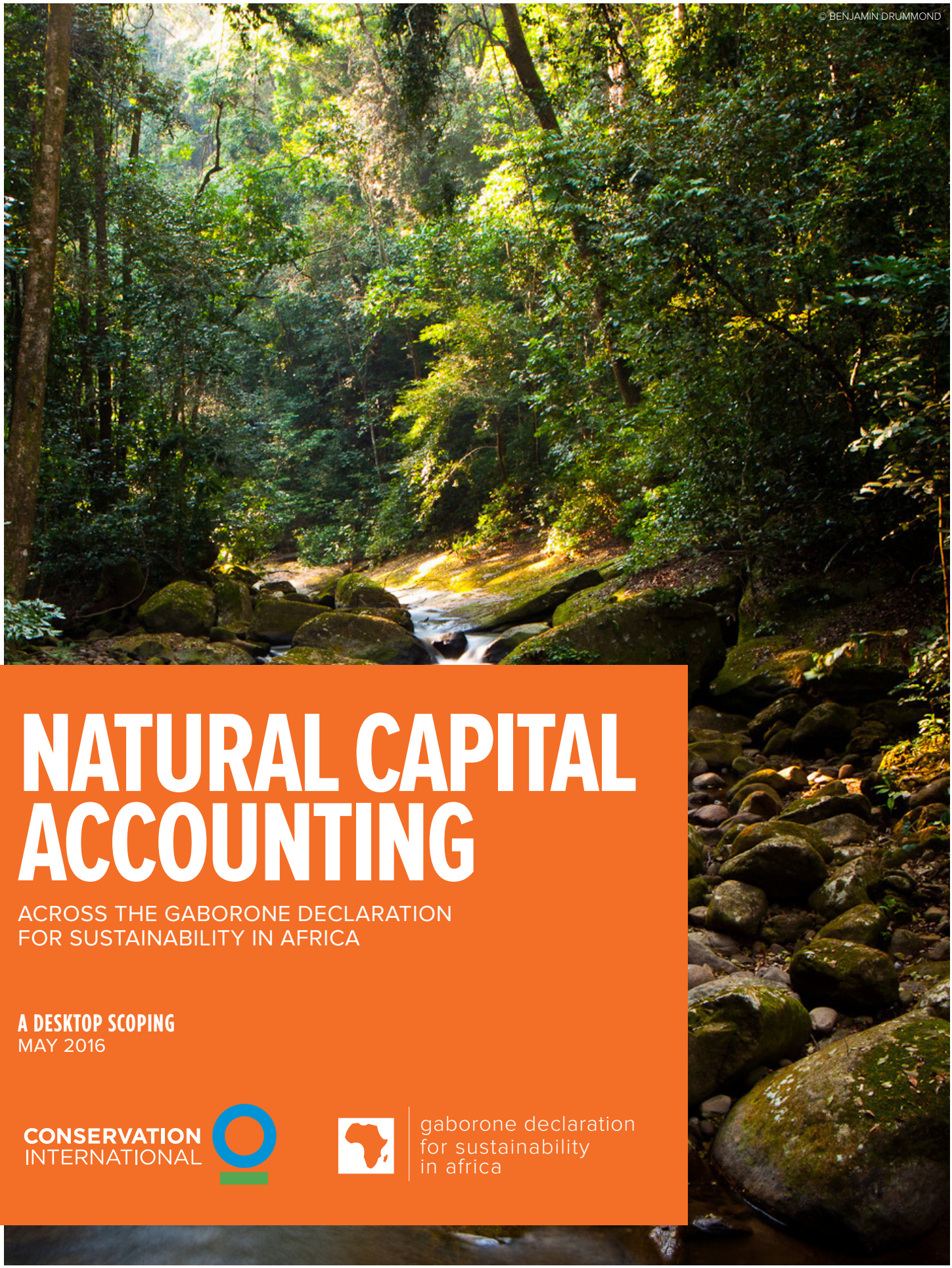

NATURAL CAPITAL ACCOUNTING

ACROSS THE GABORONE DECLARATION FOR SUSTAINABILITY IN AFRICA

A DESKTOP SCOPING
MAY 2016

CONSERVATION INTERNATIONAL

gaborone declaration for sustainability in africa

Natural Capital Accounting across the Gaborone Declaration for Sustainability in Africa: A Desktop Scoping

Compiled by Conservation International on behalf of the Gaborone Declaration for Sustainability in Africa

May 2016

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Foreword

Africa's economic growth is already a defining global story and likely to remain so throughout the twenty-first century. The past decade and a half has seen many countries sustain growth rates above other areas of the world. As a consequence of this growth, it has become increasingly clear that the dependencies and impacts of Africa's growth are intricately linked to global sustainable development.

Changing climate, loss of natural ecosystems, water shortages, and desertification are all symptoms of world in which we face increasingly complex environmental challenges that are unavoidably linked with other global challenges, such as financial crises, increasing social inequality and population pressure. The gravity of these global challenges raises questions about how standard measures of progress – such as Gross Domestic Product or GDP – accurately depict and capture the tradeoffs associated with development at the cost of nature.

The concept of Natural Capital Accounting (NCA) has emerged as one of the leading mechanisms for measuring and valuing a nation's natural capital stocks as well as the ecosystem services that flow from these stocks into the economy. NCA can be used as a benchmark by which policy-makers, investors, and civil society evaluate their approaches and determine if they are supporting a sustainable model of development. In addition, NCA can be used as a monitoring tool for bringing together diverse pieces of information about the environment, such as would be required to measure progress towards the Sustainable Development Goals. The importance of NCA, particularly in Africa, is supported in the operative decisions, resolutions, and declarations of the sixth special session of the African Ministerial Conference on the Environment, the second United Nations Environment Assembly, and the eighth Summit of the Heads of State and the Governments of the Africa, Caribbean, and Pacific (ACP) Group.

NCA is now being implemented in over 70 countries in the world, many of which follow the standards and guidelines approved in 2012 by the United Nations. Those countries that do embark on NCA, begin a journey in which they thoughtfully measure and value their natural resource assets in both monetary and non-monetary terms. These journeys have allowed nations to appreciate, understand, and manage assets about which they previously had limited information.

The exploration of the valuation and measurement of natural capital is core to the Gaborone Declaration for Sustainability of Africa, a commitment signed by ten African Heads of State in 2012. This report celebrates that exploration and examines the contexts, actors, landscapes, and histories of the Gaborone signatory countries in undertaking a

journey towards understanding and incorporating natural capital into their decision-making.

I would recommend this report for both the readership and necessary action of all individuals and groups that are committed to balancing sustainable and inclusive development in Africa. Conservation International remains committed to ensuring the transition of Africa towards a green economy and the conservation of the continent's rich ecological resources for the present and future generations.

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Background

The **Gaborone Declaration for Sustainability in Africa** (GDSA)[1] is a transformative platform for achieving sustainable development in Africa. It was initiated as a regional policy framework in May 2012 and announced at Rio +20 by the Government of Botswana and nine other African countries to take action toward sustainability in three major areas:

- Incorporating the value of natural capital in public and private policies and decision-making;
- Pursuing inclusive sustainable production in agriculture, fisheries, and extractive industries while maintaining natural capital; and
- Generating data and building capacity to support policy networks

Given these focus areas, the Declaration is a vehicle for achieving the Sustainable Development Goals, transitioning towards a green economy, addressing climate change, and establishing the conditions necessary for long-term, sustainable prosperity.

Natural Capital Accounting

Nature is foundational to the prosperity and security of people and economies. Natural capital, which includes all of nature's assets – geology, soil, air, water, and all living things – provides a wide range of services to people and is estimated to contribute to 36% of the total wealth of developing countries worldwide.[2] Yet, many of the benefits we receive from nature and the impacts we have on nature remain hidden and are often not taken into consideration when making decisions. As a result, nature is being eroded at an alarming rate; the loss of forest alone is costing the global economy between $2 and $5 trillion per year, or nearly one-third of the U.S. economy.[3] Neither the value of natural

Key Terms

Natural Capital Accounting (NCA): The measurement of natural resource stocks (both renewable and non-renewable) and the flows of benefits they provide. Broad term used to describe accounting efforts in both the public and private sectors for nature.

Environmental-Economic Accounting: NCA for the public sector, specifically in relation to the United Nations SEEA Framework and integration of those results into the System of National Accounts.

Central Framework (CF): Standards published by the United Nations SEEA to guide the development of accounts that largely focus on estimating the amount of renewable and non-renewable goods provided by nature (e.g. mineral and energy resources, land, soil, timber, aquatic, and other biological and water resources).

Ecosystem Accounting (EA): Accounting for the stocks and flows of ecosystem services from different ecosystems to beneficiaries in a spatially explicit manner. Guidelines for this type of accounting are developed by the United Nations Statistics Division, with organizations like Conservation International contributing to the research and development in this field.

[1] www.gaboronedeclaration.com

[2] World Bank. 2011. The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium. Washington, DC.

[3] The Economics of Ecosystems and Biodiversity (TEEB). 2010. Mainstreaming the Economics of Nature: A synthesis of the

capital nor the impacts of its loss are captured in the System of National Accounts, which is used by nations to measure economic activity and by decision makers to assess performance, set policy, and report on progress.

Natural Capital Accounting (NCA) is commonly defined as the measurement of stocks of natural resources (both renewable and non-renewable) and the flows of benefits they provide. NCA seeks to capture and integrate the contribution of nature into the systems that the private and public sectors use to make decisions. In the private sector, the Natural Capital Protocol is setting the standard for the integration of nature into business decision-making; more than 40 businesses are piloting the protocol.

NCA efforts in the public sector, typically referred to as environmental-economic accounting, are the domain of the United Nation's System of Environmental-Economic Accounts (SEEA). The SEEA is an internationally accepted framework to make explicit the interactions between the economy and the environment. The SEEA is an important step towards the incorporation of nature into the System of National Accounts and includes the *Central Framework (CF)* - which deals with, for example, water, energy, and mineral accounts - as well as guidelines for the next generation of standards under development known as *Ecosystem Accounting (EA)*.

Conservation International's NCA activities adhere to the CF international standards and contribute to the research and development of EA guidelines. Following the SEEA CF and EA frameworks will enable countries to implement accounts in a comparable and repeatable manner. This report focuses only one NCA in the public sector.

approach, conclusions and recommendations of TEEB.

Desktop scoping natural capital accounting: purpose and objectives

In December 2014, the Government of Botswana delegated the functions of the GDSA Secretariat to Conservation International (CI). Therefore, CI is operating in partnership with the Government of Botswana to manage the functions of the Secretariat of the Declaration until December 2018. In addition, CI will act as an implementer of certain project activities.

The GDSA Secretariat, over the coming years, will focus on articulating linkages between the Gaborone Declaration and other global and regional frameworks, establish partnerships to support the transition to a green economy and sustainable development in Africa, scope and identify flagship examples of implementation efforts by member countries, and amplify best practices across Gaborone Declaration countries. These functions require a deep understanding of ongoing efforts across the Gaborone Declaration region. This includes understanding how countries are approaching the topic of Natural Capital Accounting (NCA) given that the first outcome of the declaration explicitly relates to NCA.

Therefore, in June and July 2015, Conservation International – on behalf of the GDSA Secretariat – conducted a desktop scoping study for the 10 GDSA countries as well as for Uganda and Madagascar. Uganda and Madagascar are two countries that may join the GDSA in the future. **The objectives of**

this desktop scoping study were to gain a preliminary understanding of each country's natural resources and important ecosystems, relevant policies and actors working in this space, as well as to understand the history of each country's experiences with ecosystem valuation and natural capital accounting (inclusive of Central Framework and Ecosystem Accounting initiatives). This scoping focused on public sector natural capital accounting initiatives. While the accounting for natural capital was the primary focus of the scoping, information about tourism accounts was also collected as tourism in the GDSA countries is closely linked to wildlife and eco-tourism. In total, over 500 documents and websites were reviewed and incorporated into this report.

Limited stakeholder engagement and ground-truthing took place until November 2015 though it was not undertaken systematically across all countries. Therefore, it should be acknowledged that the country profiles presented here may be incomplete. Future scoping studies will be undertaken to provide a more rounded picture of the work being undertaken by Gaborone signatory countries.

It is hoped that this report can act as a public source of information to help share information among and between Gaborone Declaration countries.

Status of natural capital accounting across the Gaborone Declaration for Sustainability in Africa

This scoping indicates that most of the GDSA countries have undertaken either national or sub-national NCA initiatives (Table 1). In many cases, these initiatives are supported by external donors and partners (Figure 1), including the Forest Investment Program (FIP) Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), World Bank Wealth Accounting and Valuation of Ecosystem Services (WAVES) program, the United Nations Environment Programme (UNEP), and the United Nations Statistical Division (UNSD).

Current initiatives are taking place in various phases, including: 1) beginning account planning; 2) developing pilot accounts; 3) being finished with the development of an account; and 4) repeating the same account several times (e.g. a repeated effort; Table 2). In reporting on their NCA initiatives, most countries faced several complex and overlapping hurdles (Table 3). More broadly, all of the countries have undertaken initiatives that are related to NCA (Table 4) and these other initiatives could help build a foundation for future NCA work.

*Table 1: Past, current, and planned natural capital accounting (NCA) efforts in GDSA countries.**

	Accounts																		
	National														Sub-National				
Country	AR	C	EA	E	Fi	F/T	L/R	La	LD	M	S	Wa	We	Wi	U	EA	Fi	F/T	W
Botswana																			
Gabon																			
Ghana																			
Kenya																			
Liberia																			
Madagascar																			
Mozambique																			
Namibia																			
Rwanda																			
South Africa																			
Tanzania																			
Uganda																			

Color Legend:

Past efforts	Current efforts	Future efforts	Interested expressed at GDSA meeting	Lower priorities for countries

* Boxes are highlighted when there have been efforts within a country to undertake NCA in the country (columns indicate different types of national and sub-national efforts). Accounts are noted if they have been classified as lower priorities for countries (based on information taken, for example, from World Bank WAVES documents).

