

Zambia's Natural Capital Accounts: Informing Key Policy Priorities



June 2020



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Wealth Accounting and Valuation of Ecosystem Services (WAVES) is a World Bank–led global partnership, initiated in 2012, that aims to promote sustainable development by ensuring that natural resources are mainstreamed in development planning and national economic accounts. In 2018, a larger umbrella program that includes WAVES as one of its pillars, the Global Program for Sustainability was started.

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Executive Summary



Executive Summary

This report introduces Zambia's new natural capital accounting (NCA) system and in particular its recently established water, forest, and land accounts. It summarizes why the Zambian government believes that production of natural capital accounts is a priority and describes how they were produced with the support of the World Bank Wealth Accounting and Valuation of Ecosystem Services (WAVES) program. It describes the significant policy implications of the accounts and how the information in the accounts has helped to improve policies and plans at the national, sector, and local levels. Considering that regular accounting can bring further benefits, the report looks at how far Zambia has already institutionalized natural capital accounting as a standard process. It is hoped that Zambia's many achievements and lessons will encourage even more progress in Zambia, as well as inspire other countries.

1. Since 2016, Zambia has been putting in place a system to account for the status and use of its valuable natural resources and using it to inform important decisions. Zambia's economic growth and strategies for poverty reduction depend on its natural capital. National wealth accounts prepared by the World Bank show that natural resources are Zambia's greatest asset, accounting for 40 percent of the country's total wealth. Although Zambia has had national forest and water information systems for many years, they were neither comprehensive in coverage nor systematically used. Thus, the important contributions of the forest and water sectors to the economy—and the effects of economic activity on the resources themselves—has been consistently underreported for many years. The government of Zambia therefore decided to adopt the more systematic approach of natural capital accounting, starting by preparing accounts for water, forests, and land. The results are already improving decision-makers' understanding of natural resource potentials and risks and helping them make better policy and investment decisions.

2. Zambia's forest accounts have demonstrated the country's dependence on its forest assets, the many pressures on them, and the risks to them, but the accounts have also revealed how forests can contribute to sustainable development. The forest accounts show that 80 percent of Zambia's energy consumption comes from fuelwood, yet only 3 percent of this harvest was licensed in 2015. The year-on-year data reveal how harvesting for charcoal increased sharply when the electricity subsidy was removed and when hydropower production fell after a drought.

The forest accounts indicate the potential for sustainable use of forests. For example, Zambia earned USD10.7 million from honey and USD2.6 million from beeswax between 2010 and 2015, with much of the income going to community producers. The accounts also suggest that Zambia could produce 10 times this yield—sustainably and at low cost. This finding has been used to develop a new National Strategy for Honey and Beeswax. The forest accounts are also inspiring innovations in better forest management—work on timber tracing in key value chains and certifying sustainable forest production so that producers can access environmentally discriminating markets. The forest accounts could help identify which forests are under the greatest pressure from agricultural and urban expansion and which justify better conservation management, especially to develop ecotourism.

3. Zambia's water accounts offer a unique and systematic means of tracking the many ways in which the country's water resources interact with the economy. The water accounts reveal where and how water is contributing to the people, the economy, and government revenue—and where water is being wasted. As such, the accounts provide systematic data to inform policy and investment decisions so that scarce water resources can be more effectively and efficiently used.

The water accounts have revealed greatly increasing pressure on groundwater—and the lack of data on it. They also suggest that the water supply network is inefficient, with 21 percent of piped water leaking away between dams and users. The accounts have helped identify and assess policy options such as managing demand through water pricing and licensing, improving regulation of groundwater abstraction, and increasing water supply through dam construction. The major messages from the water accounts informed the 2019 State of the Nation address, which focused on water management: the need to protect catchments, conserve water, and realize higher value from it. The accounts are now a key resource in reviewing the 2010-20 National Water Policy.

4. Zambia's land accounts reveal how land cover is changing rapidly and in different ways across every province in Zambia. They demonstrate major losses of forests and uncertainties regarding wetland viability but also great potential from new forms of multiple land use. The land accounts provide the basic platform for relating to the supply of diverse ecosystem services from each area of land, which can help with local-level decisions on the best approaches to managing landscapes for multiple values, including managing climate change risk and adapting to climate change. Data from the land accounts have directly informed the design of four major integrated landscape projects in Zambia so that diverse yet compatible uses can be made of the land resource. In future, the land accounts can form the basis for detailed accounting of multiple ecosystem services. The land accounts would be more useful if further geographic detail were added below the provincial level, an improvement that is being considered.

5. NCA provides powerful information that can be used to help Zambia achieve its overall policy priorities. Although the accounts produced to date have already informed forestry, water, and land decisions, NCA can also revolutionize how Zambia's wider policy priorities are addressed. Zambia's natural capital underpins its achievement of many economic priorities: sustained economic growth that creates jobs and reduces poverty; economic diversification away from copper toward tourism and high-value agriculture—thereby increasing government revenue from the large natural capital base; and security of energy and food. NCA has begun to inform Zambia's 8th National Development Plan (NDP) and several policy processes about how to secure these important underpinning roles of natural capital. The accounts' contributions are remarkable, given how recent they are. They have enabled decisions to be more evidence-based throughout the policy cycle on several topics, from identifying challenges to reviewing policy implementation (figure 1).

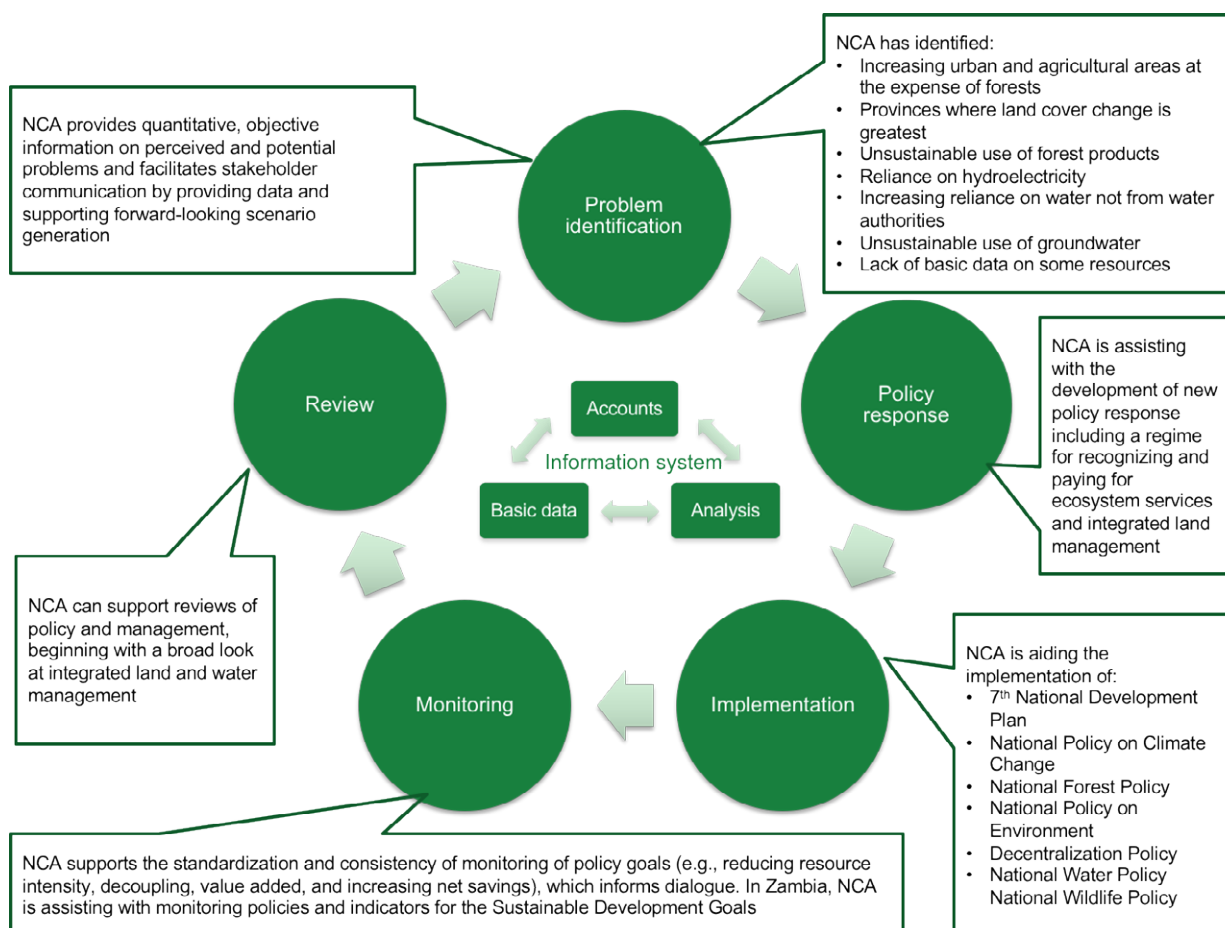
6. Zambia has made unusually rapid progress in producing its natural capital accounts and making good use of them. Zambia stands out as an encouraging leader for other countries on NCA, providing confidence in the WAVES programming approach and offering useful lessons on how to organize the process. It has overcome many—but not yet all—data and institutional challenges. With accounts having been developed for water, forests, and land, Zambian stakeholders have developed an appreciation of the connections between the accounts and how they provide a suite of information to address complex trade-offs. The connections have become particularly apparent at the landscape level, where understanding and managing the relationships between land, forest, and water are critical for sustainable development. They are also important for critical cross-cutting policies. For example, the accounts are starting to inform climate policy. Zambia is using information from the accounts to feed recently introduced modeling of different natural capital scenarios and their economic consequences. These recent uses of the accounts has helped in taking the first steps toward additional accounts: Zambia is adding accounts for minerals, energy, and tourism, which are crucial for development under the 7th NDP.

