and natural capital revolves around weak sustainability versus strong sustainability.

Proponents of weak sustainability argue that, in general, human welfare can be maintained at a constant level or increased when natural capital is destroyed – as long as natural capital is replaced with sufficient quantities of physical and human capital. This implicitly assumes that natural capital is substitutable to some degree by human or physical capital. Proponents of strong sustainability argue that other forms of capital are not a good substitute where natural capital is 'critical', meaning that its loss will inevitably cause a reduction in production or welfare. Governance of critical natural capital stocks should therefore be informed by biophysical limits, potential irreversibility, thresholds, and risks to essential life support functions that could cause complete destruction of ecosystems.

To resolve the debate, substitutability and criticality of all capitals would need to be carefully measured and assessed. Yet estimates of criticality (ecological tipping points and thresholds) are difficult to obtain. Unless we have a near-perfect ecological model, by the time we can observe indications of criticality, it might be too late. However, best estimates indicate that the substitutability of some kinds of natural capital may be rather low, suggesting that governance regimes including natural capital accounting (NCA) and natural capital oversight committees need to be put in place to protect critical natural capital and prevent major risks to future prosperity.

Source: Cohen et al. 2017.

Renewable Energy

Uganda's 2019 draft National Policy on Energy[61] aims to meet energy needs in an environmentally sustainable manner – managing energy-related environmental impacts and increasing the quantity, proportion, efficiency, and resilience of renewable energy like solar and biofuels. Relevant issues that the policy wishes to address include the lack of information on natural energy assets, the vulnerability of electricity production (nearly all of which is from hydroelectricity), and climate change.[62] The accounts developed with WAVES have highlighted that woodfuel from forests and woodlands is a principal source of energy. With Uganda's population expected to reach 70 million by 2040, energy demand is set to grow. Increasing urbanization is also significant in energy terms as it usually drives a shift from fuelwood to charcoal, with increasing commercialization of supply chains. These factors, along with preferences for fire-based heating and cooking, mean that demand for fuelwood is expected to more than double in the next 20 years.[63]

The accounts point to three needs, each of which NCA can support in a systematic way:

1. *Regular and reliable information on woodfuels:* The value of woodfuels is included in Uganda's GDP estimates, with a positive value based on total demand and average price. However, the net effect of woodfuel use may be negative, as its production depletes natural resources. The lack of readily accessible and up-to-date data has greatly obscured the potential of the charcoal industry to contribute significantly to the country's revenue base. It will require investment to produce such information.
2. *Effective regulation:* Despite the scale, value and growth trajectory of Uganda's woodfuel and charcoal industry, it operates largely in the informal sector. Rates of regulatory compliance are low, with rampant and systemic corruption in the charcoal trade and a lack of clarity on the exact paperwork required to produce charcoal and to trade it. This discourages investment that might result in modernization, efficiency

[61] https://www.energyandminerals.go.ug/site/assets/files/1081/draft_revised_energy_policy_-_11_10_2019-1_1.pdf.
[62] UBOS. 2019a.
[63] From the fuelwood policy brief: https://www.wavespartnership.org/en/knowledge-center/woodfuels-overview.

gains and better environmental and social safeguards. As such, some formalisation of the woodfuel and charcoal industry will be needed, with, for example, enforceable packaging standards, uniform bag weights and consistent fees. Stronger government incentive mechanisms will also be needed for management and revenue collection by, for example, reinvesting a percentage of fees in the agencies responsible or by coordinating oversight of commercial woodfuels, to avoid current overlaps and duplication.