Account Acronyms: AR: Aquatic Resources; C: Carbon; EA: Ecosystem Accounts; E: Energy; Fi: Fisheries; F/T: Forest/Timber; L/R: Lakes/Rivers; La: Land; LD: Land Degradation; M: Minerals; S: Soil; U: Unknown; Wa: Water; We: Wetlands; Wi: Wildlife

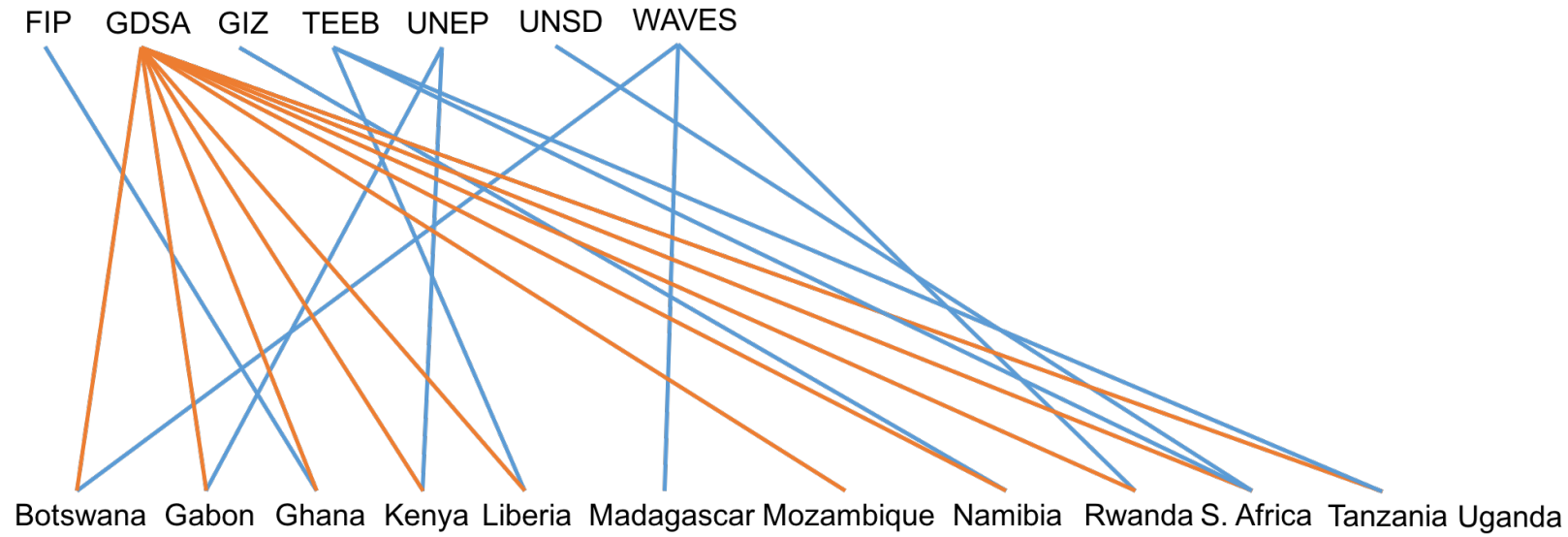

Figure 1: Connections between countries and different institutions with whom they have partnered on their NCA initiatives.

*Table 2: Current natural capital accounting (NCA) efforts in GDSA countries.**

	Accounts																			
	National														Sub-National					
Country	AR	C	EA	E	Fi	F/T	L/R	La	LD	M	S	Wa	We	Wi	U	EA	Fi	F/T	W
Botswana																				
Gabon																				
Ghana																				
Kenya																				
Liberia																				
Madagascar																				
Mozambique																				
Namibia																				
Rwanda																				
South Africa																				
Tanzania																				
Uganda																				

Color Legend:

Initiatives just starting	Development of pilot accounts underway	Pilot accounts have been completed	Accounts have been repeated	Unknown status for initiative

* Current efforts are divided into four categories: 1) initiatives just starting; 2) development of pilot account(s) underway; 3) pilot account(s) that have been completed; 4) account(s) that have been repeated. We also highlight where there are current efforts underway but where we did not have enough information available to determine at what stage the accounts were.

Account Acronyms: AR: Aquatic Resources; C: Carbon; EA: Ecosystem Accounts; E: Energy; Fi: Fisheries; F/T: Forest/Timber; L/R: Lakes/Rivers; La: Land; LD: Land Degradation; M: Minerals; S: Soil; U: Unknown; Wa: Water; We: Wetlands; Wi: Wildlife

*Table 3: Hurdles facing countries in their development of NCA.**

Countries	Lack of existing/ quality/ organized data	Lack of long-term funding	Insufficient technical expertise or capacity	Insufficient supporting legislation	Insufficient communication between government entities	Difficulty engaging technical working group	Disagreement over which accounts to develop	Need to demonstrate/ communicate value of NCA to decision-makers	Post-WAVES planning needed	Accounts not routinely updated	Accounts not incorporated into national statistics
Botswana	■							■	■	■	■
Gabon											
Ghana	■		■	■	■						
Kenya											
Liberia	■	■	■								
Madagascar	■		■							■	■
Mozambique	■	■	■								
Namibia	■		■							■	■
Rwanda	■	■	■			■	■	■	■		■
South Africa	■		■		■			■			
Tanzania	■		■							■	■
Uganda	■	■	■					■			

* These hurdles are not inferred; they have been explicitly listed in documentation/reports about the countries' NCA efforts (authored by country governments or by funding organizations) or were stated by government representatives during GDSA Roadshow presentations.

*Table 4: Country participation in programs related the valuation of ecosystems and ecosystem services.**

Country	Signatory of NCA Communiqué	Has a national NCA committee?	UN PEI	UNDP BIOFIN	TEEB	ProEcoServ	Ecosystem Valuation		REDD+		
							National	Sub-National	Program	Committee	Partners
Botswana	Yes		Finished	Yes			Yes	Yes			
Gabon	Yes							Yes	Yes		UNREDD
Ghana	Yes						Yes	Yes	Yes	Yes	UNREDD
Kenya	Yes		Yes				Yes	Yes	Yes	Yes	
Liberia	Yes				Yes			Yes			
Madagascar	Yes	Yes					Yes	Yes	Yes	Yes	
Mozambique	Yes	Maybe	Yes				Yes	Yes	Yes		
Namibia	Yes	Yes (for Water)						Yes			
Rwanda	Yes	Yes	Yes					Yes	Yes	Yes	GIZ USAID World Bank WWF
South Africa	Yes			Yes	Yes	Yes	Yes	Yes	Yes		GIZ
Tanzania	Yes		Yes		Yes		Yes	Yes	Yes	Yes	UNREDD
Uganda			Finished	Yes			Yes	Yes	Yes		

* Note that national Payment for Ecosystem Services (PES) schemes are not included in this table as it is unclear whether any of the countries have national PES mechanisms though Rwanda does have a national PES steering committee.

BOTSWANA

The Republic of Botswana is considered to have one of the most stable economies in Africa and is a middle income country.[1] Botswana's 2014 Gross Domestic Product (GDP) is estimated to have been USD$16.3 billion and the 2014 GDP per-capita (PPP) was USD$16,000.[1] Real GDP growth is approximately 4-6% per year.[1] In 2014, the contributors to Botswana's GDP were: agriculture (1.9%), industry (28.7%), and services (69.4%); the official unemployment rate was 17.8% in 2009.[1] Mineral extraction (diamonds) dominates economic activity (one-third of GDP and 70-80% of export earnings) though tourism is a growing sector due to the country's conservation practices and extensive nature reserves.[1] Important agricultural products include livestock, sorghum, maize, millet, beans, sunflowers, and groundnuts.[1] Subsistence agriculture employs approximately half of the workforce.[2] Approximately 2.2 million people live in Botswana, 42.8% of the population lives in rural areas, and 30.3% of the population was below the poverty line in 2003.[1]

Ecosystem extent and condition

Botswana's area covers a total of 581,730 km^2.[1] In 2011, land uses included agricultural land (45.8%), forest (19.8%), and other uses (34.4%).[1] The terrain is predominantly flat with rolling tableland and the Kalahari Desert in the southwest.[1] Botswana is made up of seven eco-regions: Kalahari Acacia-Baikiaea Woodlands, Southern African Bushveld, Zambezian Baikiaea Woodlands, Zambezian and Mopane Woodlands, Zambezian Flooded Grasslands, Zambezian Halophytics, and Kalahari Xerix Savannah.[2] Over 40% of the country is under formal protection, among the highest rates of any country in the world.[3]

Acronyms

BIOFIN: Biodiversity Finance Initiative
CBD: Convention on Biological Diversity
CBNRM: Community-based Natural Resource Management
CSO: Central Statistics Office
DAP: Department of Animal Production
DEA: Department of Environmental Affairs
DoM: Department of Mines
DWA: Department of Water Affairs
GEF: Global Environment Facility
GDP: Gross Domestic Product
GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit
IUCN: International Union for Conservation of Nature
MEWT: Ministry of Environment, Wildlife, and Tourism
MFDP: Ministry of Finance and Development Planning
MMEWR: Ministry of Minerals, Energy, and Water Resources
NCA: Natural Capital Accounting
NCCSAP: National Climate Change Policy and Comprehensive Strategy and Action Plan
NDP10: Tenth National Development Plan
NPNRCD: National Policy on Natural Resources Conservation and Development
NRA: Natural Resource Accounting
NSPR: National Strategy for Poverty Reduction
PEI: Poverty Environment Initiative
SADC: Southern African Development Community
SAfMA: Southern African Millennium Ecosystem Assessment
SEEA: System of Environmental-Economic Accounting
SNA: System of National Accounts
NRASA: Southern African Natural Resource Account
TEEB: The Economics of Ecosystems and Biodiversity
UNCCD: United Nations Convention to Combat Desertification
UNDP: United Nations Development Program
UNEP: United Nations Environment Program
WAVES: Wealth Accounting and Valuation of Ecosystem Services

Ecosystem services and natural resources

Botswana's important natural resources include its fauna and flora, diamonds, copper, nickel, salt, soda ash, potash, coal, iron ore, and silver.[1] Botswana's natural resources are the most significant driver of economic development and growth.[5] Approximately 75% of paid employment in the country can be linked to natural resource utilization and services in agriculture, mining, tourism (hotels and restaurants), and water.[5] Between 1995 and 2005, Botswana increased it per capita wealth by 35%; this has been largely attributed to careful management of its natural resources.[6]

Botswana's ecosystems provide many other important ecosystem services. For example, up to 3000 veld products are used across Botswana and play an important role in reducing vulnerability and are sometimes a source of cash income (but the value of these products are not recorded in national accounts).[4] In addition, the Makgadikgadi Pan ecosystem has a high carbon sequestration value of P$136 million per year.[4] Finally, the seasonal flood plains around the Okavango and Zambezi support high densities of large mammals as well as some of the major wildlife migration routes in Southern Africa.[2] These animals have provided substantial income from tourism; tourism now accounts for 12% of the GDP.[2] In addition, the Okavango and Zambezi provide water, fish, and food services.[2]

Threats to ecosystem services and natural resources

Botswana's natural hazards include periodic droughts and Botswana is a water scarce country.[1,7] Environmental issues include overgrazing, desertification, habitat destruction, development (which can limit species' movements), poaching of flagship species, and limited freshwater resources.[1,2]

Four of the seven eco-regions are considered vulnerable[2] as 69% of Botswana's land is degraded as a result of deforestation, overgrazing, and erosion.[8] The South African Bushveld is threatened by deforestation, overgrazing from unregulated cattle, range degradation, and fires.[2] The Zambezian Baikiaea Woodlands are threatened by unregulated cattle grazing.[2] The Zambezian Halophytics are threatened by mining, rangeland degradation, fires, wind erosion, increased water extraction for irrigation resulting in increased salinity, disruption of migration routes due to fencing, overgrazing, lack of protection for avian breeding sites, and uncontrolled tourism.[2]

Climate change will significantly impact Botswana over the long term and will likely result in increased frequency and intensity of severe weather events including droughts and floods.[4] As a result of climate change, Botswana may experience up to 20% less rainfall each year and average temperatures may rise up to 1-2 degrees Celcius.[4]

Policy

Botswana's constitution was last amended in 2006.[1] Botswana has 10 districts and 6 town councils.[1] In 2013, the government was comprised of 23 ministries and 16 Parastatal organizations.[9]

Botswana is party to several international environment agreements (Appendix A). At the national level, Botswana has many policies/laws related

to the environment. One study of 33 laws indicated that implementation covered a wide range of ministries across the government: Ministry of Agriculture (10 laws); Ministry of Environment, Wildlife and Tourism (6 laws); Ministry of Health (3 laws); Ministry of Land and Housing (5 laws); Ministry of Local Government (1 law); and the Ministry of Minerals, Energy, and Water Affairs (8 laws).[9] A 2009 report gives an overview of policies related to poverty-environment analyses.[10]

It should be noted that there is no national fisheries policy and fisheries are not included in the NDP10.[4] Other national policies related to the environment (some of which are discussed in more detail, below), include: National Policy on Natural Resource Conservation and Development (1990), the Tourism Policy (1990), the Agriculture Policy (1991), the National Water Master Plan (1992) and the National Settlement Policy (1998), the National Policy on Agricultural Development (1991), the National Policy on Forestry (2011), the 2008 Policy on Community-based Natural Resource Management (CBNRM), and the National Wildlife Policy (2013).

National policies/programs:

Community Based Natural Resource Management Plan (CBNRM, 2007): This plan outlines activities that will ensure equitable sharing of costs and benefits from protected areas and the participation of local communities in protected area management.[2] Considered an important mechanism for delivering aspects of Vision 2016,[10] CBNRM generates significant revenues and job opportunities (P$23 million in 2008; 8,000 jobs from 2006 to 2009) for communities.[4,10]

Environmental Assessment Act (2011): Replaced the Environmental Impact Assessment Act of 2005.[11]

Botswana Poverty Environment Initiative (PEI): Supported by the UNDP-UNEP Poverty-Environment Initiative (PEI), this program aims to mainstream environmentally sustainable natural resource management into national and sectoral development processes.[11] Specifically, the PEI focuses on enhancing the integration of sustainable development in national, sector, and district level policies, plans, budgets, and monitoring systems.[7] The aim of the PEI is to improve the knowledge and use of integrated tools/methodologies for sustainable natural resource management such that the economy is diversified and poverty eradicated.[7,12] Jointly lead by the Ministry of Finance and Development Planning (MFDP) and the Ministry of Environment, Wildlife, and Tourism (MEWT).[7] The Ministries of Local Government, Ministry of Agriculture, and the Office of the President are also involved.[7] This program partners with the World Bank's Wealth Accounting and Valuation of Ecosystem Services (WAVES) program.[7]

Botswana Vision 2016: Vision 2016 emphasizes the importance of sustainable development and the protection of the environment, with a larger vision of poverty eradication. This Vision is led by the Office of the President.[10,11] Vision 2016 identifies seven pillars of growth: 1) an educated, informed nation; 2) a prosperous, productive, innovative nation (includes

some aspects of environmental management); 3) a compassionate, just, and caring nation; 4) a safe and secure nation; 5) an open, democratic, and accountable nation; 6) a moral and tolerant nation; and 7) a united and proud nation.[14] An Environment Keynote Paper has been made part of the Vision 2016 documents.[14] Vision 2016 is implemented through the National Development Plans.