7. Good stakeholder collaboration has been critical to the success of Zambia's NCA—bringing together many data suppliers with many potential users of data (decision-makers). Today's policy decisions are almost always complex. They depend upon access to up-to-date data on many factors produced by multiple agencies. Zambia was able to develop its accounts because of strong collaboration put in place for the WAVES program—with a National Steering Committee and technical working groups (TWGs) for each type of account. This encourages collaboration to access the best data, to interpret the findings, and to access relevant decision-makers and processes. Their realization that NCA could relieve a prevailing constraint on progress—lack of systemic, useful data—motivated many TWG members. Although there has been regular collection of data for many years, this technical information has not been able to influence policy makers. Its 'language' was, for example, that of hydrology or forestry, not the language of economics or finance with which policymakers are more familiar.

Because NCA was a relatively new approach for Zambia, the stakeholders involved benefited from sharing expertise and experiences with other countries and expert bodies, facilitated by the WAVES Partnership.

8. The next step for Zambia is to embed natural capital accounts and their regular use in the machinery of government. Zambia's natural capital accounts are proving their worth in systematically organizing critical data and presenting it to decision-makers. Zambia began using the forest and water accounts even when they were drafts because they filled an important data gap. Work on institutionalizing the production, interpretation, validation, approval, and use of accounts as part of government operations is underway, with some staff and budget already secured. A comprehensive national NCA strategy is now called for to establish NCA mandates, procedures, roles, capacities, and resource requirements on a sustainable basis.

Figure 1. Summary Effect of Natural Capital Accounting (NCA) on Policy Cycles in Zambia



1 Introduction and overview



1 Introduction and overview

Since 2016, Zambia has been putting in place a new system to account for the status and use of its valuable natural resources and is using it to inform important decisions. Starting with accounts for water, forests, and land, Zambia's new natural capital accounts are improving decision-makers' understanding of natural resource potentials and risks and helping them make better policy and investment decisions.

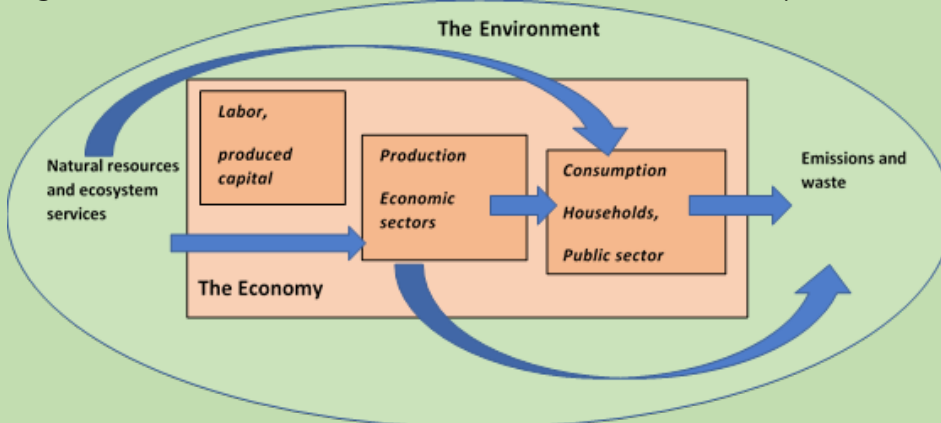
The government of Zambia understands the importance of natural resources for the country's sustainable development. For decades, Zambia has depended on copper to drive economic growth, on agriculture for many people's incomes, and on water for sustaining every livelihood and every sector, but there has not been a systematic way to track the changing quantities of natural resources, their uses, how much these uses contribute to Zambia's economy, and how in turn these uses damage or sustain natural resources.

Box 1: What Is Natural Capital Accounting and What Does It Achieve?

Natural capital accounting (NCA) allows countries to measure and value their natural resources systematically in physical and monetary terms, for example, liters of water used and the price paid for the water. Recognition of the importance of natural capital to economic activity and human well-being more generally has been recognized for some time (Nordhaus and Tobin 1972). When NCA is mainstreamed into decision-making, it allows governments, businesses, community organizations, and others to better appreciate, understand, and manage natural resources and the goods and services that come from them.

In Africa, numerous countries have been developing natural capital accounts since the late 1980s (Reuter et al. 2016). Their work has demonstrated that accounts can be produced with available expertise and information, although the accounts produced used a range of concepts, data sources, and methods and were not always comparable over time or between countries.

Figure 2. Overview of the flows included in natural capital accounts.



The standardization of NCA in 2012 through the System of Environmental-Economic Accounts (SEEA)^a prompted much international action, including establishing the Wealth Accounting and Valuation of Ecosystem Services program at the World Bank. The SEEA provides a comprehensive set of concepts and standard enabling consistent, comparable natural capital accounts to be prepared, covering assets, the goods and services that flow from these assets to households and industries and the wastes that return to the environment (figure 2).

^a See <https://seea.un.org/content/homepage>

The government has been looking to natural capital accounting (NCA) as a systematic tool to inform strategy and investment—increasing social and economic returns from natural capital, reducing risks, and shifting the economy toward a green growth path (Box 1). At the macro level, wealth accounts prepared by the World Bank have shown that, in 2014, natural resources accounted for 40 percent of Zambia’s total wealth of USD644,031 million (Lange, Wodon, and Carey 2018). Zambia has developed new accounts for forest, water, and land resources in partnership with the World Bank Wealth Accounting and Valuation of Ecosystem Services (WAVES) program (Box 2) and the importance of natural capital to Zambia is clear (Box 3). These accounts are being used to inform the 7th National Development Plan (NDP) and several policy initiatives. At the micro level, Zambia’s recent development of forest, water, and land accounts has improved how several major projects manage landscapes (MNDP 2017a). Accounts for further resources, such as minerals, agriculture, and tourism, are being established or planned. Long-term success will depend on embedding NCA within government processes, which would begin with institutionalizing the continued production of land, forest, and water accounts.

Box 2: What Is the Zambia–World Bank Wealth Accounting and Valuation of Ecosystem Services Program?