3. *Improved incentives and application of user or polluter pays principles:* This might include: expanded support for commercial tree growing on private land; industrial use of fuelwood, pellets and wood chips; and incentives to convert fossil fuel systems and introduce energy alternatives such as solar, wind, and hydro and high-tier cook stoves that meet the minimum standards of the Uganda National Alliance on Clean Cooking.[64]

Non-Renewable Energy

The macroeconomic indicators report shows no depletion of non-renewable energy assets for Uganda, in any year, reflecting the fact that Uganda does not currently produce oil, gas or coal even though it has stocks of these resources. However, this may change in future. Future estimates of income and wealth will then need to incorporate measures of energy stocks and their depletion. If mining non-renewable resources takes off, then it will be crucial to ensure that appropriate revenue is captured and that overall national wealth is maintained or increased, compensated if necessary, by increases in other forms of capital. If Uganda is to do this, several implications will need to be considered:

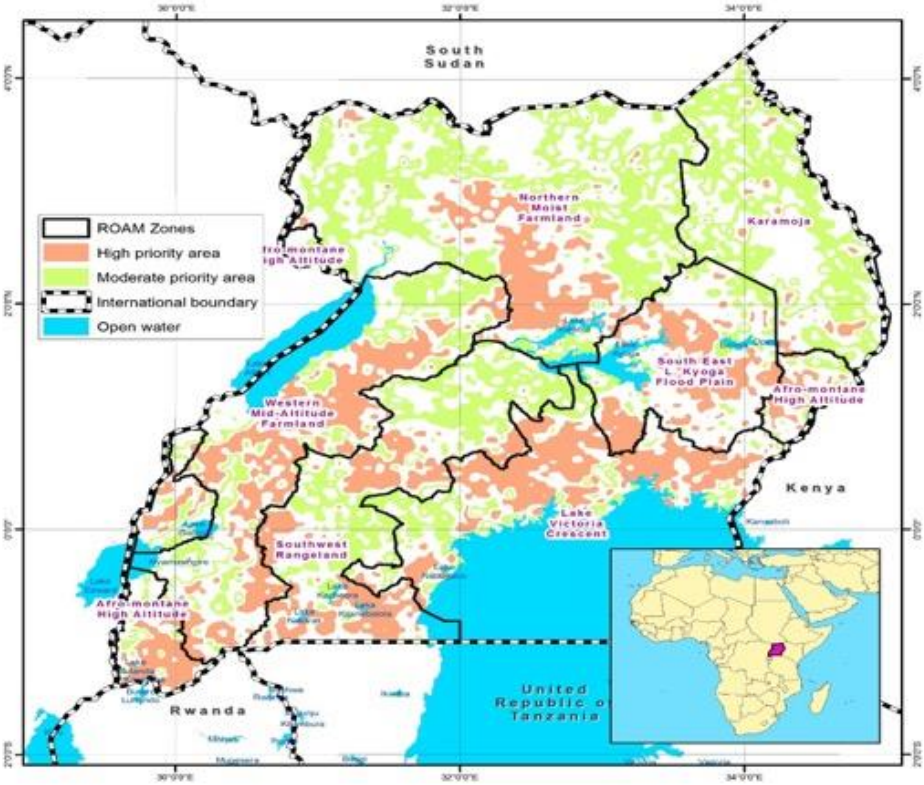
1. Adjusted savings and income indicators that incorporate the impact of resource depletion need to be compiled regularly, and to play a central role in the economic statistics toolkit.
2. Similarly, the comprehensive wealth accounts will need to include all non-renewable energy and mineral resources, and be compiled and monitored regularly, to ensure that renewable resources are not being depleted. They should also ensure that depletion of non-renewable resources is matched by the accumulation of other forms of wealth (human, produced or financial assets).
3. Accounts for the supply and uses of mineral and energy should be introduced to complement the measures of comprehensive wealth as well as the other resource accounts (such as forest and water accounts) so as to examine the interactions between hydroelectricity generation, fuelwood production and optional uses of land.
4. Appropriate public finance tools such as the Sustainable Budgeting Rule and accompanying measures should be adopted to ensure future fiscal revenues from minerals and energy are spent on public investment.
5. NCA could assess the effects of international environmental rules and markets on the value of non-renewable assets, and indeed the risk of 'stranded assets'. Greenhouse gas emissions from oil and gas production have given rise to taxes, emissions pricing or other mechanisms to limit oil and gas extraction and use. While good for the global atmosphere, this may considerably reduce the value of Uganda's oil and gas reserves.