National Biodiversity Strategy Action Plan: This Action Plan was developed between 2002 and 2004 to implement the Convention on Biological Diversity (CBD) (revised in 2007 by the Ministry of Environment, Wildlife, and Tourism).[2,13] Currently, the Plan (2011-2020) is being implemented by the Department of Environmental Affairs.[2] Development of the plans has been funded by the United Nations Development Programme (UNDP), Global Environment Facility (GEF), and the International Union for the Conservation of Nature (IUCN).[13] The 2007 Biodiversity Strategy had 11 strategic objectives, designed to reach the following vision: "A nation in balance with nature, with fair access to biological resources, where the benefits deriving from the use of these resources are shared equitably for the benefit and livelihoods of current and future generations, and where all citizens recognize and understand the importance of maintaining Botswana's biological heritage and related knowledge and their role in the conservation and sustainable use of Botswana's biodiversity."[13]

National Climate Change Policy and Comprehensive Strategy and Action Plan (NCCSAP): Botswana began drafting this policy in 2013 with the expectation that it would be adopted in late 2014.[11] This is the country's most comprehensive climate change initiative to date and its objectives include: mainstreaming climate resilience into development planning processes and legal frameworks, achieving sustainable development, and involving various sectors of society in the implementation of climate resilience actions.[11]

National Development Plans: Botswana has had ten National Development Plans (NDP), of which the sustainable use of natural resources has formed a key component.[11] During the 2013 mid-term review of the current NDP, three national areas were identified as priority areas for the environmental sector: 1) pollution prevention and control; 2) sustainable utilization of natural and cultural resources; 3) and climate change/global warming.[11] Of note, the NDP10 (the current National Development Plan, 2010-2016) aims to address Natural Capital Accounting with the World Bank WAVES program explicitly mentioned in the mid-term review document for the NDP10.[7,14] The NDP10 has eight inter-ministerial thematic working groups, is a blueprint for implementing Vision 2016, and one of its larger aims is to achieve a GDP growth rate of 5.9% per annum.[8,10,12] MFDP led the formulation of NDP10.[10]

NDP11 will take effect from 2016-2021. NDP11 is a legal document that identifies the goals and activities of each ministry and the approved budgets and investment projects to support them.[15] The process for designing NDP11 is led by MFDP and is expected to commence mid-2015 once the Framework for the National Vision beyond 2016 is completed.[15] MFDP is committed to mainstreaming WAVES

Natural Capital Accounting into the NDP11, and the NDP11 is expected to make reference to NCA.[6,15]

National Policy on Natural Resources Conservation and Development (1990, NPNRCD): This policy embeds the country's sustainable development and environmental protection within the national planning process.[11]

National Strategy for Poverty Reduction (NSPR, 2003): This is Botswana's strategy to reduce the proportion of the population living in poverty by 2007 and to eradicate absolute poverty by 2016.[10] Progress on this policy is coordinated by the Multi-Sectoral Committee on Poverty Reduction.[10]

National Strategy for Sustainable Development: Identifies NCA work undertaken through the WAVES programs as instrumental in informing sustainability objectives.[15]

Data Availability and Monitoring

Several program documents have noted that data availability may be limited in Botswana. In 2007, the accessibility of biodiversity data and lack of computerized data were considered a constraint; this led to the duplication of data collection and not including important data in analyses.[13] Two years later, a 2009 report again noted that accurate environmental data and statistics were scare and that data capture and management was a key constraint.[10] However, the report also mentioned that UNDP and the government were co-funding the creation of an Environmental Information System to incorporate data from various sectors.[10] In 2013, a report indicated that environmental data/statistics from the Directorate of Economic Statistics were being updated once every five years.[9] However, this report noted that there was a "total lack of coordination between various entities" in terms of monitoring, evaluation, and research.[9] It was noted that there is a lack of adequate funding to undertake important data collection activities (e.g. a study on forest cover).[9] Likewise, a 2014 report on the development of the WAVES Mineral Accounts indicated that there were large data limitations in conducting resource rent calculations.[16] It was hypothesized that these data limitations – which related to the size of mineral reserves – may have been kept confidential due to the strategic importance of this information.[16] The report suggested different types of data which Statistics Botswana and MMEWR could begin collecting on an annual basis that would facilitate calculation of Mineral Accounts.[16]

There are, however, some signs of progress. First, a biodiversity clearing house mechanism/environmental monitoring system has been developed (though is not yet operational due to technical and data ownership issues).[2] In addition, a 2012 scoping report for the WAVES program provided an in-depth view at available data and data issues for water, energy, land, tourism, and minerals.[17] At the 2015 Gaborone Declaration for Sustainability in Africa (GDSA) Roadshow meeting, it was noted that the government was interested in the creation of a central ecological-economic planning and monitoring facility with capacity and resources to gather, compile, synthesize, and analyze data to inform policies and decision-making.[18] Examples of data resources are listed in Table 5.

*Table 5: Data availability from different sources.**

Type of Data	Data Source
Biodiversity	
Forest Inventories	Ministry of Environment, Wildlife, and Tourism[13]
Bird Counts	Birdlife Botswana[13]
Forestry statistics	Statistics Botswana [10]
Wildlife statistics	Statistics Botswana [10]
Fisheries	
Fisheries stocks	Department of Wildlife and National Parks conducts fish stock assessments quarterly since 1999.[10]
Land Use/Environmental Assessments	
Land tenure and use	Statistics Botswana[10]
Natural Resources	
Community Forestry/Indigenous Trees	Forestry Association of Botswana[13]
Availability and quality of natural resources	Statistics Botswana[10]
Socio-economic/Administrative	
Socio-economic data	Statistics Botswana (surveys conducted at ten year intervals)[10]
Poverty	Statistics Botswana[4]
Tourism	
Tourism statistics (visits/expenditures)	Department of Tourism[10]
Water/Hydrology	
Climate	Department of Meteorological Services[11]

* A comprehensive and detailed scoping of data availability was conducted in 2012 by the WAVES program in data and data issues for water, energy, land, tourism, and minerals.[17] For brevity, the data sources identified in that scoping report are not listed here.

Statistical capacity

The Central Bureau of Statistics is responsible for reporting economic statistics in the country.[19] The framework used is based on the 1993 System of National Accounts (SNA).[19] The International Monetary Fund has a comprehensive review of the methods used by Botswana in the development of their national accounts.[19]

As per a Public Expenditure Review of the environment, budgeting and accounting are completed by ministries using the Government Accounting and Budgeting System. In 2013, this system was in use across the country except in a few districts.[9] Monthly accounts are prepared by the Auditor General's office; annual accounts are audited by the Auditor General's office, certified, and presented to parliament each year.[9] The budgeting system cannot track all expenditures on environment or natural resources because it is structured to collect information from organizations (e.g. a Ministry) using line items that can generate administrative information but not functional information (e.g. environmental protection). For this reason, it can be difficult to collect information regarding expenditures on the environment.[9]

A 2012 WAVES scoping report noted that Statistics Botswana produces GDP data quarterly and are available within 90 days of the end of the relevant quarter.[17] Data are produced by GDP, by output, and by expenditure in both current and constant prices. GDP by

income data have not been produced for the past data.[17] In published data, the economy is disaggregated into ten sectors though Statistics Botswana will produce data for 36 sub-sectors if requested.[17] There are inconsistencies between the published data series and the source data.[17] A 2014 WAVES report indicated that Botswana does not produce a consolidated picture of national wealth in official statistics (i.e. there is no national balance sheet).[16] The report noted that the only component of national wealth that is regularly calculated and published is net financial assets (published by the Bank of Botswana).[16] Statistics Botswana used to publish information on produced capital (capital stock) across different economic sectors, but this has not been done since 2006/7.[16]

Botswana is a member of the Southern African Development Community (SADC), which is currently implementing its Regional Indicative Strategic Development Plan (RISDP).[20] The RISDP has four intervention areas: 1) development of legal framework in Statistics; 2) harmonization of statistics in the SADC region; 3) provision of relevant statistics for regional integration; and 4) statistical capacity building development in SADC.[20] As part of this work, SADC coordinates, enhances, and promotes national statistical systems in member states. As such, SADC has undertaken several projects with its member countries to expand their capacity in this regard, including Botswana.[20]

Relevant Actors

Government

There are several government institutions that have experience in fields relevant to this scoping effort (Table 6); the institutional map of the government agencies related to the environment can be seen in Figure 2.

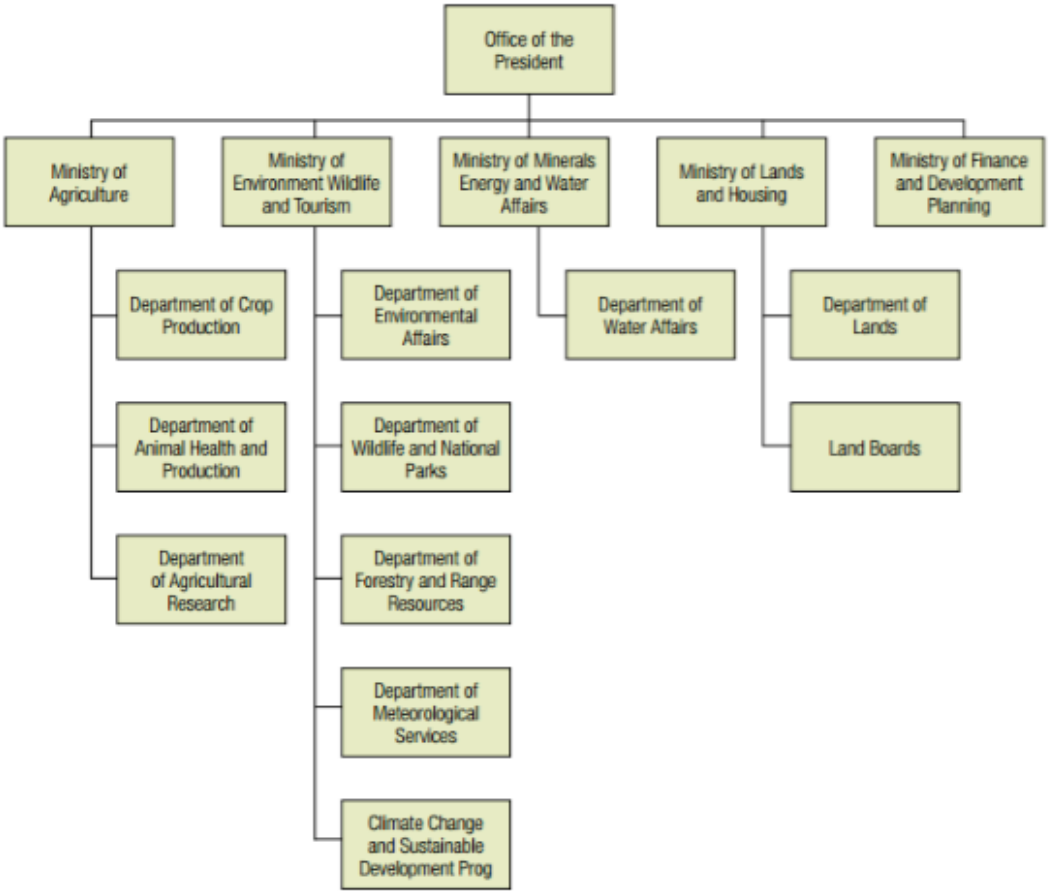

Figure 2: A 2010 institutional map of government departments involved in environmental management and climate change planning. Source: http://za.boell.org/sites/default/files/downloads/HBF_web_Bots.pdf

Table 6: Government ministries/agencies that have had roles related to ecosystem valuation and natural capital accounting.

Ministry	Notes
Agriculture	
Ministry of Agriculture	Responsible for the national gene bank, agricultural research, and mapping of resources.[13] Involved in Botswana PEI implementation.[7] Received training from the PEI program.[8] Ministry is on the steering committee for the World Bank WAVES program.[21] Involved in developing natural capital accounts.[6]
Environment	
Ministry of Environment, Wildlife and Tourism (MEWT)	Responsible for preparing and updating the State of the Environment Review; overall responsibility for the environment lies with this ministry.[11] Has partial responsibility to oversee the Department of Environmental Affairs (DEA), the Department of Forestry and Range Resources, and the Department of Wildlife and National Parks.[11] Helps lead the PEI Botswana program.[11] Involved in the UNDP BIOFIN program.[3] National focal point for the CBD, UNCCD, Ramsar, and Stockholm conventions.[13] Received training from the PEI program.[8] The DEA undertakes Natural Capital Accounting work.[10] Ministry is on the steering committee for the World Bank WAVES program.[21]
Ministry of Minerals, Energy, and Water Resources (MMEWR)	Received training from the PEI program.[8] Ministry is on the steering committee for the World Bank WAVES program.[21] Contains the Department of Water Affairs (DWA) that hosts the WAVES Water Accounts.
Ministry of Lands	Ministry is on the steering committee for the World Bank WAVES program.[21]
Planning/Finance	
Ministry of Finance and Development Planning (MFDP)	Helps lead the PEI Botswana program and houses the program development team.[8,11] Organized large workshop on the green economy concept in 2011.[11] Involved the UNDP BIOFIN program.[3] Lead government agency for the World Bank WAVES program.[21] Is mandated by the President to undertake Natural Capital Accounting.[22]
Office of the President	Involved in Botswana PEI implementation.[7] Involved in developing natural capital accounts.[6]
Statistics/Science	
Statistics Botswana (Formerly the Central Statistics Office, CSO)	Received training from the PEI program.[8] Falls under the MFDP; primary function is to provide information for monitoring, evaluation, and formulation of development plans and programs.[10] CSO collects, processes, analysis, reporting, and dissemination of data.[10] Involved in developing natural capital accounts.[6]
Ministry of Infrastructure, Science, and Technology	Ministry is on the steering committee for the World Bank WAVES program.[21]
Water	
Department of Water Affairs	Involved in developing natural capital accounts.[6]
Water Utilities Corporation	Involved in developing natural capital accounts.[6]

Civil Society

University of Botswana: Undertakes plant, rangeland, and wildlife research.[13] Researchers from the university participated in a 2013/14 ecosystem valuation project in of the Kalahari rangelands.[23] There is a memorandum of understanding between the Ministry of Finance and Development Planning and the University to introduce Natural Capital Accounting training modules into the environment sciences and economics departments at the university.[15]

Bilateral/Multilateral Institutions

UNDP: Leads and is responsible for administration support and financial management for the PEI program (see below).[8]

UNDP Biodiversity Finance Initiative (BIOFIN) Program: Launched globally in 2012, this program aims to address biodiversity finance challenges by increasing investment in the management of ecosystems and biodiversity.[3] This program is currently being undertaken by the Ministry of Environment, Wildlife and Tourism and the Ministry of Finance.[3] The following four BIOFIN components are implemented in Botswana:[3]

Component 1: Review of Biodiversity Policies, Institutions, and Expenditures (ongoing)

Component 2: Defining the costs of implementing National Biodiversity Strategies and Action Plan

Component 3: Developing a Resource Mobilization Strategy for Biodiversity Finance (starting in 2015)

Component 4: Initiate implementation of the Resource Mobilization Strategy (starting in 2015)

UNDP-UNEP Poverty-Environment Initiative (PEI): Partners with the Government of Botswana for the Botswana Poverty Environment Initiative, which began implementation in 2010.[7] Starting in 2014, the program transitioned from a full country program to a technical advisory support program for the government's Poverty Eradication Strategy (led by the Office of the President) and the Sustainable Development Strategy (led by the Ministry of Environment, Water, and Tourism).[24]

World Bank WAVES program: WAVES is helping Botswana use environmental accounting to access the economic information it needs to improve decision making.[21] The project is collecting detailed information to optimize natural capital use, and looking beyond GDP as a measure of economic growth to find indicators that take natural capital into account.[21]

The World Bank: The World Bank funds less projects in Botswana than in other Gaborone Declaration countries but nevertheless has undertaken some environmental work in country (beyond the WAVES program) including the Northern Botswana Human Wildlife Coexistence Project (P095617) and the National Land Management and Livestock Project (P000147).