Zambia’s work on natural capital accounting (NCA) benefited from being part of the wider global Wealth Accounting and Valuation of Ecosystem Services (WAVES) Program—a World Bank–coordinated global partnership that promotes sustainable development by ensuring that natural resources are mainstreamed in development planning and national economic accounts. Zambia was the first country to join WAVES in its second phase. Building on the experiences of earlier partner countries, the WAVES team and its partners provided important technical and institutional support to assist the Zambian team in producing accounts, analyzing results, and using the findings to inform policy.

The Ministry of National Development Planning has been spearheading the development of NCA. It has been working with technical experts from selected government ministries involved with providing data (i.e. the “supply side” of accounting, as well as those involved with policy who use data (the “demand side”). The ministry was also the lead Zambian authority coordinating the work under the WAVES project.

A steering committee of permanent secretaries oversees the strategic aspects of the work, with senior representatives from the ministries of National Development Planning; Finance; Lands and Natural Resources; Mines and Minerals Development; Agriculture; Fisheries and Livestock; Water Development, Sanitation, and Environmental Protection; Energy; Commerce, Trade, and Industry; and Tourism and Arts.

Technical working groups (TWGs) were set up to ensure effective development of each of the accounts—with ongoing TWGs for land, forests, and water. Each TWG had a focal point officer in the relevant lead agency (Ministry of Lands and Natural Resources Planning for the Land TWG with the collaboration of the National Remote Sensing Centre; Ministry of Lands and Natural Resources for the Forest TWG; and Ministry of Water Development, Sanitation, and Environmental Protection; Department of Water Resources Development for the Water TWG). TWGs have been set up for the second wave of accounts for minerals, energy, and tourism and to support modeling of natural resource use and economic scenarios based on the accounts.

Box 3: How Important Are Natural Assets to Zambia's National Wealth?

Natural capital accounting is part of wealth accounting, which the World Bank undertakes regularly (Lange, Woden, and Carey 2018). Changes in total wealth of a country are critical to understanding its prospects for sustainable development. Zambia's wealth more than doubled between 2000 and 2014 to USD644,031 million and consisted of human capital (43 percent), natural capital (40 percent), and produced capital (17 percent).

Of the 40 percent of Zambia's total wealth that was natural capital, 73 percent was renewable natural capital—protected areas such as national parks, pastureland, cropland, and forests. Zambia's renewable asset base of USD11,970 per person is more than double the average for lower-middle countries (USD5,006/person) and for sub-Saharan African countries (USD6,403/person).

Although total wealth in Zambia has been growing, the changing composition of wealth between 1995 and 2014 suggests that Zambia has not achieved a balanced portfolio of assets that is likely to support strong economic growth. The typical trajectory from low to middle income starts with an abundance of natural capital and using this (not always efficiently or sustainably) to invest in the social, human, infrastructure and other forms of capital that enable economic growth towards higher income levels. The share of natural capital in total wealth thus becomes lower in higher-income countries, although the absolute level of natural capital is still higher than in low-income countries. Development is not just about liquidating natural capital to purchase other assets; it is also about efficient use of all natural capital and sustainable management of renewable natural capital while investing in other assets to increase productivity, together with strong institutions and policies that make investment attractive.

One indicator within wealth accounts is adjusted net savings, which measures the true rate of savings in an economy after taking into account investments in human capital, depletion of natural resources, and damage caused by pollution. Zambia's adjusted net savings was negative in 2003 but positive from 2004 to 2016. This positive adjusted net savings shows that Zambia has been investing in the future by accumulating assets, partly by depleting its nonrenewable natural capital assets (e.g., copper) but also by investing in other capital assets.

2 Zambia's Forest Accounts



2. Zambia's Forest Accounts

Zambia's forest accounts have demonstrated the extent of the country's dependence on its forest assets, the high and diverse pressures on them, and the risks to them, but they have also shown how forests can contribute more to sustainable development. There is real potential for protecting forests and making sustainable use of them through, for example, ecotourism, honey and beeswax production, and community management of forests.

Zambia's forest accounts revealed a range of stark problems, indicating the need to better understand the central role of forests in people's well-being and the country's development and to protect and sustainably manage them (WAVES 2020a). The accounts clearly showed how expansion of farming, but also urbanization, is driving deforestation. They also revealed increasing demand since 2011 for high-value indigenous timber and exotic (plantation) timber (figure 2) and the importance of fuelwood (charcoal and firewood) to households (figure 4). The exotic timber supply fell sharply between 2010 and 2011 and in 2015 was 935,097 m³, nearly 10 times as much as the indigenous timber supply of 96,934 m³. The reasons for the fall in supply were not explored but may be examined in future analyses.

Figure 3. Zambia's Forest Account: Indigenous and Exotic Timber Supply, 2010 to 2015 (Cubic Meters)

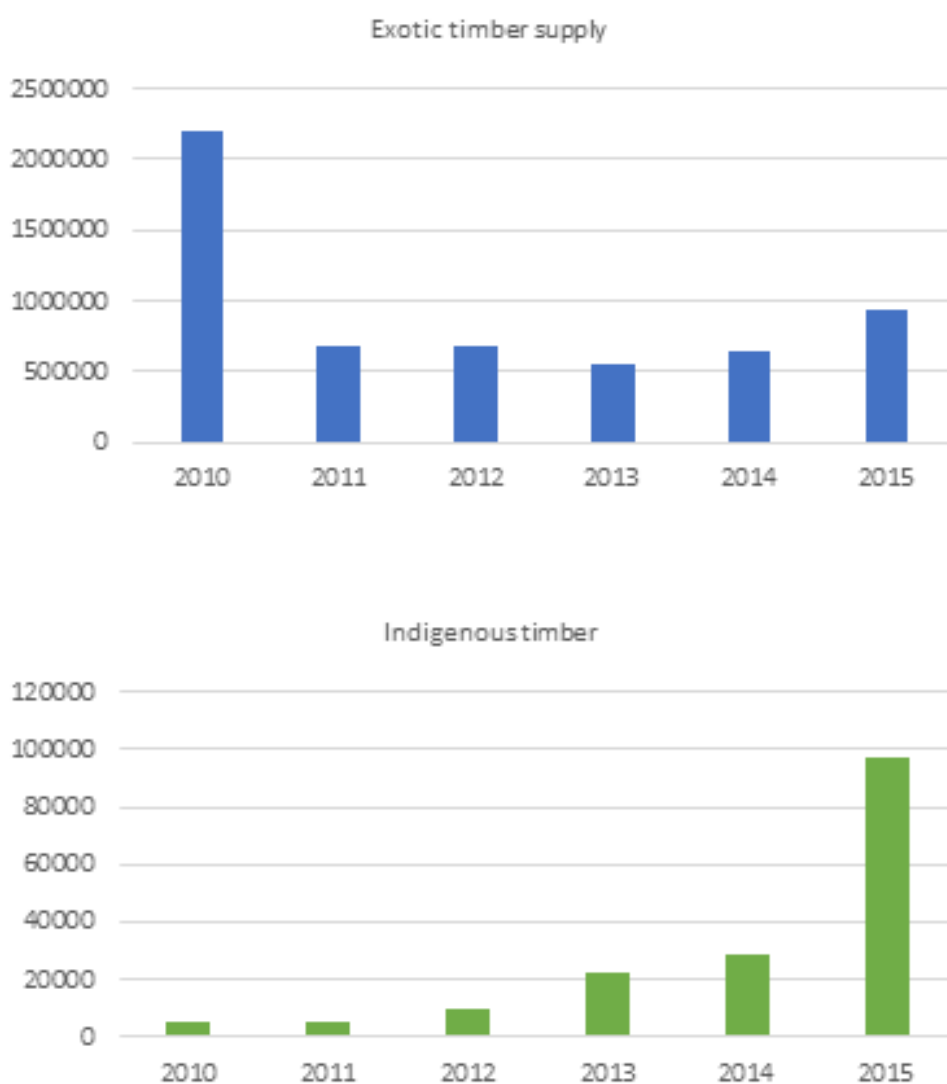
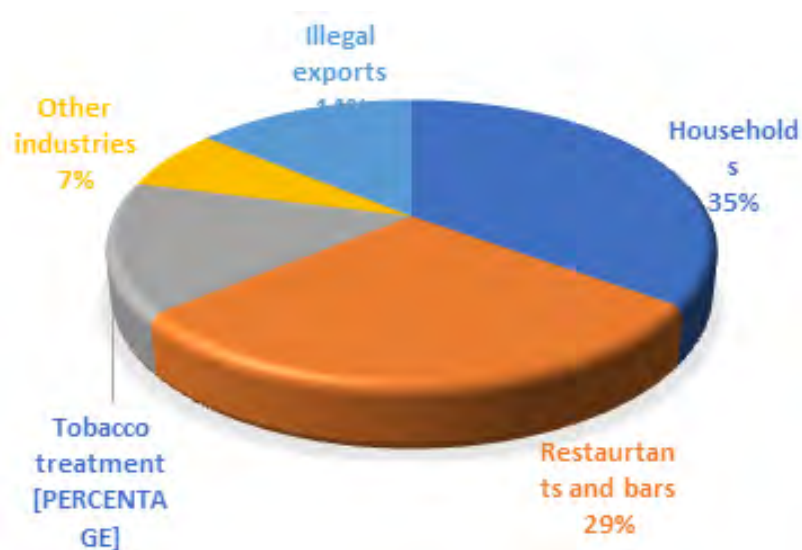