[64] UNACC. 2015.

Integrated Land Management (ILM)

Land, forest and ecosystem accounts can be used as inputs for tools for ILM.[65] One such tool is the Restoration Opportunities Assessment Methodology (ROAM), a framework for assessing forest restoration potential developed by International Union for Conservation of Nature (IUCN) and World Resources Institute to meet the Bonn Challenge to bring 150 million hectares of the world's deforested and degraded land into restoration by 2020, and 350 million hectares by 2030. A principal output of the ROAM process is a map of priority areas for 'Forest Restoration Landscapes'. Such a map has been prepared for Uganda (Figure 7.1) to assist Uganda to meet its own commitment of restoring 2.5 million hectares of land and forest.[66]

Figure 7.1. Map of Priority areas for Forest Restoration in Uganda from the ROAM Process



In Uganda, building on the existing ROAM work makes practical sense. There are some clear ways that the land, forest and ecosystem accounts could be connected to it. Firstly, the accounts can identify the land cover and land uses that overlap with the highest priority areas defined by the ROAM process (which identifies the drivers of land cover change). Secondly, when data from the environmental accounts are combined with data from national accounts, the value of economic benefits needed to prevent and reverse the changes in the high priority areas can be estimated. This can be done regionally or nationally. But, the benefits would need to outweigh the processes driving the change and could include things like payments for restoration linked to the likely future flow of ecosystem services. Finally, the accounts can

[65] See: https://www.iucn.org/resources/conservation-tools/more/restoration-opportunities-assessment-methodology#:~:text=The%20Restoration%20Opportunities%20Assessment%20Methodology,at%20a%20national%20or%20sub%2D

[66] MWE. 2016.

be used to estimate where the greatest benefits from restoration would occur, allowing the available funds to buy the greatest amount of restoration possible.

The accounts could also be used to learn about the shares of greenhouse gases from agriculture and associated deforestation. With ROAM working spatially, a complementary approach, such as greenhouse gas emissions accounts, could assess how and where best to reduce emissions and how to prioritise policies among sectors and sub-sectors. The water account shows water use by sector and highlights the current importance of hydropower, a 'zero-carbon emitter', for electricity generation.[67]

[67] WAVES Third Policy Forum Paris 26–27 November 2018, personal communication (p. 52).

8 Sharing and Cooperation Produces Credible and Useful Accounts

It is notable how many agencies, ministries, and environmental stakeholders have been involved in producing the accounts in Uganda – both national and international players, and both 'supply side' and 'demand side' in terms of producing or using the accounts respectively. The WAVES network was able to facilitate exchanges of experience, notably by engaging WAVES teams from Rwanda and Zambia. This and more (Box 8.1) has helped Uganda to stand out as an NCA leader in the region.

Box 8.1. Uganda's International Collaboration and Leadership on Natural Capital Accounting (NCA)

The 4th Policy Forum on Natural Capital Accounting for Better Policy Decisions was held in Kampala, Uganda, from 18-19th November 2019. Co-hosted by the Ugandan Government, the Forum brought together users and producers of natural capital accounts (NCAs) for the fourth time – and for the first time was held outside Europe. Over 100 high-level participants from many organizations came to Kampala to understand how NCA is used in government and business decision making, with a focus on the complex field of decentralized, landscape-level decisions. The Forum provided a platform for sharing lessons and identifying ways to improve decision-making in Integrated Land Management (ILM) through NCA. The Forum's proceedings summarised the discussions and key findings (Vardon and Bass, 2020).

The Forum was followed by a special meeting in Kampala which convened Africa's developers and users of NCA and valuation of ecosystem services, exploring in particular what could be achieved by forging an *African community of practice on the policy use of NCA*.[68] This community has now taken off well and is very active.