Ecosystem valuation, natural capital accounting, and ecosystem accounting

Botswana has an extensive history of undertaking natural capital accounting. In 1998, Botswana initiated a natural capital accounting program with the purpose of incorporating aspects of sustainability into its system of national accounts. This program was initially part of a regional Natural Resource Accounting initiative covering Botswana, Namibia, and South Africa.[11,25] The DEA was the lead institution for this effort;[17] pilot accounts were developed for selected sectors, with monetary accounts developed for minerals and physical accounts for minerals, water, and livestock.[11] In total, water accounts were developed for 1990-2003, livestock accounts for 1980-2002, and mineral accounts for 1990-2004.[11] Accounts were developed under the National Development Plan 9 and followed SEEA/UN guidelines.[26] Accounts were hosted and maintained by multiple agencies, though they were linked through the DEA;[11] the intention was to transfer the responsibilities of these accounts to the DWA (water), DoM (minerals), and DAP (livestock).[17] This transfer of responsibility was not achieved though 120 sectoral officers were trained in environmental economic principles and methodologies with the goal of getting them to integrate these concepts into their development planning activities.[10]

It is not clear that these early accounts reached policy makers. A 2009 report considered these accounts useful but their impact on policy making was described as limited.[10] Likewise, a 2010 Poverty Environment Initiative document stated that information on the economic value of environmental services (as well as the benefits, costs, and impact of environmental degradation) was not available to decision makers.[12] A 2012 WAVES scoping study indicated that the accounts were insufficiently used in development planning and resource management and that they were not routinely updated.

During this time, however, several government documents commented on the importance of environmental valuation. First, in the 2007 Biodiversity Strategy and Action Plan (for the CBD), Botswana noted the importance of the economic value of biodiversity and the need to economically evaluate certain actions including the development of cost calculations for restoration and rehabilitation of destroyed habitats.[11,13] Second, in a 2011 international workshop on the green economy concept (organized by the Botswana Ministry of Finance and Development Planning), it was noted that development needed to value environmental capital.[11] Third, in a 2011 report on the Poverty Environment Initiative, indicated that the government appeared open to Poverty-Environment mainstreaming and interested in enhancing its capacity to deal with Poverty-Environment issues.[8]

Botswana has been a partner country for the World Bank WAVES program since 2011, with the Ministry of Finance and Development Planning making progress towards continued implementation of its NCA objectives.[11] As part of the WAVES program, Botswana is working on four priority areas for NCA: 1) Water Accounts; 2) Land and Ecosystem Accounts (focusing on the Okavango Chobe, Makgadikgadi Pans, and Central Kalahari); 3) Mineral and Energy Accounts; and 4)

Macroeconomic indicators for sustainable development.[27] The government has already created Water (starting in 2012) and Mineral Accounts as well as satellite Tourism and Wildlife Accounts following UN SEEA methods.[28] The government has progressed beyond an experimental approach and are now trying to move towards a more macro-economic approach.[28] NCA, as developed through the WAVES program is being institutionalized; a unit has been set up within the Macroeconomics Policy Division of the Ministry of Finance and Development Planning to coordinate NCA objectives across relevant sectors.[27] However, Botswana is still working to understand and convey the utility of experimental accounts and of sector specific accounts.[28] Nevertheless, there is broad support for NCA; President Khama highlighted the importance of NCA in two annual State-of-the-Nation addresses.[27] The WAVES program has undertaken a large number of outreach programs related to NCA and dissemination of their preliminary results.[15]

Aside from the WAVES program, there have been some other areas of progress. First, Botswana is a signatory of the Natural Capital Accounting Communiqué (related to the Rio +20 in 2012).[11] Second, The current National Development Plan (NDP10) specifically addresses Natural Capital Accounting.[7] Third, Botswana has made headway in locating sustainable financing for natural capital accounting; Botswana finances its NCA efforts using water tariffs and international support.[6] Fourth, Botswana is a member of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES); the members of IPBES are committed to building IPBES as the leading intergovernmental body for assessing the state of the planet's biodiversity, its ecosystem, and the essential services they provide to society.[29]

Moving forward, there are some hurdles that need to be overcome. First, accounts need to be incorporated into the GDP or into policy; a 2012 report indicated that the most ecosystem services from land, water, and air are not captured in the GDP of Botswana and that the GDP greatly understates the contribution of ecosystems.[4,9] Second, a 2012 scoping report indicated that there are still some government agencies who are not aware of the value of NCA. For example, the Land Boards and Departments of Lands and Town and Regional Planning showed little interest in the construction of land accounts.[17]

Past and current efforts relevant to this scoping are detailed, below.

Ecosystem Valuation

Regional (multi-country) efforts:

Southern African Millennium Ecosystem Assessment (SAfMA): Determined that freshwater, food-producing ecosystems, and biodiversity are the most important ecosystem services in Botswana.[11]

Sub-national efforts:

Economic valuation of the Makgadikgadi Pan: Study used the total economic valuation framework to assess the economic value of goods and services provided by the region.[11] The Makgadikgadi Pan is a unique saline wetland ecosystem and the direct and indirect use values were more than a P$1 billion per year in 2010.[4] Putting these prices into a TEEB ecosystem services

framework indicates that nearly two-thirds of the total estimated value comes from provisioning ecosystem services (e.g. soda ash and salt).[4] The Makgadikgadi Pan ecosystem has a high carbon sequestration value of P$136 million per year.[4]

Economic valuation of the Okavango Delta: Study which combined the total economic valuation framework with a national accounting framework to determine the direct, indirect use, and non-use values of tourism and natural resource use.[11] Regulating services have an economic value of at least half of the combined annual GDP contribution of tourism, agriculture, and natural resource harvesting in the Delta.[5] Economic values were estimated in 2005 and the results found that the delta contributed P$401 million to the national economy from tourism. In addition, the study found that indirect use values were calculated at P$277 million/year, 58% of which are attributable to carbon storage and 28% to wildlife refuge services.[4]

Study on the economic benefits of land and land-based ecosystems: Research project by the University of Botswana and several European universities which focused on rangeland systems in the Kgalagadi District of Botswana's Kalahari.[23] The project lasted from 2013-2014 and aimed to assess the costs, benefits, and trade-offs associated with different land use and management strategies.[23] Objectives included measuring the extent of degradation and identifying ecosystem services (type, quantity, and value).[23]

UNDP-UNEP Poverty-Environment Initiative (PEI): The PEI works together with the World Bank WAVES program.[11] One of the main activities of this program is to conduct economic analysis on the value of natural resources, the costs of environmental degradation and inaction, and the benefits of sustainable resource management, as well as public expenditure reviews for environment and climate change.[24]

The PEI undertook an analysis of the condition (e.g. level of environmental degradation) of key natural resources including water, forests, and soils.[11] In addition, the program completed an economic study on the contribution of natural resources towards economic growth. The resulting report (published in 2012) focused on tourism and agriculture.[30,31] This report found that diamond mining was the largest contributor to GDP and government revenue in the last two decades and that coal mining is expected to increase.[5] The report also found that traditional arable and livestock agriculture is of marginal GDP value because of low productivity levels related to a number of bio-physical, agro-ecological, social, and economic constraints though it is an important sector for the rural poor.[5] It was noted that there are opportunities in Botswana for payment for ecosystem services related to carbon storage and watershed management.[5]

Natural Capital Accounting

Regional (multi-country) efforts:

Southern African Natural Resource Account (NRASA) project: Funded by the United States Agency for International Development (USAID) in the early 2000's, this program aimed to assist and enhance the in-country capacity for Botswana, Namibia, and South Africa to prepare and utilize

Natural Resource Accounts in the decision-making process to achieve sustainable natural resource development.[32] The accounts that were developed from this regional effort were at the national level. This program was responsible for initiating Botswana's efforts in the early 2000's in natural resource accounting (see below for more details).[32]

National efforts:

Energy Accounts: Preparations are underway, via the World Bank WAVES program, to develop Energy Accounts (asset accounts, supply and use accounts).[15] As part of this process, the energy sector has decided to prioritize electricity and coal. During the next National Development Plan (NDP11), work will expand to include transport fuels.[15] A scoping study for the development of these accounts has been published; this scoping study noted that the Energy Accounts will be linked closely with the Minerals Accounts.[15] Accounts will be created in 2015/2016+ and will include Energy Flow Accounts; accounts will be created using the SEEA methodology.[15]

Water Accounts: Botswana calculated Water Accounts in 2004 for the time period spanning from 1992-2003 and again starting in 2012 with the World Bank WAVES program. Details of these accounts are provided, below.

The DEA created water accounts from 1990-2003.[4] The water accounts were created by a technical team that involved the Central Statistics Office (Ministry of Finance and Development Planning), the National Conservation Strategy Agency (Ministry of Lands, Housing, and Environment), and assistance from the Centre of Applied Research.[32] Staff members from the Department of Water Affairs, Water Utilities Corporation, and from the Department of the Local Government services also assisted in data provision.[32] UN guidelines were followed.[32]

The aim of the water accounts were to enhance decision making in the use and development of water resources to sustain national development.[25]

The accounts included freshwater resources as well as wastewater treated in Wastewater Treatment Works. Accounts included stocks and flows of water resources and water quality accounts. Monetary accounts were not developed due to data limitations.[17,25] In a 2006 report, it was noted that the stock accounts were limited to dams (with partial accounts for groundwater) as well as three use accounts (by institution, economic sector, and source).[25] Water accounts were constructed for each of the known major categories of water supply (Water Utilities Corporation, Department of Water Affairs, and District Councils) and other users who were self-sufficient as well as for different water sources (groundwater, dams, and rivers).[32] Data were also compiled by administrative district.[32] More detailed information about the methods used to develop the accounts can be found in several reports.[17,25,32] One of the major hurdles to the project were data issues (discrepancies in data as well as missing data).[32]

Starting in 2012, water accounts were developed by the Department of Water Affairs (for 2010/11 and 2011/12[11,33]) with the help of the World Bank WAVES program. The lead agency for this work is the Department of Water Affairs (in the MMEWR); a Technical Working Group includes the

Water Utilities Corporation, Statistics Botswana, Department of Mines, Ministry of Agriculture, Department of Geological Survey, and Ministry of Lands and Housing. The Water Accounts were explicitly mentioned within documents related to the National Development Plan 10.[14]

The water accounts adopt the framework of the United Nations System of Environmental Economic Accounting for Water (SEEA-Water). The following water accounts have been developed in Botswana: physical use and supply accounts (water abstraction by sector and by natural source; water imports and exports; water use and consumption by sector; water abstraction at the sub-national level by Water Utilities Corporation) and physical stock accounts for reservoirs.[33] The water accounts have generated several indicators for the productivity of water use by economic sector, including the value added per m^3 of water used and employment creation per m^3 of water used.[33] It should be noted that a working group has been formed by the Department of Water Affairs (DWA) to update the former water accounts; therefore, a time series of water use by industry from 1993-2012 is now available.[15]

These accounts have helped the government examine the water flows and stocks across the country. Specifically, information from these accounts has increased understanding about which sectors are the major water consumers and to help address leakage/efficiencies within those sectors.[28] For example, the accounts have increased understanding of how different mining sectors were using water resources and how this might change as revenue from the diamond industry decreases and revenue from other mining industries (such as coal) increases.[33] Key findings include: 1) groundwater accounts for the largest share of water use; 2) total water use has increased by one-third between 1993 and 2011 though water use per person has fallen by 10% in the same period; and 3) the agricultural sector (livestock and irrigation) is the highest water user but is a low contributor to GDP and formal employment.[27]

In 2015 it was noted that the government welcomed preliminary results from the first water accounts, and a second phase is underway.[27] These natural capital accounts are being institutionalized. For example, the DWA has established a water accounting unit and a roadmap (2013-2016) was been established by DWA, the MMWER, and the WAVES steering committee.[27,34]

Mineral Accounts: Botswana calculated Mineral Accounts in 2004 for the time period spanning from 1992-2003 and again starting in 2012 with the World Bank WAVES program. Details of these accounts are provided, below. Other prior work on mineral accounts had also been done prior to 2004 (in the late 1990s) though the outputs from this were integrated into natural resource accounting programs that followed. Mineral accounts are considered a priority by the government.[27,28]

The Department of Environmental Affairs (DEA) prepared a set of Mineral Accounts from 1990-2004 (in 2007, they were expanded to span from 1980-2005).[11,16,26] This exercise focused on mineral asset accounts and intended to quantify stocks of available minerals in physical and monetary terms.[16] Accounts were developed for diamonds, coal, and copper/nickel.[17]

Flow accounts do not exist as most of Botswana's minerals are exported to foreign countries.[17] More detailed information about the methods used to develop the accounts can be found in several reports.[17,35] It was noted that the results from these accounts were extremely relevant to the long-term development of the country and for achieving Vision 2016.[26]

Supported by the World Bank WAVES program, a preliminary mineral resources account was developed in 2014.[16] The preliminary work focused on the production of asset accounts however it was noted that value added industries may require the development of use accounts in the future.[16] Extensive reports have been written detailing the methods used in the creation of these preliminary accounts.[16] The lead agency for this work is MFDP; a Technical Working Group includes the Statistics Botswana, Bank of Botswana, Ministry of Minerals, Energy, and Water Resources, University of Botswana, and BIDPA.

The aims of the preliminary Mineral Accounts (and subsequent policy analyses) are to: 1) quantify the major physical trends in resource stocks for major minerals; 2) quantify the major monetary trends in resource stocks for major minerals; 3) explore the extent to which the government has captured the resource rents from mineral extraction for the country's development and growth; 4) identify the uses to which mineral revenues have been put; 5) product estimates of national mineral wealth; 6) identify challenges with regards to the appropriation and use of resource rents; and 7) identify challenges that need to be addressed for the future compilation of mineral accounts.[16]

Early findings from the Mineral Accounts suggest that: 1) mineral resource rents have made a major contribution to Botswana's economic growth; 2) the vast majority of resource rents have been derived from diamond mining with a small contribution from copper-nickel mining; and 3) the resource rent from coal has been negative, which suggests that it has been underpriced relative to its economic cost.[27]

Macroeconomic Indicators of Sustainable Development: Supported by the World Bank WAVES program, and using the SEEA methodology, Botswana will develop indicators for natural capital and changes to natural capital (depletion/additions), including adjusted net national income, adjusted savings, and national wealth accounts with natural capital.[11,27]

Satellite Tourism Account: In 2005/6 tourism satellite accounts (following methodology developed by the World Travel and Tourism Council) were developed to measure the contribution of the tourism sector to GDP; statistics from 2001-2005 were published.[17,28,36] Methods for these accounts are available.[34]

The accounts divide productive activities in an economy into those producing tourism-specific products (e.g. accommodation) and non-specific products.[17] It then estimates the tourism component of these activities and derives the total contribution of tourism-related supply and consumption to GDP.[17] However in Botswana, tourism satellite accounts are constructed infrequently. There were two separate tourism satellite accounts constructed in 2008 and both gave different results.[17]

Most recently, tourism accounts are being developed jointly with land and ecosystem accounts via the WAVES program (see below).

Ecosystem Accounting

National efforts:

Ecosystem/Land/Tourism Accounts: Experimental Ecosystem/Land Accounts are currently being developed as part of the World Bank WAVES program.[27] These accounts are considered more complex than the other WAVES accounts and require a multi-disciplinary technical working group involving many different agencies.[15]

Tourism is considered a priority for current accounting efforts.[11,15,28] The Tourism Accounts will help provide the value of ecosystem services to support optimal management of different land use zones (e.g. Protected Areas, Wildlife Management Areas, communal areas, forest areas, and agricultural areas).[15] These accounts will first start at sub-national levels (focusing on the Okavango Chobe, Makgadikgadi Pans, and Central Kalahari) and then scale up to a national level.[15] The existing Working Group for Tourism Statistics (chaired by MEWT) is now guiding the tourism accounts.[22] The Land/Ecosystem Accounts will be linked with the Tourism Accounts.[15]

Wildlife Accounts: A 2007 government document indicated the government's intention to create a wildlife resources account.[26] Now, and supported by the World Bank WAVES program, a satellite wildlife account has been created.[28]

Priorities within the country

Botswana is a country that is trying to simultaneously diversify its GDP in preparation for a post-mineral economy, while undertaking programs that manage drought, desertification, and climate change. Botswana is somewhat unique among the countries included in this scoping effort as it is not only relatively stable but is advanced in its management of natural resources (especially its mineral resources and in reinvesting the profits resulting from the extraction of sub-soil assets); careful management of its natural resources has been cited as the reason for a 35% increase in per capita wealth. Its CBRNM program, has generated significant revenues and job security for numerous communities.