Figure 4. Zambia's Forest Account: Use of Charcoal and Firewood by Industry and Households, 2010



The accounts have enabled policy-makers to determine that a range of (often unanticipated) demands drove the supply of forest products, which was largely uncontrolled yielding extremely low levels of government revenue capture. Forests were shown to be the primary source of energy, with 80 percent of total energy consumption in Zambia coming from fuelwood (charcoal and firewood), although just 3 percent of this harvest was licensed in 2015. The accounts have also revealed how more wood was harvested for conversion to charcoal after the removal of an electricity subsidy and a drought that reduced the amount of electricity available from hydropower.

The accounts also highlight forest uses with higher potential. For example, Zambia earned 197.8 million kwacha (~USD10.7 million¹) from the sale of liquid honey and another 47.5 million kwacha (~USD2.6 million) from the sale of beeswax between 2010 and 2015. Most was exported, although the share varied from year to year. The accounts revealed the market potential of honey and beeswax products and suggested that Zambia can produce 10 times the yield sustainably and at low cost (Zambia Honey Council 2010). The forest account has thus informed a new National Strategy for Honey and Beeswax—realizing the hope of the Minister of Finance and Planning that NCA would help Zambia diversify from copper to products that benefit many ordinary people, such as honey.

The accounts have also inspired work on an innovation to access promising environmentally discriminating markets: timber tracing of key value chains and certifying sustainable production. A pilot is being designed to track an endangered indigenous tree that yields a highly valuable hardwood – *Pterocarpus chrysothrix* (*Mukula*)—from forest stand to export. On the one hand, trade in this species is controlled by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); on the other hand, Chinese demand is high. The pilot seeks to ensure a viable stock of this species and to manage stocks to secure continued revenue streams on a sustainable basis. The pilot will benefit from NCA geographic information covering sustainable management of particular forests. Such innovations will require better information correlating forest condition, forest management, and yield of valuable products to help maximize the environmental and economic benefits. This need for information should inform the next stage of the forest accounts.

¹ Using average exchange rate of kwacha to US dollars of 0.054. See XE currency charts: <https://www.xe.com/currencycharts>

In addition to informing these innovations driven by the imperative of sustainably producing high-value products, the forest accounts have begun to inform the revision of the National Forest Policy—the main national commitment to promoting sustainable, equitable use of forests. This revision could embrace three other challenges that the accounts clearly reveal: the importance of forests to households for the secure supply of fuelwood; identification of forests under greatest pressure from conversion to agriculture or urban expansion and degradation from overharvesting; and identification of areas needing better conservation management, especially those that can be used to develop ecotourism.

Forest ecosystem services should be accounted for because they explain forests' indirect contribution to Zambia's performance in other fields such as climate mitigation, water supply, wildlife conservation, and cultural benefits. Adding a geographic dimension to the accounts would greatly improve their utility by identifying which forests are important or under the greatest pressure. Production of forest accounts should be institutionalized, involving all of the agencies in the Forest TWG. These improvements to the forest accounts would help to strengthen the government's case for recapitalizing the forestry sector—enhancing its operations to combat high levels of deforestation and forest degradation and supporting sustainable forest management.

3 Zambia's Water Accounts



3. Zambia's water accounts

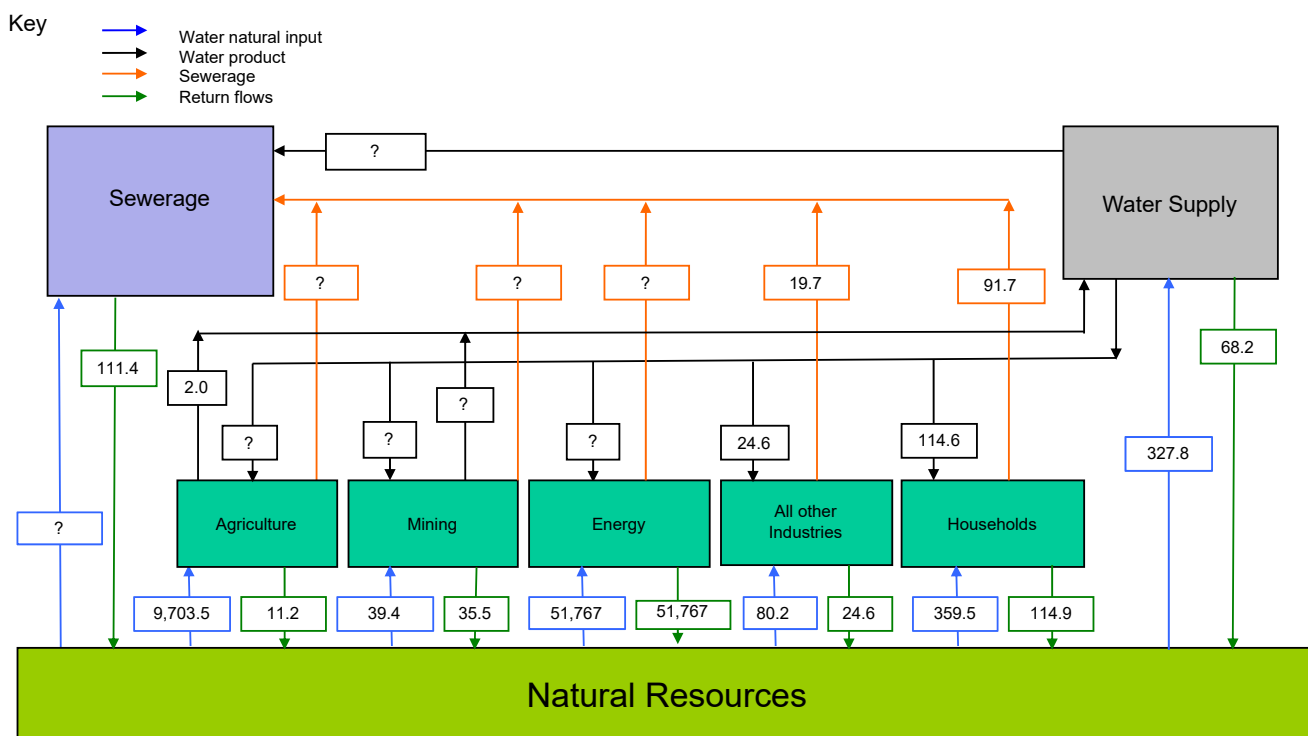
Zambia's water accounts offer a unique, systematic means of tracking the many ways in which water resources interact with the economy. They reveal where and how water contributes to the people, the economy, and government revenue—and where water is being wasted. The water accounts can provide systematic data to inform policy and investment decisions so that scarce water resources can be more effectively and efficiently used.