To achieve diverse policy goals, collaboration is always key. Collaboration in NCA has been actively supported by, for example, the Ugandan custodian agencies for each of the individual sustainable development goals (SDGs). It is widely acknowledged in Uganda that data for monitoring the SDGs should come from many agencies, and Uganda's SDGs and NCA processes have supported each other. The Uganda NCA Program also interacted fully with the various other groups producing and using accounts in Uganda, many of which also involved UBOS, NEMA, NFA and NPA. WAVES followed on from previous one-off accounting efforts in Uganda and was concurrent with other on-going accounting work – notably the water accounts[69] aided by the United Nations and Statistics Netherlands, and further work with UNEP-WCMC in drafting accounts for biodiversity and tourism, fisheries, and land degradation.

[68] Reuter et al. 2020.

[69] See https://www.wavespartnership.org/en/knowledge-center/uganda-water-accounts-report-2015-2018.

9 The Future

'We have opened lines of communication and shown what NCA can do. But it is clear that establishing routine NCA, to provide the evidence needed for better decisions, is perhaps a 5-year process'.
(Evelyn Atuhaire, WAVES National Technical Coordinator)

Our review of the Ugandan NCAs, as well as our key informant interviews, highlight several needs that were not possible to address within the relatively brief period of WAVES support. If Uganda is to sustain and grow WAVES' legacy, keeping up the good momentum of the past two years, addressing these needs is now important.

Together, the needs amount to *institutionalising and expanding NCA to meet critical Ugandan needs for decision-making.* They cover:

1. Setting priorities, implementing the NP-AEEA (the NCA roadmap) and keeping it under review
2. Developing the coordination and technical roles of UBOS
3. Consolidating the results from all NCA initiatives in Uganda
4. Developing the roles of other organisations and their collaboration in producing, interpreting, and using accounts
5. Developing tools to enable policy analysis and modelling using the account
6. Generating improved data and filling data gaps
7. Constructing new accounts to meet new demands, likely to cover non-renewable natural capital such as oil and gas
8. Refining accounting methodologies
9. Communicating the accounts and making them accessible, and
10. Sustainably resourcing the NCA process.

Areas of further work to consider are:

- *Setting priorities, building on the guidance provided by the NCA roadmap – the NP-AEEA.* It is important to implement the NP-AEEA as Uganda's roadmap for NCA and to keep it under review. There are many potential accounts, sub-accounts and uses of accounts. Prioritisation criteria should be agreed to ensure that any new accounts are; (a) *decision-centred* - addressing the top Ugandan policy priorities and major risks to their achievement, (b) *practicable* - matching agency capacity and operationalized quickly and at low cost, and (c) *sustainable* - contributing to building an ongoing NCA system as well as the Plan for National Statistical Development. Subject to assessing such priorities, the next points need to stand out.
- *Developing the coordination and technical roles of UBOS.* UBOS' mandate has proven to be central in convening stakeholders and engaging them in NCA production and use. UBOS can use its established working links, for example, to Statistics Units in Ministries and to organisations holding administrative data, in order to obtain data that can be useful for environmental accounts. UBOS is also in a position to ensure systematic links between NCA and Uganda's System of National Accounts. Fully establishing the UBOS Satellite Account Unit will be a foundation for coordinating NCA in future.

- *Consolidating results from all NCA initiatives in Uganda.* It will be important to align, consolidate and then coordinate the NCAs being developed in Uganda under various projects to form a coherent whole. Gaps may then be more clearly identified and addressed, building on this summary of the current situation. See Table 9.1.