Botswana has five priority development issues that are important to the country beyond 2016: 1) eradicating extreme poverty and reducing inequality; 2) strengthening human development outcomes; 3) generating export-led diversified growth and employment; 4) managing the trade-off between income generation and environmental sustainability; and 5) deepening democracy outcomes and strengthening governance.[18]

Botswana has indicated its environmental priorities in several of its policy documents and programs. First, the Poverty Environment Initiative has been effective in enhancing the integration of sustainable development in policies, plans, budgets, and monitoring systems (especially in National Development Plans). Second, Vision 2016 emphasizes the importance of sustainable development and protection of the environment, with a larger vision of poverty eradication. Third, the National Biodiversity

Strategic Action Plan has been implemented and includes 11 strategic objectives, one of which is the valuation of biodiversity. Fourth, during the 2015 GDSA Roadshow, water scarcity featured prominently in government presentations and discussions.[18] The government acknowledged that there is a trade off in water use and that the water scarcity problems in Botswana are requiring the government to address this trade off directly.[18] Botswana recognizes that a green economy can deliver important benefits to Botswana and help it meet its environmental and development goals.[18]

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GABON

The Gabonese Republic has a per capita income that is four times that of most nations in sub-Saharan Africa due to a low population density, abundant petroleum, and foreign private investments. Gabon's 2014 Gross Domestic Product (GDP) is estimated to have been USD$36.35 billion and the 2014 GDP per-capita (PPP) was USD$22,000.[1] Real GDP growth is approximately 5%.[1] In 2014, the contributors to Gabon's GDP were agriculture (3.7%), industry (61.7%), and services (34.6%) with 60% of the labor force involved in agriculture, 15% involved in industry, and 25% involved in services.[1] In 2010, the economy was reliant on oil for approximately 50% of its GDP, ~70% of revenues, and 87% of goods exports.[1] Due to its reliance on natural resources, the economy is impacted by fluctuating prices in oil, timber, and manganese exports.[1] Important agricultural products include cocoa, coffee, sugar, palm oil, rubber, cattle, okoume (a softwood), and fish.[1] Approximately 1.7 million people live in Gabon and 12.8% of the population lives in rural areas.[1] The contribution of selected environmental assets to country total wealth was estimated as 66% in Gabon in 2006.[2]

Ecosystem extent and condition

Gabon's area covers a total of 267,667 km^2 and the country has 885 kilometers of coastline.[1] In 2011, land uses included agricultural land (18.1%) and forest (81%).[1] Gabon's important ecosystems include forests, savannas, mangroves, and wetlands.[3] Gabon's terrain includes a narrow coastal plain, a hilly interior, and savanna in the east and southern portions of the country.[1] Gabon has an extensive protected area network; 23% of Gabon's water and EEZ (Exclusive Economic Zone) are protected.[4]

Acronyms

AGEOS: Agency for Space Studies and Observations
ANPN: National Agency for National Parks
DGSEE: Directorate General of Statistics and Economic Studies
EEZ: Exclusive Economic Zone
FESP: Forest, Fisheries, Biodiversity, and Environment Sector Program
GDP: Gross Domestic Product
GDSA: Gaborone Declaration for Sustainability in Africa
GHG Emissions: Greenhouse gas emissions
ICT: Information and Communications Technology
MoE: Ministry of Environment
NCA: Natural Capital Accounting
NERC: National Environment Research Council
PSGE: Emerging Gabon
REDD+: Reducing Emissions from Deforestation and Forest Degradation
SDGs: Sustainable Development Goals
SEEA: System of Environmental-Economic Accounting
SNA: System of National Accounts
UNEP: United Nations Environment Program
WAVES: Wealth Accounting and the Valuation of Ecosystem Services
WCS: Wildlife Conservation Society
WAVES: Wealth Accounting and Valuation of Ecosystem Services

Ecosystem services and natural resources

Gabon has abundant natural resources, the most of important of which include petroleum, natural gas, diamonds, niobium, manganese, uranium, gold, timber, iron ore, hydropower, and its wildlife (fauna and flora).[1] Gabon is home to some of Africa's most bio-diverse rainforests, including 8,000-10,000 plant species (20% of which are endemic).[5] In 2011, hydroelectric plants produced 41% of the country's electricity.[1]

Threats to ecosystem services and natural resources

Environmental issues in Gabon include deforestation, pollution, and poaching, though the country's small population and oil/mineral reserves have helped the country avoid extensive degradation of rainforests.[1,6] In the marine realm, primary environmental threats include industrialized commercial fishing, oil spills, and displacement associated with oil exploration and drilling in marine areas.[7] Gabon is particularly vulnerable to the impacts of climate change.[8]

Policy

Gabon adopted a new constitution in 1991 with amendments made as recently as 2011.[1] The country has 9 provinces.[1] Article 1 of the constitution provides for the protection of the country's natural environment as a core principle of the State.[4] Gabon is party to several international environment agreements (Appendix A). Specific national policies relevant to this scoping study are discussed in more detail, below.

National policies/programs:

Emerging Gabon (Plan Stratégique Gabon Emergent, PSGE): This plan seeks to strengthen and diversify the economy around three pillars: 1) Green Gabon (sustainable development of the country's natural resources); 2) Industry Gabon (development of local processing of primary materials and export of value-added products); and 3) Services Gabon (development of the Gabonese workforce to become a regional leader in financial services, Information and Communications Technology [ICT], green growth, tertiary education, and health).[4]

Fonds Souverain de la République Gabonaise: Created in 2012, this fund is intended to finance infrastructure and development projects with natural resource profits.[4]

Gabon Environmental Code: The environmental law of Gabon was designed to provide basic national principles to: 1) guide conservation and sustainable use of Gabon's natural resources, 2) combat pollution, 3) improve and protect the living environment, 4) promote new values and income-generating activities using the natural environment, and 5) to harmonize development with environmental conservation.[4]

National Climate Change Action Plan (2012): This plan is designed to enable Gabon to control its greenhouse gas (GHG) emissions and reduce climate risks across the country. The plan also seeks to enable the reconciliation of environmental protection and sustainable economic development in accordance with the Gabon Emergent strategy. The National Council on Climate Change was established in 2010 as part of this plan.[4]

National Parks Law (2007): The National Parks Law is the legal framework used to govern the country's 13 national parks, which amount to ~11% of the total land area of the country.[4]

Reducing Emissions from Deforestation and Forest Degradation (REDD+): Gabon is a partner in the UN-REDD program.[9] Gabon also worked with the

REDDiness project (lead by Eurosense) from 2011 to 2013 to set up a measuring, reporting, and verification system.[10]

Resolution No. 20/2013 on Sustainable Development: Approved in 2013, this resolution will create a national and international ecosystem services market. As part of this resolution, the National Sustainable Development Agency (under the Ministry of Economy and Sustainable Development) was charged with developing a new code for sustainable development that included a provision for the creation of Gabonese Sustainable Development Credits. These credits will be calculated as the difference in carbon emissions between sustainable, planned development and a baseline.[4]

Data Availability and Monitoring

It is unclear whether there are relevant data available in Gabon to undertake natural capital accounting and if environmental data are collected systematically and regularly.

Some limited information is, available regarding datasets relevant to natural capital accounting. First, in 2013, and as part of a World Bank program, a national database on biodiversity was created.[11] Second, and also in 2013, a news article noted that Gabon was "investing millions of dollars to improve access to satellite imagery and remote sensing for a new forest management program." Third, the Natural Environment Research Council (NERC) provided £74,000 to the University of Edinburgh (Astrium Geo-Information Division) and Ministry of Environment to develop a system that uses satellite radar data to deliver annual maps of tropical forest degradation.[12] Finally, in 2015, Gabon's National Agency for National Parks (ANPN) initiated capacity building and trainings related to the BIOPAMA initiative (regional collection, management, and analysis of protected areas data).[7] The aim was to initiate data collection in mid-2015 so that protected areas in Gabon could be assessed as part of a broader, regional effort.[7] A few examples of data resources are listed in Table 7.

Table 7: Data availability from different sources. This is not a comprehensive list and is simply illustrative of the kinds of data that may be available.

Type of Data	Data Source
Land cover	
Forest cover	Food and Agriculture Organization
Forest cover	Government (for 1990, 2000, and 2010)[8]
Cropland	Food and Agriculture Organization
Forest Atlas (spatial)	World Resources Institute[13]
Satellite image monitoring of rainforests	With help from Brazil and France[5]
Land Use/Environmental Assessments	
Natural resource concessions (spatial data)	World Bank[14]
Protected areas (spatial data)	World Bank[14]
Water	
Freshwater Atlas	The Nature Conservancy[15]

Statistical capacity

The Directorate of National Accounts of the Directorate General of Statistics and Economic Studies (DGSEE) produces and disseminates Gabon's national accounts.[16] In 2002, the DGSEE used the 1968 System of National Accounts (SNA) reporting methodology for accounts which were published 24 months after the end of the year.[16] "Rapid Accounts" have been created and are designed to help provide prior-year GDP estimates of value use concepts based on the 1993 SNA.[16] The DGSEE website indicates that national accounts have been published from 2001-2005 with rapid accounts published from 2006-2008 and in 2010.[17] The International Monetary Fund has a comprehensive review of the methods used by Gabon in the development of their national accounts.[16]

In the early 1990's, the World Bank financed the Technical Assistance Project which, among other things, trained 55 individuals at the Institute of Economics and Finance in computer technology.[14] The overall goal of this project was to strengthen key ministries in economic management, though not all project goals were achieved.[14]

Relevant Actors

Government

There are several government institutions that have experience in fields relevant to this scoping effort (Table 8).

Civil Society

Wildlife Conservation Society (WCS): WCS is working in Gabon on marine conservation issues.[7]

Bilateral/Multilateral Institutions

Forest Carbon Partnership Facility: The Forest Carbon Partnership Facility is a partnership of donors and developing countries committed to reducing greenhouse gas emissions from deforestation and forest degradation, as well as forest stock conservation, sustainable forest management, and the enhancement of forest stock (REDD+). The partnership will pilot performance-based incentive payments for forest conservation.[4]

United Nations Environment Programme (UNEP): UNEP is working with Gabon (and also with Kenya and Morocco) to embark on a new program aimed at creating forest accounts based on the SEEA.[4,15] This project started in December 2011 and is scheduled to end in December 2015.[15] The aim of the project is to understand the economic costs of the loss of natural resources and ecosystem degradation as well as the economic benefit linked to the sustainable use and protection of these assets and related services.[15]

The World Bank: The World Bank has funded many environmental programs in Gabon with sub-national and national impacts (e.g. Capacity Building on Environmental Management;

Table 8: Government ministries/agencies that appeared to have had roles in the past related to ecosystem valuation and natural capital accounting.

Ministry	Notes
Environment	
Ministry of Environment (MoE)	Created in 2005 to ensure that future economic development was compatible with environmental preservation.[4]
Climate Change Council	Aims to develop the strategic direction of the national policy on climate change, resulting in the formation of a national climate plan.[5]
Forests/Monitoring	
Ministry of Water and Forests	Advocates for the sustainable development and conservation of Gabon's forests via the Forest Code.[4]
Gabonese Agency for Space Studies and Observations (AGEOS)	Established in 2010 to develop national forest monitoring capabilities. The agency collects, analyses, and provides satellite data to support sustainable management of the environment, natural resources, land use, and land use planning initiatives.[4]
Planning	
Ministry of Economy, Employment and Sustainable Development	Has participated in events concerning natural capital accounting.[4,18]
Statistics/Finance	
Directorate General of Statistics and Economic Studies (DGSEE)	Responsible for national statistics.
Wildlife	
National Agency for National Parks (ANPN)	Manages Gabon's national park system. Is a partner in the BIOPAMA Observatory for Protected Areas and Biodiversity in West and Central Africa (collection, management, and analysis of protected areas data at a regional level together with other institutions in different countries).[19]

Sustainable Management of Critical Wetlands Ecosystems, P143914). In 2005, the Bank gave Gabon a loan to undertake an environmental and social assessment for natural resource management through the Forest, Fisheries, Biodiversity, and Environment Sector Program (FESP).[4] Of note, the Sustainable Management of Critical Wetlands Ecosystems project involves the valuation of ecosystem services at select sites (sub-national assessments).[20] In addition, the Natural Resources Management Development Policy Operation (finished in 2011) mapped the location of various natural resource concessions.[14]

Ecosystem valuation, natural capital accounting, and ecosystem accounting

Gabon has shown high-level interest in natural capital accounting and using economic instruments in sustainable development. First, in 2012, speaking at an event at the Rio+20 Conference on Sustainable Development, President Ali Bongo Ondimba was quoted as remarking that, "accounting for all aspects of sustainable development, including natural capital, is crucial to our efforts to construct a sustainable future for humanity."[21] During the same year, it

was noted that the government would be developing Sustainable Development Credits, Biodiversity Credits, and Community Capital Credits. These credit systems would be similar to those in Australia and Wales and would be valued and traded on the National Registry and Exchange in Libreville.[4] Also in 2012, Gabon signed the the 50/50 Campaign, a World Bank initiative to get 50 companies and 50 countries to publicly commit to support natural capital accounting. At a conference in Washington, President Ondimba reiterated several challenges for natural resource accounting in Gabon, highlighting the challenges of inter-generational equity and mechanisms for compensating those with natural capital.[4]

In 2013, Gabon participated in high-level discussions about natural capital accounting alongside several other countries and the World Bank.[18] Reports on this meeting noted that Gabon was interested in understanding (and was in the process of scoping) the logistics required to compile forest accounts so that the government could capture the full set of values flowing from its forest into its economy.[18] The report, quoting the Ministry of Economy, Employment and Sustainable Development, noted that the "national environmental accounts and a new indicator for sustainable development…will combine human development and ecological footprint indicators."[18] Also in 2013, the World Bank WAVES program indicated in its annual report that it was "also in discussions with…Gabon about mainstreaming NCA into upcoming World Bank operations for technical assistance there."[22]

Starting in 2011, UNEP began working with Gabon (and also with Kenya and Morocco) on a new program aimed at creating forest accounts based on the SEEA.[4,15] This project started in December 2011 and is scheduled to end in December 2015.[15] The aim of the project is to understand the economic costs of the loss of natural resources and ecosystem degradation as well as the economic benefit linked to the sustainable use and protection of these assets and related services.[15]

Starting in 2014 the World Bank began its program on the sustainable management of critical wetlands ecosystems.[20] Among other things, this project (which runs until 2020) will undertake sub-national valuation assessments of ecosystem services associated with wetlands.[20]

Past and current efforts relevant to this scoping are detailed, below.