Water accounts were one of the three priority accounts that the National Steering Committee identified for production, given the strategic importance of water and the availability of water data (even though fragmented and with large gaps). The water accounts brought together a range of government agencies to assemble the diverse economic and social data about water that were needed. The Water TWG, led by the Ministry of Water Development, Sanitation, and Environmental Protection, chose to produce physical and monetary supply and use tables because they would be useful for managing water supply, could be produced with available data, and would be a good precursor to producing other types of water accounts. For example, a water asset account (a water “balance sheet”) would, in combination with a water supply and use account, provide information on the sustainability of water use, whereas a water emissions and water quality account would assist in identifying the industries causing water pollution and enable application of the “polluter pays” principle.

Although initial aspirations were for provincial accounts, data availability and some core policy questions necessitated that the initial water accounts be produced at the national level. The accounts cover 7 years, from 2010 to 2016 (WAVES 2020b). Figure 5 shows the flows of water from the environment to the economy and the use of water by industry and households. Households and commercial farmers increasingly rely on groundwater because many are not connected to the water supply network, which has resulted in greatly depleted groundwater reserves, notably around Lusaka. Although this problem has been known for some time (Mpamba et al. 2008), mechanisms to address it have been difficult to implement, owing at least partly to lack of information. This lack was evident in the initial water accounts, in which the quantities of groundwater abstracted had to be estimated because there is little direct measurement. In addition, the water supply network is inefficient, losing much water between abstraction from dams and supply to farms, businesses, and households; of the 328 million m³ of formal water supply, approximately 21 percent, or 68 million m³, leaks back into the environment. Opportunities for cost saving, revenue raising, coordination, and connecting more users to suppliers are being missed.

By far the biggest user of water is hydroelectricity. This use is nonconsumptive, that is the water is returned to the environment immediately after use and can be used downstream by others, such as households and farmers, yet hydroelectricity generation and agriculture, most of which is rainfed, are prone to climate risk. Irrigated agriculture is underdeveloped, so climate risk is also undermanaged, meaning that food, energy, and water security are all threatened during times of drought. The accounts provide a time series of data from year-to-year, which enables the economic effects of past decisions relating to water management to be analyzed and provides integrated environmental-economic information to central agencies to justify spending additional resources on water management. In addition, the accounts allow likely changes in water availability due, for example, to future droughts to be estimated. When combined with scenario modeling, the accounts allow policy options to be evaluated quantitatively, for example, comparing the economic benefits of investing in irrigation infrastructure with possible environmental costs associated with irrigation (typically reductions in water flows in rivers and increases in water pollution levels).

Figure 5. Zambia Water Account: Physical Supply and Use of Water (Million m³), 2016



The monetary water accounts were limited to water that the water utilities supplied. They showed that, over the years, households used approximately two-thirds of the value of the water that the water utilities supplied. This was broadly in line with the physical quantities used, indicating little variation in price over time. The accounts also confirmed that households paid more for water per liter than industry.

The results of the water accounts and their implications for water management were presented to the National Assembly Committee on Agriculture, Lands, and Natural Resources and Committee on Energy, Water Development, and Tourism, as well as to international audiences at the 3rd and 4th Policy Forums on Natural Capital Accounting for Better Decision Making. In all cases, the risks from climate change and the need to integrate water information with other information on the economy and the environment was stressed. The water account informed the 2019 State of the Nation address, which focused on water management—the need to protect catchments and conserve and realize higher value for water. The draft water accounts have helped identify and assess policy options, such as managing demand through water pricing and licensing, improving regulation of groundwater abstraction, and increasing water supply through dam construction. The water accounts are informing the overall review of the 2010–20 National Water Policy.

Moving forward, the plan is to institutionalize water accounting, which entails developing a comprehensive, nationwide water statistics database and data management system following the United Nations Statistics Division’s (2012) “International Recommendations for Water statistics” and a program to generate data on an ongoing basis at decentralized levels, extending the time series of the water accounts’ supply and use tables and expanding the types of accounts to cover water assets and water quality. As they develop, the water accounts will be able to help with the overall goal of achieving water security, informing decisions on, for example, managing water in the face of climate change; where to invest in (or subsidize) integrated water development and management, irrigation, and water supply connectivity; and setting appropriate regulation and charges for water, particularly for groundwater extraction, to optimize water stocks, flows, and socioeconomic benefits across the different industries in Zambia and to ensure equity between households and industries.

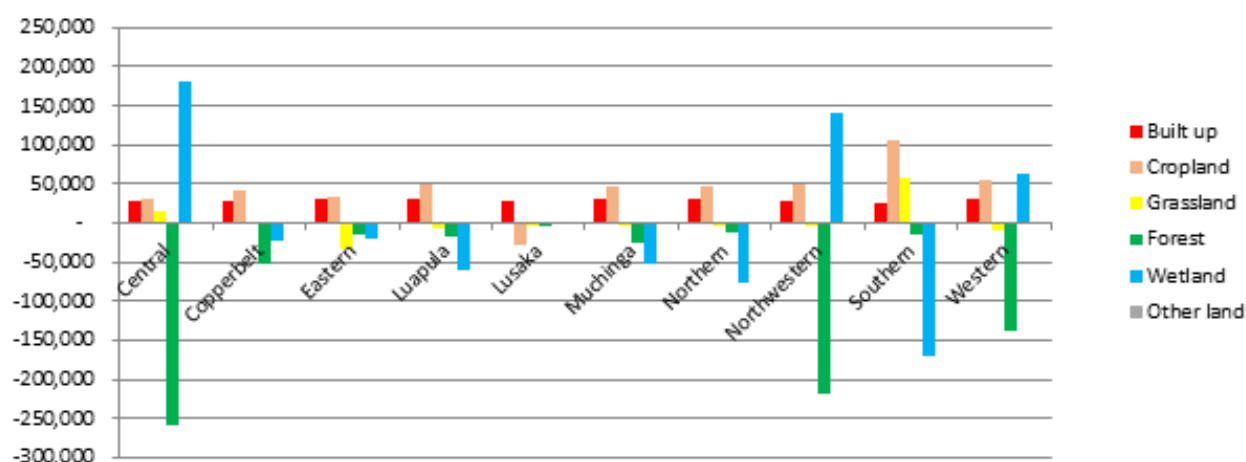
4. Zambia's land accounts

Zambia's land accounts reveal how land cover is changing rapidly and in different ways across Zambia's provinces. They demonstrate major losses of forests and uncertainties regarding wetland viability, as well as potential arising from new forms of multiple land use. The land accounts can also provide essential information on the supply of ecosystem services, which can help with local-level, geographically specific decisions on the best approaches to managing climate change risk, adapting to climate change, and managing landscapes for multiple purposes.

Land is a geographic asset within which economic activities and environmental processes take place and interact (United Nations et al. 2014). The first draft of the land accounts was produced quickly, within 1 year of the Land TWG commencing work. The accounts were produced for the whole of Zambia, as well as for its 10 provinces, and spanned 15 years (2000–15). The land accounts are the only accounts in Zambia produced at the subnational level for each of the 10 provinces. This localized information makes the land accounts a good basis for accounting for ecosystem assets and ecosystem services, many of which are tied to particular natural areas (e.g., habitats and watersheds). Furthermore, and as in most countries, most decisions on land management are made in subnational government agencies and in community organizations and businesses. To inform such decisions, subnational data are needed, which was recognized in Zambia. The land cover accounts are the first part of this information and it is hoped will lead to a richer land account that will show land use, land tenure, and use of ecosystem services at the provincial and lower levels.

Important findings from the land cover accounts overlap with those of the forest accounts; that is, cropland and urban areas are expanding at the expense of forest areas. The land cover accounts offer more detail than the national forest accounts, because they are at a subnational level. In particular, they showed where change in land cover occurred fastest (Central, Northwestern, and Western provinces) (figure 6).