Table 9.1. Uganda's NCA Initiatives

Asset (Stock)	Supported by	Goods and Services (Flows)	Supported by
Land	WAVES (2019)		
Water	UNSD (2019)	**Water**	UNSD (2019)
Forest	WAVES (2020)	**Wood** **Non-wood forest products**	WAVES (2020)
Ecosystems		**Ecosystem services**	
Extent	WAVES (2020)	*Carbon storage and sequestration*	WAVES (2020)
Condition	WAVES (wetlands) (2020) UNEP-WCMC (lakes and rivers) * UNEP-WCMC (soil) *	*Soil retention* *Water yield*	WAVES (2020) WAVES (2020)
Biodiversity	UNEP-WCMC (2017)	*Fish provisioning* *Crop provisioning Wildlife tourism*	UNEP-WCMC* UNEP-WCMC* UNEP-WCMC*
Energy		**Energy**	
Minerals		**Minerals**	
		Air emissions	
		Water emissions	
		Waste	

Key	* Expected completion 2020-1	Developed or under development	Not developed

- *Developing the roles of other organisations and improving their collaboration in producing, interpreting, communicating and using NCA.* MoFPED, NPA, MWE, NFA, NEMA and other organisations' responsibilities now need to be clear. Their roles could usefully build on what worked during the Uganda NCA Program. Their capacities for upfront identification of priority policy questions and for interpreting the accounts will be especially important. In addition to individual organisations' roles, a systematic multi-disciplinary approach is needed. The Natural Capital Forum that has been called for by the NDP III will be especially important, along with bringing together experts across the board (notably economists as well as natural scientists) to jointly prepare issues papers. As well as networking within the country, Ugandan NCA stakeholders call for capacity development and exchange within the region and globally through UNSD and WAVES – linking up neighbouring countries going through similar tasks for peer learning or working on shared resources like Lake Victoria.
- *Developing tools to enable policy analysis and modelling using the accounts.* While general awareness of NCA has improved, better tools and capacities are needed to make use of the powerful potentials of NCA. The strength of NCA is that it conforms to economic accounts and so can easily be integrated into economic models to support forward-looking analysis and develop environmental-economic indicators. Augmenting input-output models and more advanced economic models such as Computable General

Equilibrium models with environmental data from the accounts would be a powerful way to integrate natural capital issues into economic decision making.

- *Generating better data and filling data gaps.* Ugandan data is still lacking for some resources and for time periods. Available data is of low quality in some cases. MoFPED in particular has been asking why global data are being used in NCA, when Ugandan data should be available. It is a priority to generate the capacity to collect the right data in Uganda on a regular basis. External assistance is likely to be needed for collecting and interpreting specialized data, such as for air pollution, and for developing ways of meeting policy demands using 'big data'.

- *Constructing new accounts to meet new demands, such as further ecosystem services and accounting for minerals, oil and gas.* In future, the demands that matter are not necessarily the direct demands for 'new accounts' led by accountants, or simply by intellectual curiosity. Rather, they will be led by real demands for evidence in making policy decisions. NCA can provide order to disorderly argument over energy, land, forests and wetlands – or to explore the development of ecotourism, for example, all big issues with implications for both poverty and environment.

  The NP-AEEA has already pointed to the likely need for some accounts that are not yet in place including energy, solid waste, and air emissions. An emerging policy priority is the use of non-renewable resources. At present there are no accounts for minerals or fossil fuels, and these are not identified in the NP-AEEA. However, as these resources are discovered and exploited, information on them will help to assess if revenue received by government (such as from the sale of concessions and product taxes), the profits to businesses, and the income to employees, are adequate compensation for the depletion of the non-renewable resources, including the possible depletion or degradation of water, forests and other ecosystems. It will be important to determine where and how NCA can access available data, and generate the timely evidence needed for policy, resource allocation, investment or fiscal reform. A balance should be struck between expanding the scope and accuracy of existing accounts and developing entirely new accounts for other forms of natural capital. In theory, the more accounts Uganda has, the better it can deploy them to deal with the complex trade-offs of sustainable development.