Ecosystem Valuation

Sub-National efforts:

World Bank valuation of wetlands: The World Bank will be undertaking valuation assessments of ecosystem services for an ongoing program on the sustainable management of critical wetland ecosystems.[20]

Natural Capital Accounting

National efforts:

Forest Accounts: In 2013, the government indicated that they were beginning to scope the logistics needed to compile forest accounts.[18] This work is being done with the help of UNEP and will be based on the SEEA approach.[4] The objectives of this project is to demonstrate how key economic sectors

are dependent on forests and forest-related ecosystem services and the contribution of these services to the real economy via "hybrid physical and monetary resource accounts".[15] This project will endeavor to augment the SEEA with dynamic models that link computable general equilibrium models with general ecosystem equilibrium models.[15]

Priorities within the country

Gabon is a country that is trying to diversify its economy (given its strong reliance on oil) while simultaneously balancing economic development with conservation. The government hopes to achieve double-digit growth by 2016 through the exploration of newer industries like mining, forestry, hydrocarbon, tourism and agro-industrial.[4]

This desire to become stronger – both economically and in terms of the environment – is seen the Emerging Gabon plan (with its three pillars: Green Gabon, Industry Gabon, and Services Gabon). It is also clear, however, that income equity remains a challenge and must be addressed over the coming years. Balancing sustained economic development with conservation remains a challenge that requires both institutional and local conservation efforts.[7]

Gabon has expressed interest in NCA initiatives. In 2013, Gabon was clear on its desire to develop environmental accounts as well as new indicators for sustainable development (as part of a post-2015 landscape including SDGs).[18] In addition, Gabon has signed the communiqué for natural capital accounting (related to Rio+20).[23] Finally, Gabon is currently working with UNEP on forest accounts.

The 2015 GDSA Roadshow did not visit Gabon. It is therefore not possible to ascertain the government's priorities related to NCA beyond the information discovered during the desktop review.

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GHANA

The Republic of Ghana, the first sub-Saharan country in colonial Africa to gain independence, has historically had a strong economy although there has been a decline in recent years.[1] Ghana is taking steps to avoid an economic crisis, in part with assistance from the International Monetary Fund (IMF).[1] Ghana's 2014 Gross Domestic Product (GDP) is estimated to have been USD$108.3 billion and the 2014 GDP per-capita (PPP) was USD$4,100.[1] Real GDP growth was 4.2% in 2014, down from 7.3% in 2013 and 8% in 2012.[1] In 2014, contributors to Ghana's GDP were agriculture (22%), industry (28.4%), and services (49.6%); 45% of the labor force is involved in agriculture, 14% is involved in industry, and 41% is involved in services.[1] Ghana has a growing oil industry though decreases in oil prices reduced the anticipated oil revenue in 2015 by half.[1] Important agricultural products include cocoa, rice, cassava, peanuts, corn, shea nuts, bananas, and timber.[1] Approximately 26.3 million people live in Ghana, 46% of the population lives in rural areas, and 24% of the population was below the poverty line in 2013.[1] The contribution of selected environmental assets to the country's total wealth was estimated as 13% in 2006.[2]

Ecosystem extent and condition

Ghana's area covers a total of 238,533 km^2 and the country has 539 kilometers of coastline.[1] In 2011, land uses included agricultural land (69.1%), forest (21.1%), and other uses (9.7%).[1] Ghana's important ecosystems include forests, mangroves, and savannahs.[3] Ghana's terrain is composed mostly of low plains with a dissected plateau in the south-central region of the country.[1]

Acronyms

CEA: Country Environmental Analysis
CI: Conservation International
CREMA: Community Resource Management Areas
DANIDA: Danish Ministry of Foreign Affairs
ENRAC: Environmental and Natural Resources Advisory Council
FCPF: Forest Carbon Partnership Facility
FIP: Forest Investment Program
GDP: Gross Domestic Product
GDSA: Gaborone Declaration for Sustainability in Africa
GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit
GNI: Gross National Income
GSGDA: Ghana Shared Growth and Development Agenda
IUCN: International Union for Conservation of Nature
MEST: Ministry of Environment, Science, and Technology
NBSAP: National Biodiversity Strategies and Action Plans
NCA: Natural Capital Accounting
NCCAS: National Climate Change Adaptation Strategy
NCCC: National Climate Change Committee
NCDPF: National Climate Change Policy Framework
NDPC: National Development Planning Commission
NEP: National Environmental Policy
REDD+: Reducing Emissions from Deforestation and Forest Degradation
R-PP: Readiness Preparation Proposal
SCP: National Program on Sustainable Consumption and Production
SEA: Strategic Environment Assessments
SEEA: System of Environmental-Economic Accounting
SNA: System of National Accounts
UNEP: United Nations Environment Program
UN-REDD: United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation.
USAID: United States Agency for International Development
WAVES: Wealth Accounting and the Valuation of Ecosystem Services

Ghana is home to Lake Volta, which is the world's largest artificial lake (it is a manmade reservoir).[1]

Ecosystem services and natural resources

Ghana's natural resources include gold, timber, diamonds, bauxite, manganese, fish, rubber, hydropower, petroleum, silver, salt, limestone, and its wildlife (fauna and flora).[1] Key natural capital resources are land, crude oil, minerals, water, energy, soil, timber, and aquatic resources.[4] In 2015, hydroelectric plants provided 54% of the electricity produced in-country.[1] The forestry sector accounts for 6% of the GDP while fisheries account for an additional 5% of GDP.[5]

Threats to ecosystem services and natural resources

Ghana's natural hazards include dry, dusty, northeastern harmattan winds as well as droughts.[1] Environmental issues include recurrent drought in the north (which severely affects agricultural activities), deforestation, overgrazing, soil erosion, poaching, and water pollution.[1] Degradation is caused by pollution, bush burning, over-harvesting, and misapplication of chemicals.[3] Economic losses from soil erosion amount to 4-5% of the agricultural GDP per year.[6] Ghana is vulnerable to climate change; high temperatures and variability in rainfall have already been recorded.[5]

Policy

Ghana adopted a new constitution in 1993 with amendments made in 1996.[1] The country has 10 administrative regions.[1] Ghana is party to several international environment agreements (Appendix A). Specific national policies relevant to this scoping study are discussed in more detail, below.

National policies/programs:

Community Resource Management Areas (CREMA): A community-based program that aims to improve the natural resource management capacity of fringe communities in off-reserve wildlife conservation.[3]

Ghana Shared Growth and Development Agenda (2010-2013, GSGDA): Authored by the National Development Planning Commission (NDPC), this planning agency advises the President on development policy and strategy.[5] This strategy addresses the linkages between the environment and poverty as well as the promotion of science, technology, maintenance of the quality of the environment, and integration of environmental concerns into development policies.[3]

National Climate Change Adaptation Strategy (2014, NCCAS): This was/is developed with assistance from the United Nations Environment Programme (UNEP) and Danish Ministry of Foreign Affairs (DANIDA).[7] The NCCAS is a comprehensive document that provides clearly defined mechanisms for enhancing Ghana's capacity, in terms of the infrastructure and knowledge required to deal with the impact of climate change and to reduce vulnerability in key sectors, ecosystems, and regions of the country.[7]

National Environmental Policy (NEP, 2014): Launched in 2014, the NEP presents a road map for addressing major environmental threats that jeopardize the

natural and common resources base of Ghana. The NEP validates the Strategic Environmental Assessment (SEA) process as a tool for mainstreaming environment into all government policies, programs, and projects.[8] NEP is also relevant to Reducing Emissions from Deforestation and Forest Degradation (REDD+) programming as it promotes the use of incentives (in addition to regulatory measures) for the sustainable management of natural resources.[9]

National Forest Plantation Development Program: This program was launched in 2001 to recover degraded forest areas and to improve employment opportunities and environmental quality, while increasing timber supply to the national market.[7]

National Program on Sustainable Consumption and Production for Ghana (2011-2016): UNEP is partnering with the government on the National Program on Sustainable Consumption and Production (SCP). The SCP is an implementation strategy designed to achieve sustainable development and involves economy, society and environment, and aims to foster technological and social innovation.[7]

REDD+ Programs in Ghana: Ghana is currently in the readiness phase for REDD+, with ongoing work on REDD+ since 2008. Ghana has developed a National REDD+ Strategy and is in the Implementation Phase of the Readiness Preparation Proposal (R-PP) as a participant country of the Forest Carbon Partnership Facility (FCPF). Ghana is a pilot country for the Forest Investment Program (FIP) and has developed an investment plan related to this effort. While Ghana does not receive direct support from UN-REDD for its national program, it has been a partner country to that program since 2011. As of 2013, there were a number of REDD+ initiatives and carbon programs being implemented in Ghana, including seven REDD+ pilot schemes. These were being coordinated by the Climate Change Unite of the Forestry Commission as well as the REDD+ Secretariat of the National REDD+ Technical Working Group.[10]

Data Availability and Monitoring

There do appear to be some hurdles related to data availability and the existence of adequate monitoring systems in Ghana. First, at the national level, a lack of reliable information has been cited as a major hurdle facing natural capital accounting work in Ghana.[4] Second, the lack of information and lack of ability to use cost-benefit analyses have been cited as obstacles to the NBSAP.[3] Third, in 2012, researchers from the University Ghana noted that the lack of accurate information, up-to-date data, and information gaps are a major hindrance to plant/biodiversity conservation and sustainable use in Ghana.[11] These researchers then outlined the steps which were taken to create a national biodiversity information network starting in 2009 (funded in part by JRS Biodiversity Foundation).[11]

Table 9: Data availability from different sources. This is not a comprehensive list and is simply illustrative of the kinds of data that may be available.

Type of Data	Data Source
Biodiversity	
Georeferenced biodiversity data	Ghana Biodiversity Information Facility[14]
Land Cover	
Cocoa farms	Bioversity International[15]
Natural Resources	
Global Forest Resources Country Report	Ghanaian government[5]
Fisheries	
Oceanographic metadata	Ghana National Oceanographic Data Centre[16]

In an attempt to increase data availability and data sharing, the World Bank is currently undertaking a project (P144140 ending in 2019) to increase the number of datasets that are available on the government data website from 1324 (in 2014) to 5000.[12] A separate World Bank program aims to establish an electronic dashboard of key environmental, social, and economic fisheries statistics which will be publicly accessible.[13] A few national data resources are listed in Table 9.

Statistical capacity

The Ghana Statistical Service is responsible for reporting economic statistics in the country. In 2005, the Ghana Statistical Service used the 1968 System of National Accounts (SNA) reporting methodology though there were plans to adopt the 1993 SNA.[17] The International Monetary Fund has a comprehensive review of the methods used by Ghana in the development of their national accounts.[17]

In regards to statistical capacity, the World Bank is currently undertaking the Ghana Statistics Development Project (P118858 ending in August 2016).[18] The program's development objective is to "strengthen the national statistical system in the production and dissemination of timely and robust statistics relevant for evidence-based policy-making and other uses."[18] The project is currently rated as satisfactory and has helped initiate various survey initiatives related to the production of new national data.[18] Specific goals of the project are to have economic statistics produced in accordance with internationally accepted standards and to produce supply and use tables.[18]

Relevant Actors

Government

There are several government institutions that have experience in fields relevant to this scoping effort (Table 10).

Civil Society

National Climate Change Committee (NCCC): This panel of experts was formed to advise MEST on climate policy related issues and consists of representatives from a broad range of government and non-governmental entities.[5] In 2010, NCCC was given the mandate to develop the National Climate Change Policy Framework (NCDPF).[5]

University of Ghana: The Department of Agricultural Economics and Agribusiness collaborated on a study on the cost implications of agricultural land degradation in Ghana. The study was funded by United States Agency for International Development (USAID).[20]

Table 10: Government ministries/agencies that appeared to have had roles in the past related to ecosystem valuation and natural capital accounting.

Ministry	Notes
Environment	
Ministry of Lands and Natural Resources	Manages the forestry, wildlife, land, and mining policies.[4] These policies incorporate natural capital information into decision-making (but not through natural capital accounts).[4]
Ministry of Environment, Science, and Technology (MEST)	Reconstituted in 2008 to better coordinate climate change activities across the government.[5] Works with the UNEP on its green economy initiatives.[19]
Inter-ministerial Committee on Green Economy	Spear-headed a national assessment of key opportunities and challenges for moving towards a green economy in Ghana (with UNEP).[19]
Environmental and Natural Resources Advisory Council (ENRAC)	A high-level body that advises the parliament on environmental and natural resource issues.[7]
Statistics/Finance	
Ghana Statistical Service	Is collecting, managing, and processing information in regards to natural capital.[4] Responsible for calculating national statistics.
Ministry of Finance and Economic Planning	Has been tasked with seeking, coordinating, and managing climate-related finance flows.[5]

Bilateral/Multilateral Institutions

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): GIZ has funded several environmental or governance projects in Ghana including: green economy initiatives (employment for sustainable development in Africa);[21] adaptation of agro-ecosystems to climate change;[22] and good financial governance.[23]

UNEP: UNEP is collaborating with the government on several green economy studies/initiatives (e.g. Green Economy Assessment; Green Economy Advisory Services).[5,7,19] With support from UNEP, the Government of Ghana aims to: 1) identify and invest in key sectors for transition towards a green economy; 2) develop a coherent national framework to guide the transition to a green economy; and 3) create awareness on a green economy.[24]

The World Bank: Although Ghana is not a partner country on the World Bank Wealth Accounting and the Valuation of Ecosystem Services (WAVES) program, it was noted in 2013 that natural capital accounting (NCA) is being mainstreamed into upcoming World Bank operations for technical assistance in Ghana.[24] This will be done by linking NCA programs to existing programs on statistical capacity building as well as green growth development policy loans.[24] In 2006, the World Bank funded the Country Environmental Analysis

(CEA) which helped ascertain the state of natural resources in Ghana.[5] From 2008 to 2011, USD$40 million were disbursed as part of a World Bank program in order to, in part, ensure predictable and sustainable financing for the forest and wildlife sectors and mainstream environment into economic growth.[25]

Ecosystem valuation, natural capital accounting, and ecosystem accounting

In a 2014 report summarizing progress on natural capital accounting in different countries across the world, it was noted that Ghana was currently training and building local capacity for establishing natural capital accounts (but that no accounts existed at that time).[4] However, natural capital information was being used in decision-making by the government in forestry and wildlife policy as well as mining and land policy.[4] The report further noted that the focus of future accounts would be on: land, crude oil, minerals, water, energy, soil, timber, and aquatic resources.[4] This report, citing government officials, indicated that Ghana was collaborating with the United Nations Statistics Division and the World Bank WAVES program on capacity building for natural capital accounting.[4] This capacity building is being developed in line with the United Nations System of Environmental-Economic Accounting (UN-SEEA) framework and it was noted that the collection, management, and processing of information for this undertaking is being handled by the Ghana Statistical Service.[4] The accounting system being developed will help track the use and management of their mineral and energy resources.[4,24]

Regarding the relationship between Ghana and the World Bank WAVES program, Ghana is not a partner country on the WAVES program. However, in 2013, it was noted that NCA is being mainstreamed into upcoming World Bank operations for technical assistance in Ghana.[24] This will be done by linking NCA programs to existing programs on statistical capacity building as well as green growth development policy loans.[24] In January 2015, Ghana's Public Procurement Authority noted that the Ministry of Environment, Science, and Technology had received financing from the World Bank towards the cost of the Natural Resources and Environment Governance Technical Assistance Program (the money was being used to hire a consultant).[25] While it is not clear what this consultant will be doing for the government, the hiring criteria for the consultant included knowledge of the SEEA framework, knowledge of the SNA, and experience in environmental economics.[25]

The main challenges in Ghana concerning natural capital accounting have been the absence of reliable information, lack of legislation, and limited capacity/skills in key areas.[4] In addition, there is limited sharing of natural capital information among different government entities.[4]

Ghana is a supporter of the Rio+20 Communiqué on Natural Capital Accounting.[4] The 2015 Pan-African Business and Biodiversity Forum (which had a strong emphasis on natural capital accounting) was held in Ghana. Past and current efforts relevant to this scoping are detailed, below.