Figure 6. Zambia Land Account: Change in Land Cover from 2010 to 2015 (Hectares)



The land cover accounts also showed changes in the area of wetlands at the provincial level. Wetlands grow and shrink often on a seasonal basis and according to wider climate patterns, including the amount of rainfall. As such, the area of wetlands would be expected to change, and this is reflected in land cover accounts for 2000, 2010, and 2015, which show large variation. It is likely that annual land cover accounts for every year from 2000 to 2015 would have shown gradual changes, and subannual accounts would have shown variation within the year. As with forests, the subnational data reveal that changes to wetlands are

more pronounced in some provinces than others, with the largest change in the Central and Northwestern provinces (figure 6). This information highlights the need for further analysis and interpretation of the land accounts to understand and act on regional differences. For example, the expansion of built areas into wetlands, as has happened in several provinces, may mean that households and businesses in these areas have a high risk of flooding, with implications for spatial planning.

The land accounts rely on data from a range of sources and expertise from many agencies. The data were turned into accounts using SEEA as a guide, but the land cover accounts deploy the land cover classification developed by the United Nations Framework Convention on Climate Change (UNFCCC) and that Zambia uses for greenhouse gas emission reporting. The UNFCCC land cover classification has only six simple categories, which is fewer than in the SEEA recommended land cover classification and fewer than what is available in national data sets. Although this small number limits interpretation of the accounts to some extent, using UNFCCC categories enables the work to be more easily linked to climate change information and policy. Work has started on linking the land cover accounts and other accounts to climate policy, and more work is planned, particularly producing further accounts of direct relevance to decision-making on climate, notably accounts for energy and ecosystem services such as carbon sequestration. (See section 5 below.)

The land accounts have great potential to improve land and landscape planning and management. How NCA can assist integrated landscape management and vice versa was the theme of the 4th Policy Forum on Natural Capital Accounting for Better Policy (WAVES 2019). Integrated landscape management is a strategically planned approach to developing and managing land resources for multiple uses in ways that increase human benefits and reduce negative effects. Zambia made important contributions to this forum, with a presentation showing the application of its accounts to particular integrated projects within Zambia (WAVES nda) and highlighting how work on the accounts had helped break down institutional silos. This is summarized in figure 6, which is adapted from the presentation. The land accounts show loss of forest not only as an unsustainable use of forest resources for wood supply (for timber and firewood), but also as degrading water quality and reducing water availability and, where land was cleared for agriculture, increasing food production. It was also noted in the water and land accounts that the increased use of irrigation was increasing pressure on water resources and land.

As noted earlier, the land accounts provide information on the trade-offs involved in current land management and for potential management changes. The land accounts can also assist at the project level, and the data from the accounts has directly informed four major integrated landscape projects in Zambia.²

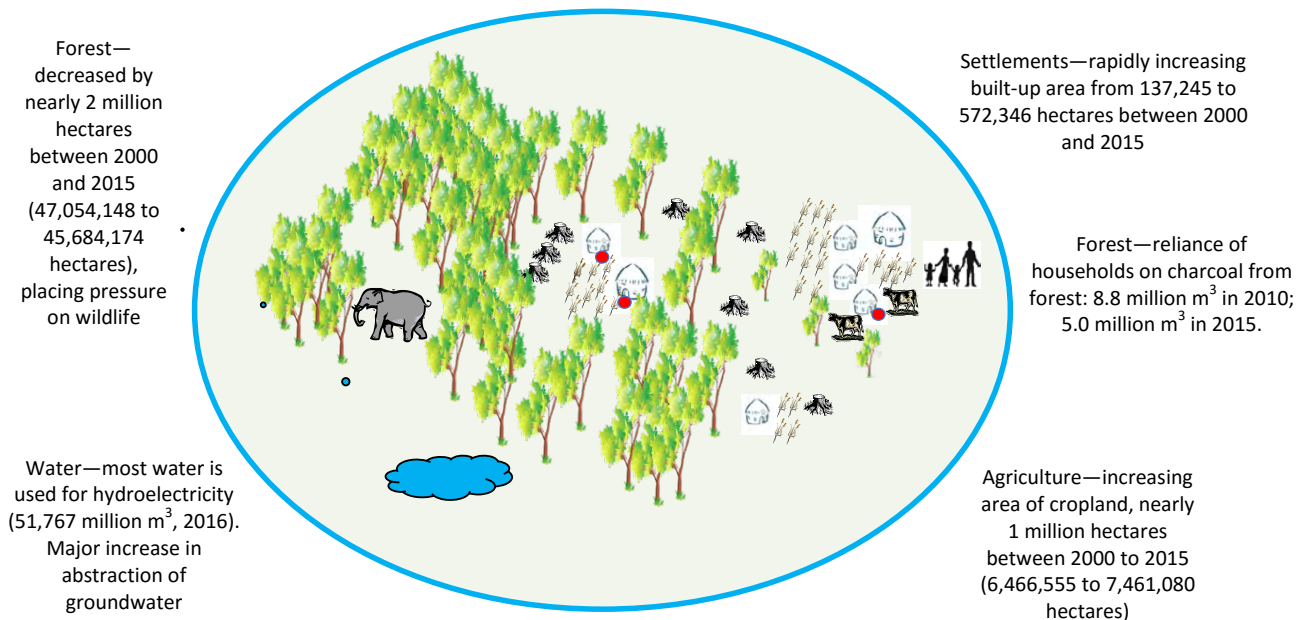
The land accounts highlight at least two other important links to national policy: achieving the sustainable development goals (SDGs) and supporting national priorities in the 7th NDP. For the SDGs, the land accounts included a special section showing how the accounts can directly address 13 of the SDG indicators and provide spatial information for several others. For the 7th NDP, the land accounts can inform several national priorities—enhancing land productivity, expanding agricultural, planning for urban and rural development, and reducing deforestation.

² Zambia's NCA has informed these major integrated forest landscape projects:

- Assisted Natural Regeneration Project (with the Global Environmental Facility)
- Decentralized Forest and Other Natural Resources Management Project (with the Finnish Government)
- Transforming Landscapes for Resilience and Development (with the World Bank)
- Zambia Integrated Forest Landscape Project (with the World Bank)

Zambia is considering expanding the land accounts with land use accounts to complement the accounts on land cover type, ecosystem accounts, monetary land value accounts, and special agricultural land accounts (see section 5 below) and doing all these at more local levels—perhaps districts, as well as provinces, as at present. Institutionalizing the production of land accounts is critical if the accounts are to become embedded in government decision-making.

Figure 7. Integrated Land Management and Natural Capital Accounting in Zambia



5 Accounts Supporting Zambia's National Development Priorities



5. Accounts Supporting Zambia's National Development Priorities

NCA can provide powerful information to help Zambia achieve its overall policy priorities.

The accounts to date have already informed forestry, water, and land decisions, but NCA can also revolutionize how Zambia's overall priorities are addressed. Zambia's natural capital underpins its achievement of many economic priorities: sustained economic growth that also creates jobs and reduces poverty, economic diversification away from copper and toward tourism and high-value agriculture, growth in government revenue from the large natural capital base, and energy security. NCA has begun to inform national development planning and policy processes to secure these important roles of natural capital.

The natural capital accounts produced have started to address top policy priorities in Zambia. The accounts—and the processes put in place to produce, interpret, and use them—have identified or clarified ways that natural capital allocation, investment, and management can help achieve priority goals. The accounts are beginning to be used to review, implement, and monitor specific policy responses and initiatives.

Zambia identified several government policies and mechanisms for which NCA would be of potential use in its formal expression of interest in joining the WAVES program in 2016. Zambia's 7th NDP (MNDP 2017b) is the highest-level government document that lays out Zambia's response to development challenges. Zambia hoped that NCA development would directly inform the NDP and the national development planning cycle, along with the review of Zambia's overarching Vision 2030. Other important policies that Zambia has identified include the National Policy on Climate Change (MNDP 2016), National Forest Policy, National Policy on Environment, Decentralization Policy, National Water Policy, and National Wildlife Policy. The upfront identification of these priority decision areas helped focus the account producers' attention on the likely demand for the accounts. The three accounts have offered information on how natural capital can support these priorities.