- *Refining accounting methodologies.* There are several challenges to be faced including: (a) improving the way that accounts treat social and spatial distributional issues; (b) integrating information such as remotely-sensed data with local site-level data; and (c) enriching the National Social Accounting Matrix, the economy-wide database that records transactions between economic agents for a specified period.

- *Communicating the accounts and related macroeconomic indicators and making them accessible.* It is important to let stakeholders know that the accounts exist and are available for use. Communication should target both those who need to make key natural capital decisions and those who wish to influence such decisions, or to hold decision-makers accountable. Doing this will help to drive demand for the accounts and their use and, in turn, drive continuous improvement of the accounts. Effective user access to the accounts could be provided through a more interactive interface than is afforded by the current static .pdf and hard-paper documents. As NCA develops, it will be important to disseminate the accounts regularly – alongside the main national accounts – with articles and blogs that draw out the links and issues. Ugandan stakeholders are also keen that

relevant World Bank and other development cooperation in Uganda are made aware of the accounts, draw on them in making their cooperation plans, and contribute directly to NCA development where appropriate.

- *Sustainably resourcing the NCA process.* Secure funds are needed to drive the cross-sectoral processes of NCA development, use and continuous improvement. Cross-departmental finance is needed for NCA coordination; for the TWG to meet regularly, to review existing accounts, and to scope new accounts; for supporting continued capacity improvement especially for interpretation, modelling and scenario development; and for keeping many lines of communication open within Uganda and beyond. Ugandan stakeholders believe that continued exposure to good international experiences of NCA will be mutually fruitful, including participation of Uganda's experts in international and regional communities of practice on NCA.

  The resources and networks required for this are modest – but potentially powerful in realising the desirable benefits of a systematic approach to measuring and valuing natural resources. WAVES has provided well for Uganda over the past two years. In future, much could be achieved through further support. This includes Uganda fully embedding NCA and realising its potential to inform the country's sustainable development, and, moreover, inspiring other African governments to make similar step-by-step changes to the management of their natural wealth.

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Annex 1: Summary of Ugandan Strategies and Policies that NCA can Usefully Inform

Vision 2040 (Uganda Government, 2007) is an umbrella document that sets the tone for successive national development plans (NDPs) and other major plans. It includes a number of potential entry points for NCA, and in particular for land accounts. Vision 2014 aims at: (a) increasing forest cover from 15 percent in 2010 to 24 percent by 2040; (b) establishing large irrigation schemes in different parts of the country; (c) making land reforms to facilitate faster land acquisition for urbanization, infrastructure development, and agricultural commercialization; and (d) planning urban systems to enhance productivity, liveability and sustainability while releasing land for commercial agriculture.

The National Land Policy (2013) aims to ensure the efficient, effective and optimal utilization and management of land for poverty reduction, wealth creation and socioeconomic development. Land is a key strategic asset for Uganda and there are significant trade-offs involved in changing its allocation and use. There is a need for objective information on land cover types and land use if land allocation is to be optimised.

The SDGs (United Nations, 2015) identify NCA as a means of mainstreaming environment concerns into decision-making (SDG Target 15.9). Furthermore, NCA is a very strong foundation for achieving the SDGs. Indeed, 40 indicators for nine SDGs can be monitored by NCA. Uganda was a prominent player within the United Nations (UN) in negotiating the SDGs and has firmly committed to them, and subsequently the UGGDS and Uganda's NDP III (see below) were envisaged as key vehicles for this.

The UGGDS (Uganda Government, 2015 with updates) aims to ensure that social and economic development is achieved through a low-carbon pathway, safeguarding the integrity of the environment and natural resources. It promotes catalytic investments in agriculture, green cities, transport, and natural capital management (wildlife and tourism, forestry, and wetlands, fisheries and water resources). The UGGDS proposes new approaches to public sector resource allocation, environmental fiscal reform, green public procurement, certification of sustainable production and trade, inclusive green social enterprises, as well as payment schemes for environmental ecosystem services. Finally, the UGGDS aims to fast-track NCA, to attribute natural capital depletion and appreciation to particular economic sectors and activities.