Ecosystem Valuation

National efforts:

The Impact of Deforestation on Ghana's National Savings Rate: In a joint study undertaken by the International Union for Conservation of Nature (IUCN) and the World Bank, Ghana was used as a case study to show the impact of deforestation on Ghana's national savings rate.[26] This study indicated that the saving rate was 6% of Gross National Income (GNI).[26] This does not appear to have been an exercise undertaken together with the government of Ghana.

Sub-national efforts:

There have been several academic sub-national attempts at valuing both ecosystem services and the environment in Ghana (e.g. the economic value of urban forests, as undertaken by the Forestry Research Institute of Ghana).[27]

Natural Capital Accounting

National efforts:

Forest Accounts: In 2014, Ghana was one of eight countries that participated in an initiative called the Forest Investment Program through which the country is conducting forest accounting.[5] The country aims to mainstream forest accounting into its development planning process.[5]

Priorities within the country

During the 2015 Gaborone Declaration for Sustainability in Africa (GDSA) Roadshow, the Government of Ghana indicated an interest in SEEA Central Framework accounting, including forestry, energy, and mineral accounts (though it was noted that the government had not decided on their most immediate priority).

More broadly, Ghana is a country trying to simultaneously diversify its GDP, increase its Real GDP growth rate, and lift its people out of poverty. Ghana plans to attain middle-income status by 2020, with a per-capita income of at least USD$3000.[5,8] Like many of the GDSA signatory countries, Ghana is keen on protecting the environment; this interest is reflected in the Medium-Term National Development Policy Framework as well as the Ghana Shared Growth and Development Agenda (2010-2013).[7] However, there are a lack of financial resources for biodiversity-related activities including climate-related conventions.[3] It is therefore unclear if Ghana has the financial resources to undertake sustained NCA work. A review of the governance landscape of Ghana can be found in Appendix (B).

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KENYA

The Republic of Kenya is the economic and transport hub of East Africa and is part of the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA). Kenya's 2014 Gross Domestic Product (GDP) is estimated to have been USD$62.72 billion and the 2014 GDP per-capita (PPP) was USD$3,100.[1] Real GDP growth is approximately 5%.[1] In 2013, the contributors to Kenya's GDP were agriculture (29.3%), industry (17.7%), and services (53%). In terms of employment, 75% of the labor force is involved in agriculture while 25% is in industry and services.[1] Important agricultural products include tea, coffee, wheat, and sugarcane.[1] Approximately 45 million people live in Kenya, 75% of the population lives in rural areas, and 43.4% of the population was below the poverty line in 2012.[1] Much of the rural population depend on natural resources for their livelihoods.[2] The contribution of selected environmental assets to the country's total wealth was estimated as 21% in Kenya in 2006.[3]

Ecosystem extent and condition

Kenya's area covers a total of 580,367 km^2 and the country has 536 kilometers of coastline.[1] In 2011, land uses included agricultural land (48.1%), forest (6.1%), and other uses (45.8%).[1] Kenya's important ecosystems include: lowland and mountain forests, dry woodlands, freshwater, wetlands, coastal and marine areas, arid and semi-arid lands (ASALs), and wooded and open grasslands.[2,4,5]

Acronyms

ASAL: Arid and Semi-Arid Lands
CBD: Convention on Biological Diversity
COMESA: Common Market for Eastern and Southern Africa
CPPMUs: Central Planning and Project Monitoring Units
DAMER: District Annual Monitoring and Evaluation Reports
DANIDA: Danish Ministry of Foreign Affairs
DFID: Department of International Development (UK)
DRSRS: Department of Resource Surveys and Remote Sensing
EAC: East African Community
EIA: Environmental Impact Assessment
EMCA: Environmental Management and Coordination Act
ERS: Economy Recovery Strategy for Wealth and Employment Creation
FAO: Food and Agriculture Organization of the United Nations
GDP: Gross Domestic Product
GHG Emissions:
GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit
KCCWG: Kenya Climate Change Working Group
KEFRI: Kenya Forestry Research Institute
KFS: Kenya Forest Service
KMFRI: Kenya Marine and Fisheries Institute
KNBS: Kenya National Bureau of Statistics
KWS: Kenya Wildlife Service
M&E: Monitoring and Evaluation
MDGs: Millennium Development Goals
MEMR: Ministry of Environment and Mineral Resources
MENR: Ministry of Environment and Natural Resources
MFW: Ministry of Forestry and Wildlife
MMMB: Miti Mingi Maisha Bora Program
MOA: Ministry of Agriculture (now the Ministry of Agriculture, Livestock, and Fisheries)
MoPND & V2030: Ministry of State for Planning, National Development, and Vision 2030
NCA: Natural Capital Accounting
NEC: National Environment Council
NEMA: National Environment Management Authority
NGOs: Non-Governmental Organizations
NIMES: National Integrated Monitoring and Evaluation System
NMK: National Museums of Kenya
NRA: Natural Resource Accounting
PEI: Poverty Environment Initiative
PES: Payments for Ecosystem Services
SEA: Strategic Environment Assessments
SNA: System of National Accounts
SoE: State of the Environment
TEEB: The Economics of Ecosystems and Biodiversity
UNDP: United Nations Development Program
UNDAF: United Nations Development Assistance Framework
UNEP: United Nations Environment Program
VANTAGE: Valuation and Accounting of Natural Capital for Green Economy
WRI: World Resources Institute
WRMA: Water Resource Management Authority
WWF: World Wide Fund for Nature

Ecosystem services and natural resources

Kenya's important natural resources include its limestone, soda ash, salt, gemstones, fluorspar, zinc, diatomite, gypsum, wildlife (fauna and flora), and hydropower.[1] Forest ecosystems are important as they contain the country's five major water towers (Mount Kenya, Mount Elgon, Aberdare Range, Mau Escarpment, and Cherangani Hills)[6] and are important for food, medicine, word for construction, and animal biodiversity.[5] Mountain ecosystems are important for their high biodiversity and as a source of water.[2] ASALs constitute 80% of Kenya's land area, support 30% of the population, and 60% of the total livestock population. Wetlands contribute agriculture, livestock production, hydroelectric power, fisheries, and tourism.[5] Management of resources has faced challenges including uncoordinated development approaches, low investment, weak linkages between research and management, and cross-border conflicts.[2]

In 2007, wildlife accounted for 70% of the gross tourism earnings, 25% of the GDP, and more than 10% of total formal sector employment.[2] Fisheries contribute to 3% of the GDP and over 860,000 people depend on fisheries directly and indirectly for their livelihoods.[2] Forests in Kenya are undervalued by approximately 2.5%, which corresponds to an annual GDP contribution of around 3.6%.[6] Kenya's Vision 2030 recognizes the economic importance of the environmental sector by attributing ~42% of the GDP to natural resource-based sectors of agriculture, forestry, tourism, mining, water and energy.[2]

Threats to ecosystem services and natural resources

Kenya's natural hazards include recurring drought, flooding during rainy seasons, and some volcanic activity (though the last eruption was in 1921).[1] Kenya is a water scarce country.[2] Environmental issues include water pollution (urban and industrial waters), degradation of water quality (due to pesticides and fertilizers), deforestation, soil erosion, desertification, poaching of wildlife,[1] climate change, population growth, mining and oil/gas exploration.[2,5] Poor land use practices and inadequate laws, policies, and institutional frameworks have been the root cause for some of this degradation.[5,7] In 2010, deforestation stripped Kenya's economy of USD$68 million, which surpassed the economic gains derived from forestry and logging. The environment is under immense pressure from an increasing population and natural resource alterations associated with the development process.[2] Kenya has been and will be impacted by climate change; the National Climate Change Action Plan noted that the frequency of droughts, floods, and other extreme climate events have increased in recent years.

Policy

Kenya adopted a new constitution in a national referendum in 2010, which created new checks and balances to executive power and provided additional power and resources to the country's 47 counties.[1] The constitution has provisions on sustainable environment and natural resource management and ministries are aligning their regional offices to this new constitution.[9] A

review of the implications of the new constitution on environmental management in Kenya has been written.[8] The government used to be composed of 43 ministries through it was restructured in April 2013 into 18 ministries; each ministry has several departments that undertake specific functions.[2]

Kenya is party to several international environment agreements (Appendix A), and also participated/s in: 2002 Johannesburg World Summit on Sustainable Development (WSSD);[2] the Nile Cooperative Framework Agreement (which aims for equitable and sustainable use of the Nile River water resources);[6] African Pollinator Initiative;[4] Lake Victoria Environmental Management Program;[4] the Convention on Biological Diversity[5] (CBD; Kenya's National Biodiversity Strategy and Action Plan is being worked on by the government to meet the goals of this convention).[7] At the national level, environmental legislation is contained within a variety of sectoral laws; many of these have not been amended to conform to the EMCA (see below).[2] Specific policies relevant to this scoping study are discussed in more detail, below.

National policies/programs:

ASAL Policy (2014): Policy designed to address investment and management of ASAL areas.[7]

Economic Recovery Strategy for Wealth and Employment Creation (2003-2007; ERS): Policy that recognized the need to achieve broad macro and sectoral objectives without compromising the environment.[2]

Education for Sustainable Development (Sessional Paper No 11 of 2014): Linking the Ministry of Education with the Ministry of Environment so as to deliver key messages on the environmental management processes.[7]

Environmental Management and Coordination Act (EMCA), No. 8 of 1999: EMCA is a framework law that enables the implementation of national environment policy by providing for effective coordination and regulation of all actions directed at, or likely to influence, the environment.[2] The act makes it mandatory to conduct an environmental impact assessment (EIA) before the implementation of a new project. The EMCA mandates the National Environment Management Authority (NEMA) to prepare annual State of the Environment (SoE) reports for submission to the National Assembly. The most recent of these reports (the 2010 edition) was produced in partnership by NEMA and the Ministry of Environment and Mineral Resources (MEMR). The SoE report is seen as an important tool for documenting timely, accurate, and pertinent information relating to Kenya's environment. Technical support for the compilation of the report was provided by the United Nations Environment Programme (UNEP), thus suggesting that the report is aligned with UNEP evaluation processes.[6] The act has been reviewed in recent years by the government to ensure relevance.[7]

Forest Act (2005): Enacted in 2007; addresses protection, management, enforcement, and utilization of forests and forest resources on government land.[5,9]

Forest Master Plan (1995-2020): Contains implementation strategies that

target the conservation of indigenous forests and their biodiversity.[5]

Integrated Coastal Zone Management Policy (Sessional Paper No. 13 of 2014): This policy provides for the strong management of marine coastal areas under NEMA and also under the Nairobi Convention.[7] The government has implemented a framework for the integration of these policies.[2]

Kenya Poverty Environment Initiative (PEI): This program supports the integration of environment into development policy, planning, and the budgeting process. Lead by the Ministry of State for Planning, National Development, and Vision 2030 (MoPND & V2030) together with the Ministry of Environment and Mineral Resources (MEMR) and the National Environment Management Authority (NEMA). Outputs from the PEI project include a set of poverty and environment indicators linking poverty and environment at the national and sub-national levels. Indicators will be measured at the national and sub-national level, as detailed by NIMES (see Data Availability and Monitoring).[2]

Kenya Vision 2030: Launched in June 2008, the Kenya Vision 2030 aims for "a nation living in a clean, secure, and sustainable environment". The vision's aim is summarized by the following goals: conservation of strategic natural resources; pollution and waste management; management arid and semi-arid areas and high-risk disaster zones; and environmental planning and governance. The Kenya Vision 2030 was not subjected to a Strategic Environment Assessment (SEA). See NIMES (see Data Availability and Monitoring) for information about indicators used to measure the Vision 2030.[2]

The Vision 2030 is implemented through five-year medium-term rolling plans; the first Medium-Term Plan covered the 2008-2012 period. Vision 2030 planned the following flagship activities/programs for the 2008-2012 period to help achieve its goals: rehabilitation and protection of indigenous forests in the five water towers; secure wildlife corridors and migratory routes; preparation of the national spatial land-use master plan; waste management systems; rehabilitation, regeneration, and restoration of the Nairobi rivers; water resources information management; water harvesting and storage program; urban sewage program; water storage and harvesting; national water supply and sanitation; water resource information management; irrigation and drainage; compensation for environmental services program; geological mapping; linkages with institutes of higher learning; and policy, legal and institutional reforms. The Second Medium Term Plan (2013-2017) is currently in place and has incorporated green economy principles.[10]

National Climate Change Response Strategy: Authored by MEMR.[6] Kenya was one of the first countries to author such a strategy, which was followed by a *National Climate Change Action Plan*.[7]

National Environment Policy (2008; Sessional Paper No. 10 of 2014): Developed by the MEMR with assistance from the United Nations (UN) PEI program, the policy created an over-arching policy for the management and protection of the environment.[11] The policy covers the following key issues:

harmonization of sectoral policy instruments with EMCA; implementation of land policy; valuation of environmental and natural resources; rehabilitation of degraded areas; loss of biodiversity; concessions and incentives; urbanization and waste management; pollution; energy consumption; climate change and disaster management; conservation of shared natural resources; invasive and alien species; and public participation, environmental education, and awareness.

REDD+ Programs in Kenya: REDD+ readiness activities include a national strategy for implementation, a reference emission level and/or forest reference level, and a national forest monitoring system with measuring, reporting, and verification capability to assess the effect of the REDD strategy on greenhouse gas (GHG) emissions, livelihoods, and other benefits.[12] The country now has a National Carbon Investment and Trading Policy and has undertaken satellite imagery interpretation to establish baseline forest cover maps and forest cover change information.[12] These efforts are organized by the Kenya Forest Service (KFS) and the REDD+ National Coordination Office, with a national REDD+ Steering Committee providing overall policy guidance.[12,13] The National Carbon Accounting System and the Advanced Land Observing Satellite Initiative are other ongoing large scale initiatives to design and implement a system for estimating GHG emissions from land based sectors.[14]

Water Act 2002: This Act provided for the formation of a Water Resources Management Authority (responsible for water pollution, and the management of lakes, aquifers, and rivers) and the establishment of a Water Services Regulatory Board (responsible for water supply through licensed water services providers).[4]

Wildlife Act (2013): This Act has been implemented and was written to help Kenya manage its natural capital.[7]

Wetlands Conservation and Management Policy (Sessional Paper No. 12 of 2014): Kenya has developed a draft policy to domesticate the provisions of the Ramsar Convention. There are six Ramsar sites: Lakes Nakuru, Naivasha, Bogoria, Baringo, Elementaita, and the Tana Delta.[2] A Wetlands Atlas was produced as a result of this legislation.[7]

Sub-national policies/programs

Integrated Regional Master Plans: Created by the Ministry of Environment, Water, and Natural Resources to assist the six sub-national regions develop and manage their resources.[9] These plans form the basis on which the counties form their plans in terms of natural resource utilization; used to develop the Integrated County Development Plans.[7]

District Development Plans: Plans created at the sub-national level, which set out the programs and projects on a sectoral basis for achieving the stated development objectives at the district level.[2]

Data Availability and Monitoring

At the national level, statistics are available to satisfy monitoring and evaluation requirements for NIMES (see

below) and the Millennium Development Goals (MDGs). However, statistics are not usually available at the sub-national level. Notably, Kenya has not aligned its international reporting requirements to the United Nations on the MDGs. Many ministries have developed and use indicators (in addition to the 48 Vision 2030 indicators); most of these indicators are relevant in informing national level monitoring. It has been noted that an effort needs to be undertaken to document the information base at the ministerial level, and to analyze the extent to which it meets reporting requirements for the MDGs and proposed poverty-environment indicators.