A priority identified in the 7th NDP is the need to create a conducive governance environment for diversified, inclusive growth. The accounts are part of this; they offer transparency; support evidence-based policy; and feed into the design, application, monitoring, and review of policies for sustained growth and socioeconomic transformation.

Accounts have provided information on the natural resources of land, forest, and water—strategic resources for which data were already relatively available—but accounts are being extended to other strategic natural resources. One goal of the 7th NDP is to create a diversified, resilient economy driven by mining, agriculture, and tourism—particularly ecotourism—for which accounts are beginning to be established.

Mineral resources, in particular copper resources in the north of the country, have been vital assets, providing income for mine workers and revenue for the government, but some copper mines have polluted the air and water in the past (Perera 1981) and allegedly in the present (BBC News 2019). Better accounting for minerals and economic and environmental effects of mining is being developed. The expectation is that it will help government and others assess the cost and benefits of trade-offs between the environment and the economy and explore options for sharing the economic benefits of minerals.

Accounting for the natural resources used in agriculture has also begun, with agricultural land cover featuring in the land accounts, farmland expansion being identified as the major reason for forest loss in the forest accounts, and the limitations of rainfed agriculture identified in the water accounts. A full understanding of how all natural capital inputs and outputs are used in agricultural production and the effects of this on the environment is planned. Developing

agricultural accounts following the SEEA specially developed for agriculture (FAO AND UNSD 2020) would draw on and complement the existing land, forest, and water accounts and use existing agricultural data. Agricultural accounts could increase the prominence of agriculture in national planning and government economic decision-making by providing a comprehensive view of the natural capital available to farming, the changing stocks and benefit flows, and links to economic activities. The accounts would permit modeling of agricultural land use scenarios based on specific government policies, likely levels of climate change, and other factors, which would enable the possible trade-offs of optional government interventions to be assessed. For example, a particular forest could be cleared and used for irrigated agriculture. This would increase food supply but would also mean that timber can no longer be extracted and could lead to soil erosion and loss of water quality, in turn compromising agriculture. The accounts enable costs and benefits, and “winners and losers,” to be identified and the effect of management changes to be assessed.

Tourism, particularly ecotourism, is highlighted in the 7th NDP as an industry that can help achieve sustainable development in Zambia. Much of Zambia’s natural capital, such as Victoria Falls, other national parks, wildlife, and other biodiversity is unique, with high value as ecotourism assets. All of these assets will require effective management and investment to enable greater levels of tourism. The accounts can help provide evidence of the costs and benefits of devoting further areas and other resources to wildlife conservation and its sustainable use and help give investors confidence that the main tourist attractions of the country will be effectively managed. For example, accounting in Botswana showed that returns to water use by wildlife conservation could be much higher than for agriculture (Vardon, Pule, and Galegane 2017).

Climate change has emerged as one of the most pressing risks to Zambia’s socioeconomic development, as Zambian Vice President Inonge Mutukwa Wina asserted in the introduction to the 2016 National Policy on Climate Change (MNDP 2016):

“The country is already experiencing climate-induced hazards, which include drought and dry spells, seasonal and flash floods and extreme temperatures. Some of these hazards, especially the droughts and floods have increased in frequency and intensity over the past few decades and have adversely impacted on the food and water security, water quality, energy and sustainable livelihoods of rural communities.”

The 2016 National Policy on Climate Change calls for a cross-government coordinated response to climate change—necessary because climate, energy, water, and natural resources interact closely. Previously, climate change had been addressed in a fragmented manner, using unconnected data and deploying separate sectoral policies, strategies, and plans, with limited overall effect. A crucial aspect of the 2016 policy is close monitoring, evaluation, and review. Although natural capital accounts were not specifically anticipated in the climate change policy, NCA can offer an integrated information solution to the complex climate problem and help with problem identification, policy development and implementation, and program management. The water accounts have been linked to climate change policy to help assess options for water security under different climate scenarios (WAVES 2018a). The land accounts have also used the UNFCCC land cover classification for ease of informing climate policy.

Figure ES1 in the executive summary illustrates how Zambia’s natural capital accounts have been able to inform diverse tasks involved in the policy cycle that address a wide range of challenges. Table AI, found at the end of this document, lays this out in more detail for each of the three accounts. The accounts’ contributions are remarkable, given how recently they were established.

6. Zambia's Rapid Progress with NCA

Zambia has made unusually rapid progress in producing its natural capital accounts and making good use of them, overcoming many—but not all—data and institutional challenges. Zambia stands out as an encouraging leader for other countries in NCA, providing confidence in the WAVES programming approach and offering useful lessons in how to organize the process. Having developed accounts for water, forests, and land, Zambia is seeing how these accounts can be brought together to address complex trade-offs. It is also adding accounts for minerals, energy, and tourism—important areas for development under the 7th NDP.

Zambia produced its first drafts of forest, land, and water accounts rapidly, within approximately 1 year, using the proven international standard, the SEEA, as a conceptual framework and a basic template for account tables. Zambia has shown not only that accounts can be developed quickly using existing data without requiring a massive special data collection exercise, but also that initial draft accounts can influence decision-makers.

Zambia offers many practical lessons on how to create, use, and embed accounts in mutually supportive ways. A core feature of the work in Zambia was its active TWGs and their overall coordination. In sectors in which intended accounts have not been produced, such as minerals and energy, lead agencies were not nominated, nor were TWGs established. Each of the four TWGs (water, land, forest, modeling) met at an initial workshop, and all except the Modeling TWG met at three subsequent workshops over the course of the project, enabling them to share what they learned, decisions on data sources and methods to be made jointly, and team members and technical experts to contribute to more than one TWG. The approach helped build working relationships between the TWGs and with experts from other countries.

Many TWG members were motivated by a realization that NCA could address a problem that had constrained progress for years—lack of systemic, useful data. Although data have been collected regularly for many years (e.g., in forestry through inventory of species, growth rates, yields, areas), this technical information has not been able to influence policy makers. Its 'language' was, for example, that of hydrology or forestry, not the language of economics or finance with which policy-makers are more familiar. Moreover, the national forest and water information systems were neither comprehensive nor systematic, so the contribution of the forest and water sectors to the economy had been underreported.

The Forest TWG was able to produce the accounts quickly, in part because of careful planning. A document outlining the tables to be produced, challenges, possible data sources, methods, and timeline helped to focus the work (MLNR 2018). As work progressed, the composition of the Forest TWG changed, which invigorated the group and expanded its focus from account production alone to account use.

Production and use of Zambia's water accounts benefited from a well-balanced, coordinated, stable Water TWG. Members of the TWG spanned data and policy agencies and included people with a diversity of knowledge and expertise, although there was a bias toward physical sciences rather than economics. Workplans and draft documents were developed and shared within the group, and the first-draft water accounts were available for comment in May 2018 (WAVES 2018b). The final accounts were published in June 2020 after several rounds of review of the draft accounts within the country, as well as international assessment, to ensure data quality.

In the Steering Committee and the TWGs, an appreciation has developed of the connections between the accounts: how the land, forest, and water accounts could provide a suite of information to help decision-makers. The connections have become particularly apparent at the landscape level, where understanding and managing the relationships between land, forest, and water is critical for ensuring sustainable development. These were outlined in some detail in section 4 above on the land accounts, which provided the principal accounting platform for integrating the data.

7 Collaboration Critical to Success



7. Collaboration Critical to Success

Good stakeholder collaboration has been critical to the success of Zambia's NCA—bringing together many data suppliers with many potential users of data (decision-makers). Today's complex policy decisions depend upon access to up-to-date data on many factors produced by multiple agencies. Because of collaboration, Zambia was able to develop its accounts to access the best data and the most relevant decision-makers. Because NCA is a relatively new approach, Zambia has also benefited from sharing expertise and experiences with other countries and expert bodies, facilitated by the WAVES Partnership.