Uganda's NDP III was developed while the Uganda NCA Program was being implemented, and the two were linked (see Section 6). NDP III aims for '*sustainable industrialization for inclusive growth, employment and wealth creation*', aspiring to become an upper middle-income country. To achieve this, per capita wealth must increase significantly. This requires investments not only in produced and human capital, but also in the natural capital which forms 38 percent of Uganda's wealth (See Box 1.1 and Box 1.2).

Several sectoral policies, laws and regulations also have major implications for natural capital and will benefit from NCA (Table A.1). While earlier policies did not anticipate NCA, later policies, notably the 2019 National Environment Act, allow for and encourage NCA. Together, they will enable the state to better implement the requirements of *Uganda's National Constitution* (Article 27) – that natural resources are to be '*managed and used in a sustainable*

manner with the state taking all possible measures to prevent or minimize damage and destruction to them'.

Table A.1. Policies, Strategies and Plans of Uganda Regarding Natural Capital

Policy	Responsible Agency	Year
The Uganda Forestry Policy	Forest Sector Support Department	2001
The National Forestry and Tree Planting Act	Forest Sector Support Department	2003
National Forest Plan 2011/2012-2021/2022	Forest Sector Support Department	2013
State of Uganda Forestry 2016	Forest Sector Support Department	2016
National Biodiversity Strategy and Action Plan II (2015-2025).	National Environmental Management Authority	2016
National Environment Act	National Environmental Management Authority	2019
Agricultural Sector Development Strategy	MAFAP	2013
Agriculture Sector Strategic Plan	MAAIF	2016
National Land Policy	Ministry of Lands, Housing and Urban Development	2013
Mining and Minerals Policy – draft	Ministry of Energy and Mineral Development	2018
National Energy Policy – draft	Ministry of Energy and Mineral Development	2019

Annex 2: A Brief Summary of NCAs Produced with WAVES Support

Account	Brief Description	Data Sources	Main Message from the Accounts	Issues	Planned Way Forward
Land Accounts	The accounts are based on physical extent of land, by 13 land cover classes, for 1990, 2000, 2005, 2010, and 2015. The accounts are further disaggregated by forest landscape, water management zone, agro-ecological zone, and climate zone, and by regions, sub-regions and Districts.	The data was almost entirely sourced from the National Biomass Survey database at the NFA. There were considerable discussions with the Ministry of Lands, Housing and Urban Development and within UBOS, which informed the additional derived data.	(1) Physical land cover and land use have generally transitioned towards increased small scale farmlands, commercial farmlands, and build up areas. (2) Natural forest areas declined in both Tropical High Forests and woodlands. The decline in woodlands was by far the largest land cover decline across the country. (3) Some districts in eastern Uganda are close to forest depletion, especially Teso and Karamoja sub-regions. (4) Forest plantations increased, particularly between 2000 and 2015. (5) Due to the relative stability of protected areas and livestock herding areas, grasslands declined only marginally over the period. (6) Bushlands, which represent relative underutilization of land, increased between 1990 and 2005, but declined thereafter as small-scale farmlands took them over.	(1) Monetary land accounts are not yet included, as the valuation is largely based on land use. (2) The number of sub-regions has increased from 11 (in 2011) to 15 (in 2016), which is not reflected in the accounts. An update is envisaged. (3) The apparent increase in forest cover in 2017 was due to improved identification of forest and higher granularity of maps. (4) The apparent increase in wetlands is due to the change in definition of wetlands in 2005.	(1) A second iteration of the land physical asset accounts will be developed using the 2019 data of the National Biomass Survey database. (2) Monetary land accounts are envisaged, along with descriptions of land use. (3) A wider stakeholder consultation is planned with the agriculture sector, and the water and urban sub-sectors.

Account	Brief Description	Data Sources	Main Message from the Accounts	Issues	Planned Way Forward
Forest Accounts	The accounts consist of forest land, wood assets, and supply and use tables for wood and other forest products. Both the physical and monetary components of the accounts were developed.	Key sources of data were: (1) The NFA National Biomass Survey database. (2) The National Accounts (the Statistical Abstract database, and the Supply and Use Tables) at UBOS. (3) The Ministry of Water and Environment/ Forestry Sector Support Department database provided reports from the Convention on International Trade in Endangered Species of flora and fauna (CITES).	(1) Uganda's wood stock reduced by 45 percent between 1990 and 2015. (2) The wood available for supply (from private land and production zones of central forest reserves) reduced by 59 percent. Wood not available for supply (in National Parks and Wildlife Reserves, and conservation and tourism zones of central forest reserves) reduced by 20 percent. (3) Wood fuel particularly charcoal and household firewood was the largest use of wood in the country. (4) The economic activities of non-wood forest production were not well documented. But trends point to increased value addition for shea oil, and stable export of Prunus Africana and Sandalwood. (5) The afforestation programs undertaken in the country has had a limited impact due to high demand compared to supply of wood (6) Forest land and wood stock reduction in many areas are mainly due to land conversion to agriculture, partly influenced by policy and governance failures.	(1) Whereas there are wood stocks on both forest land and other land cover classes, wooded land other than forest land is not included in forest land assets. (2) Non-wood forest products in Uganda include medicinal plants, fibres, gums and resins, and food items, among others. However, due to data scarcity only a few were included in the accounts.	(1) There is consensus among stakeholders for all wooded land to be included in future accounts. (2) An inventory of non-wood forest products, and ecosystem services of forests will be included in subsequent wood asset and forest resource accounts. (3) Updating the national social accounting matrix to include the accounts, particularly where government is considering fiscal reforms to support forestry sub-sector value chains including trading of wood products, and reforms in the wood fuel industry.

Account	Brief Description	Data Sources	Main Message from the Accounts	Issues	Planned Way Forward
Ecosystem Accounts	The report on "*Towards Ecosystem Accounting in Uganda*" describes the results of the first iteration for experimental ecosystem accounts in Uganda using the InVEST model version 3.7.0. Results were generated on ecosystem extent for Uganda's 13 land cover classes by drainage basin, and ecosystem services on carbon storage, water yield and sediment retention.	The key sources of data were: (1) The land cover extent was obtained from the NFA National Biomass Survey database. (2) The shape files for the drainage basins were obtained from the MWE Wetlands Management Department. (3) The parameter information used for analysing the ecosystem services was based on published research papers on the performance of carbon storage, water yield, and sediment retention under different land covers in Uganda.	(1) Experimental ecosystem accounts are at an early phase in Uganda. There are several modelling approaches for ecosystems to choose from, and much capacity building required. (2) Carbon storage increased somewhat, but that sediment retention decreased in almost all drainage basins. Water yield increased in many basins, due to higher runoff as a result of changes in land cover. (3) Out of the three target ecosystem services, carbon storage and sediment retention showed the strongest reliability. These results can be used for future management of land cover and land use in Uganda.	(1) The InVEST model's limitations include uncertainties introduced by the Revised Universal Soil Loss Equation, as well as simplifications to be aware of when interpreting the results (2) InVEST produces results that are multi-sectoral and need to be mapped to the sectoral reporting system used by UBOS. (3) The ecosystem service of water yield is part of a cluster of water-related ecosystem services. Others include water retention and infiltration, and contribution to rainfall formation (precipitation). This is important to keep in mind when interpreting the results.	(1) Complete the ecosystem accounts for water yield and sediment retention, to include both supply and use (2) Develop monetary accounts for these services (3) Expand the modelling options for ecosystem services to include other options particularly the Soil and Water Assessment Tool, among others (4) Conduct an inventory of additional ecosystem services to be included in subsequent accounts.