Many government agencies from the data supply side and the policy side worked together to produce the accounts and apply them to policy. This was evident in the regular workshops at which all of the TWGs would meet and work together, deciding on appropriate data sources and methods and presenting work to each other for constructive comment.

The sharing of knowledge and experience between countries was an important part of the WAVES program in Zambia. In particular, Botswana assisted by explaining the processes, data sources, and methods that it had used for producing water accounts, and Rwanda did the same for forest and land accounts. This sharing demonstrated that it was possible for Zambia, too, to produce accounts with existing data and to put draft accounts to productive use in informing decisions. This sharing and confidence-building was a crucial factor leading to Zambia's particularly rapid production of accounts and application to particular policies (section 6 above).

In return, Zambia has shared its experience with Uganda, across Africa, and more broadly through the Fora on Natural Capital Accounting for Better Policy, where it contributed in 2017, 2018, and 2019. The African interest in natural capital and engagement in NCA is growing at a fast pace and is not dependent on a limited number of international experts. Such was the size and enthusiasm of the participants at the 2019 forum in Kampala that an African community of practice on NCA was launched at that meeting. Catalyzed by WAVES and supported by other partners such as the United Nations Statistics Division and the Gaborone Declaration for Sustainability in Africa, the community has become very active (WAVES ndb).

8 Moving Forward



8. Moving forward

The next stage is to embed natural capital accounts and their regular use in Zambia's machinery of government. Zambia's natural capital accounts are proving their worth in systematically organizing critical data and presenting it for policy use. Zambia began using the forest and water accounts when they were drafts because they filled an important policy gap. The next step is to institutionalize the production, interpretation, approval, and use of accounts. Work on this is underway, with some staff and budget secured. A comprehensive national NCA strategy is needed to firmly establish mandates, procedures, roles, capacities, and resource requirements.

“NCA has generated quality information, which gave food for thought for decision-makers who have to make multifaceted decisions, but richer food could be offered if we had more systematic data collection, a more coherent accounting strategy, and more routine accounting.”

(WAVES Focal Person for Zambia)

Since 2016 Zambia has built considerable skills and knowledge among the teams that produce and use the accounts. Zambia has already begun working on the second iteration of its forest and water accounts. It is budgeting to continue NCA, making staff available and revising job descriptions to ensure continued coordination of the accounts. Planning is underway to extend the time series of the water and forest accounts by adding years and expanding the types of accounts to cover water assets and water quality. New accounts for minerals, energy, ecosystems, and tourism are being established. A TWG on modeling was established and will be invigorated by involving Zambian academic experts in scenario analysis and modeling. NCA is being integrated into some course curricula at the University of Zambia so that future generations become familiar with it. Zambia's work in developing natural capital accounts, and using them for decision-making, have already helped to strengthen the foundations for Zambia's path to sustainable development.

Institutionalizing NCA as a regular process is now the priority – establishing regular, systematic processes for account production, interpretation, approval, and use. The current arrangements for account production are based on the agencies and individuals represented in the TWGs, which largely rely on the agencies responsible for management of natural resources for data. A range of account production models could be explored: for example, experience has shown that it is useful for a central data agency, rather than a policy or management agency, to play the coordinating role in production.

A national strategy for NCA could usefully be developed to ensure that:

1. Decision-makers and other leaders understand NCA and what it can do and are aligned on it
2. NCA is linked formally to major planning processes (NDP) and the System of National Accounts
3. Processes and tools of accounting are institutionalized, with clear mandates and responsibilities for account production, interpretation, approval, publication, and use
4. Strategic decisions are made on which new accounts to prepare beyond forests, water, and land so that they can serve priority development needs
5. Longer time series of each account are made, with more regular data collection and accounting
6. Accounts are enriched with new kinds of data, such as geographic and local data, to increase utility
7. It is clear who should interpret and analyze the accounts and where this should be published—within the accounts or in separate documents, independently or by the accounting agency
8. Modeling and scenario analysis skills and capacities are invested in to improve the use of accounts
9. Key personnel are trained and ready to produce and use natural capital accounts
10. Resourcing is available, with regular operational budgets for the responsible authorities

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Table A1: How Accounts Contribute to Policy in Zambia

Policy cycle stage	Land account	Forest account	Water account
Problem identification	<p>The accounts have identified:</p> <ul style="list-style-type: none"> Increasing urban and agricultural areas, by 435 thousand hectares and 994 thousand hectares, mostly at the expense of forests Threats to biodiversity conservation and ecotourism from land cover change Provinces where land cover change is greatest—Central, Northwestern, Western 	<p>The accounts have identified:</p> <ul style="list-style-type: none"> Forest area decline of 1.1 million hectares between 2000 and 2015 Importance of fuelwood from forest to households—5 million households used fuelwood in 2015, and 35 percent of fuelwood use was by households Unsustainable use of forest products as shown by declining forest area and increasing indigenous timber extractions, nearly 100,000 m³ in 2015 Very low level of government revenue capture 	<p>The accounts have identified:</p> <ul style="list-style-type: none"> Reliance on water for hydroelectricity (51,767 million m³) and risk to this that climate change poses Leakages from water supply network of 68 million m³ Increasing reliance on water not sourced from water supply company Unsustainable use of groundwater
Policy response	<p>The accounts could be used for:</p> <ul style="list-style-type: none"> Identifying additional areas for conservation reserves and ecotourism Managing existing conservation areas and ecotourism areas Examining how payments for ecosystem services, in particular carbon sequestration, could address climate change 	<p>The accounts could be used for:</p> <ul style="list-style-type: none"> Examining how to design a scheme enabling payments for ecosystem services to be used to protect forests and provide income to the rural poor 	<p>The accounts could be used for:</p> <ul style="list-style-type: none"> Determining sustainable extraction levels Making the case for investment in water supply infrastructure (e.g., to reduce leakages) Making the case for greater development of irrigation to improve agricultural production during the dry season

<p>Policy implementation</p>	<p>The accounts are designed to inform (including some early activity):</p> <ul style="list-style-type: none"> • 7th NDP • National Policy on Climate Change • National Forest Policy • National Policy on Environment • Decentralization Policy • National Water Policy • National Wildlife Policy 	<p>The accounts are designed to inform (including some early activity):</p> <ul style="list-style-type: none"> • 7th NDP • National Policy on Climate Change • National Forest Policy 	<p>The accounts provide the data needed for:</p> <ul style="list-style-type: none"> • Applying user-pays principle to water pricing • Issuing water use licences <p>The accounts are aiming to inform:</p> <ul style="list-style-type: none"> • 8th NDP (to succeed 7th NDP) • National Policy on Climate Change • 2021 National Water Policy (to succeed 2010 Water Policy)
<p>Monitoring</p>	<ul style="list-style-type: none"> • Changes in land cover and land use by industry • Assistance in interpretation of reasons for change in forests and water resources • Increases in agricultural area tracked • Provision of data for monitoring SDGs, in particular 8, 11, 12, 13, 15 	<ul style="list-style-type: none"> • Changes in forest area regularly (annually) estimated • Reasons for change better understood with reference to land accounts • Provision of data for monitoring SDGs, in particular 7, 8, 12, 13, 15 	<ul style="list-style-type: none"> • Levels of water use by industry and households regularly (annually) estimated • Changes in source of water used (e.g., piped vs groundwater) • Provision of data for monitoring SDGs, in particular 6, 7, 8, 12
<p>Review</p>	<p>The accounts could be used to review the effectiveness of current policies and management. This has begun with review of the 2010–20 National Water Policy. For the 4th Policy Forum on Natural Capital Accounting for Better Decision Making, the Ministry of Lands and Natural Resources examined all of the accounts produced, which highlighted the interactions between resources and the need for integrated land and water management.</p>		

Note: NDP, National Development Plan; SDG, Sustainable Development Goal.