In general, the various aspects of environmental monitoring (data collection, processing, management, and assessment) are inadequate.[5] First, there is a need to develop a working program for environmental monitoring[5] to coordinate environmental data collection and assessment and to ensure compatibility of data and reporting standards.[2] Environmental governance remains largely incoherent despite harmonization efforts.[10] Second, a 2011 report on forest governance indicated that there was a need to establish and implement policy/mechanisms for geo-referenced data and information sharing.[9] Third, a 2010 report prepared by the KFS for the Food and Agriculture Organization of the United Nations (FAO) indicated that the generation of reliable forest resources data in Kenya continued to be hampered by: 1) lack of standardized and harmonized data collection and management guidelines; 2) lack of a comprehensive natural resource database; 3) high cost of generating natural resource data; 4) weak institutional linkages; and 5) inadequate capacities (most institutions that were involved in natural resources data and information management had a limited capacity to collect, analyze, and store accurate scientific information on natural resources).[15] In some cases, non-governmental data can fill the gaps – at least temporarily – in government data. For example, it has been noted that biodiversity assessments have not been conducted in Kenya for two decades[5] but there are several comprehensive biodiversity-related datasets available from non-government sources (Table 11) and biodiversity management information systems are being created.[16]

A few national and sub-national data collection programs are listed, below, and examples of data resources are listed in Table 11.

National Integrated Monitoring and Evaluation System (NIMES):[2,6]

Established in 2004, the National Integrated Monitoring and Evaluation System (NIMES) is the Kenyan government's institutional framework for providing feedback on the effectiveness of implementation of the policies and programs set out in national policy documents. NIMES is a well-structured system and has two levels of reporting: 1) central reporting which brings together line ministries/bodies and stakeholders (including NGOs, faith-based organizations, and community-based organizations) to provide a reporting mechanism on the Vision 2030 programs and the Medium Term Plan 2008-2012; and 2) a devolved structure based on key public and NGOs at the local level.

The main purpose of NIMES is to: 1) build a Monitoring and Evaluation (M&E) system for reporting at both the central government and lower district

levels; 2) promote the practice of M&E at all levels of government and civil society; 3) provide timely and reliable feedback to the budgetary preparation process through the preparation of reports; 4) provide regular, timely, and reliable report on the effectiveness of government programs; and 5) ensure the active participation of civil society. Various actors report to this centralized M&E system at both the national and sub-national level; details of the monitoring and evaluation process can be found in government documentation.[2]

As part of NIMES' monitoring of Vision 2030 (and development of the Medium Term Plan 2008-2012), 48 performance indicators were monitored over a period of five years. Forty-eight outcome indicators have been developed for national level monitoring as part of this program including: macroeconomic stability and accelerating growth; infrastructure and amenities; road safety; enhancement of tourism, trade, and industry; child survival; health and burden of disease; basic education; employment creation and labor productivity; environmental management and universal environmental screening of projects; incidence of absolute poverty; access to justice; and public sector transparency and devolution of power. There are also 16 district/constituency level indicators and 30 gender reporting and monitoring indicators. The direct environmental indicators include forest areas protected by gazettement and the proportion of the public sector projects subjected to Environmental Impact Assessments.

Some of the weaknesses of NIMES include the fact that environmental issues can be site-specific and monitoring at the national level does not always capture local changes in natural resource utilization and management. In addition, it is not clear that the performance indicators are adequate for addressing poverty-environment linkages. Finally, the indicators do not always measure what they are supposed to; for example, the indicator on water captures access to safe water but does not address environmental issues like protection of catchment areas, sanitation issues, or efficiency of water use.

National government data sources:

Central Planning and Project Monitoring Units (CPPMUs): Located within different ministries, CPPMUs collect information from each section/department within its ministry. The resulting ministry reports are then sent to the Monitoring and Evaluation Directorate (MED) within the MoPND & V2030. The head of the Ministry's CCPMU is the designated Principal M&E Officer.[2]

Participatory Poverty Assessments: At least four participatory poverty assessments have been undertaking (the fourth occurred in 2005-2006). Environment is not included in the scope of the assessment per se, but other data regarding poverty, agriculture, water and sanitation, and public services are collected.[2]

State of the Environment Reports: Authored by NEMA and MEMR, most recently in 2010. Frequently updated.[6]

Integrated Natural Resources Assessment (INRA): Joint project between the FAO and the Government of Kenya initiated in 2006. The goal is to enhance ecosystem services through sustainable natural resource management

via a nation-wide assessment of natural resources.[6] Contains environmental assessments, though they are not frequently updated.[6]

Water Resource Information Management: Developed through Vision 2030 and the Kenya PEI. Run by the Ministry of State for Planning, National Development.[6]

Sub-national government data sources:

District Annual Monitoring and Evaluation Reports (DAMER): Compiled by District Development Officers and are combined so that they include information from several district offices; given to the MoPND & V2030. The DAMER covers the full range of activities and programs being undertaken in the district to promote development, including those undertaken by central government agencies, local public sector institutions, the private sector, NGOs, and the civil sector. It is prepared annually in June-August of each year.[2]

Statistical capacity

The Kenya National Bureau of Statistics (KNBS) is responsible for reporting economic statistics in the country.[9] KNBS uses the 1993 System of National Accounts (SNA) reporting methodology.[9]

In regards to statistical capacity, the World Bank with co-financing from the UK Department of International Development (DFID) completed a project (as part of the multi-country STATCAP program) that assisted Kenya in developing a national statistical system in 2012.[22] This project (concept review was developed in 2003, project was implemented from 2007 to 2012) was implemented with the Ministry of Planning and National Development and the KNBS. The objective of the project was to establish a sustainable national statistical system to provide reliable, timely, and accurate data in accordance with international standards through: strengthening capacity in relevant statistical agencies; institutional reforms; establishing linkages among statistical data producers; promoting statistical information sharing among data producers and users to strengthen the quality of decision making; and developing a data access and dissemination strategy that conforms with legislation and international good practice.[22]

During the World Bank project, specific indicators were used to assess the capabilities of the government in producing accounts; details can be found in the project report. Though many indicators were achieved, the project was rated as Moderately Unsatisfactory with a Substantial risk to development outcomes. This rating was given because although the project supported increased production of better quality and more timely data, there were many challenges faced by the project that reduced overall progress (e.g. public access to data is still limited to traditional hard copy dissemination and the capacity is needed communicating the utility of statistical indicators). It is anticipated that a second World Bank program (Kenya Statistics Program-For-Results, P149718) will be approved in September 2015.[23] This program will aim to help the KNBS by increasing its capacity, helping fill gaps in data needed for national statistics, and help in the dissemination of data. The priorities, strengths, and weaknesses of the KNBS are outlined in detail in the World Bank Information Document.[23]

*Table 11: Data availability from different sources. This is not a comprehensive list and is simply illustrative of the kinds of data that may be available. **

Type of Data	Data Source
Biodiversity	
Biodiversity	Kenya's Biodiversity Atlas (NMK)[6]
2015 Biodiversity Atlas	Government of Kenya[7]
Biodiversity data (spatial)	25,000 hectares of area have annually updated geo-referenced data[17]
Biodiversity & Wildlife (spatial)	World Resources Institute[17]
2012 Wetlands Atlas (spatial)	Government of Kenya[7]
Climate Change/Degradation	
Climate change databases	NEMA/KFS Annual Reports[2]
2009 Atlas of changing environment	1930 – 2009: Government of Kenya[7]
Fisheries	
Fisheries stocks	World Bank[16]
Land cover	
Land area covered by forests	KFS Annual Report[2]
Forest cover	Kenya Forestry Master Plan 1994[15]
Forest cover mapping in 2012	Kenyan Government supported by the Japanese Government for REDD+[12]
Land use/land cover maps (spatial)	DRSRS/NEMA/MOA[2] AFRICOVER[4]
Remote sensing of agriculture	1970-2000, unknown author[4]
Remote sensing of deforestation	DRSRS[18]
Agriculture (spatial)	World Resources Institute[17]
Land cover and land form (spatial)	World Resources Institute[17]
Land Use/Environmental Assessments	
Computerized land registry	MOL Annual Report[2]
National land use master plan	MOL Annual Report[2] MoPND & V2030[6]
Environmental Assessments	State of the Environment Reports
Natural Resources	
Natural Resources	Integrated Natural Resources Assessment (2006/7)[4]
Forest inventory	Canadian Government[4] (1963-1966) Kenyan Government (1990-1993)[4]
Land resources database	FAO (1991)[4]
Socio-economic/Administrative	
Poverty mapping (spatial)	World Resources Institute[7] PEI-Kenya[3]
Kenya Open Data website; household surveys; industrial production; agriculture	KNBS
Administrative (spatial)	World Resources Institute[17]
Soil/Geology	
Generalized soil map of Kenya	Kenya Soil Survey[4]
Geological mapping	MoPND & V2030[6]
Elevation (spatial)	World Resources Institute[17]
Tourism	
Tourism (spatial)	World Resources Institute[17]
Water/Hydrology	
Hydrological monitoring stations	World Bank[19,20]
Level of water pollutants	WRMA/NEMA Annual Reports[2]
Rainfall (spatial)	World Resources Institute[17]
Status of country's water resources	WRMA[21]
Water, irrigation, and hydropower	World Resources Institute[17]
Water volume in major rivers	WRMA Annual Report[2]
Water Resources Information	MoPND & V2030[6]

*It should be noted that some of the data sources refer to Ministries that were re-structured in 2013; a ground-truthing effort is needed to confirm which government entity is currently managing the data source.

*Table 12: Government ministries/agencies that appeared to have had roles in the past related to ecosystem valuation and natural capital accounting.**

Ministry	Notes
Agriculture	
Ministry of Agriculture, Livestock, and Fisheries (Previously the Ministry of Agriculture, MOA)	Responsible for monitoring and regulating water pollution; undertakes initiatives that link support of low-income communities with the environment.[2,6]
Environment	
Ministry of Environment and Mineral Resources (MEMR)	Responsible for policy direction on all matters relating to the environment (e.g. the National Environment Policy, National Climate Change Response Strategy, Green Economy Assessment Report).[2,6,10] Monitor/regulate air pollution. Co-author the State of the Environment report.[6] Undertook a Natural Resources Assessment (2006-2007) with FAO.[6] Houses the Climate Change Secretariat which funds relevant activities across the government such as NEMA, KWS, and the civil society led KCCWG.[6] Works on the UN PEI project.[11] Contains the Department of Resource Surveys and Remote Sensing (DRSRS).
National Environment Management Authority (NEMA)	National regulatory agency with decentralized entities at the provincial and district levels, established by EMCA (see policy section). Semi-autonomous. Implements environmental programs, which must all first undergo an environmental audit or environmental monitoring process (including monitoring) to prevent environmental degradation.[2,6] Co-author of the State of the Environment reports.[6]
National Environment Council (NEC)	Multi-sectoral national environmental policy making body established by EMCA (see policy section).[2]
Fisheries	
Kenya Marine and Fisheries Institute (KMFRI)	Is undertaking research on marine and coastal ecosystems to provide the necessary data for implementing conservation programs for the CBD.[5]
Forests	
Ministry of Forestry and Wildlife (MFW)*	Worked with the Miti Mingi Maisha Bora program.[9]
Kenya Forest Service (KFS)	Semi-autonomous; implementation of environmental programs and key manager of forest resources in Kenya.[2,9] Co-lead the development of the forest account.[24] Worked with the Miti Mingi Maisha Bora program.[9]
Kenya Forestry Research Institute (KEFRI)	Semi-autonomous; implementation of environmental programs.[2]
Planning	
Ministry of State for Planning, National Development, and Vision 2030 (MoPND & V2030)*	Coordinates the Kenya PEI and compiles Annual Progress Reports for Vision 2030 indicators, using data and information supplied by the KNBS. Contains the Monitoring and Evaluation Directorate, which collects M&E reports on a biannual basis from ministries at the national level.[2] Water resources information management.[6] Was

	funded for $50,000 by the UNDP as part of the PEI project to "conduct economic assessment of the links between environmental and natural resource management" in 2005/6.[25]
Ministry of Devolution and Planning	Ministry housed within the Presidency and focuses on devolution, planning, management and budget, and coordination of targeted policy priority areas and initiatives. The Economic Secretary of this Ministry spoke at the VANTAGE Conference in Kenya in 2013.
Statistics/Finance	
Kenya National Bureau of Statistics (KNBS)	Collects data and information for various government ministries.[2] Co-lead the development of the forest account.[24]
National Treasury (Formerly referred to as the Ministry of Finance)	Assisted in implementing the UNDP-UNEP PEI.
Water	
Kenya Water Towers Agency	Running a program valuation of all Kenyan water towers; starting with five major ones and working with the KWS and the KFS.[7]
Wildlife/Biodiversity	
Kenya Wildlife Service (KWS)	Semi-autonomous; implementation of environmental programs.[2] KWS has a department of ecological monitoring and biodiversity valuation.[11]
National Museums of Kenya (NMK)	Expertise in biodiversity, and have accumulated lots of reference collections (uses of the species; population trends) and expertise.[7] Researchers from NMK undertook a regional participatory environmental valuation.[26] Works on the UN PEI project.[11]

*Given that this was a desktop study, it was difficult to ascertain whether some ministries continue to exist following the 2013 restructuring. When there is uncertainty regarding the existence of a ministry, the ministry has been marked with an asterisk (*).

Relevant Actors

Government

There are several government institutions that have extensive experience in fields relevant to this scoping effort (Table 12).

Private Sector

National Water Conservation and Pipeline Corporation: Responsible for monitoring and regulating water and air pollution.[2]

Civil Society

Nairobi university: Responsible for monitoring and regulating water pollution.[2]

Moi university: Responsible for monitoring and regulating water pollution.[2] In addition, researchers from this institution were involved in an initiative to value annual wildlife viewing at Lake Nakuru National Park (USD$7.5-15 million).[27]

Kenyatta university: Researchers from

the university undertook a regional participatory environmental valuation project.[26]

WWF Eastern Africa Regional Program Office (EARPO): May undertake sub-national work, some of it related to the UN PEI.

World Agroforestry Center/International Center for Research in Agroforestry: Located in Nairobi; staff members helped estimate the environmental costs of soil erosion.

World Resources Institute: Undertook a nation-wide research initiative to illustrate the link between ecosystem services and the poor (Project title: Nature's benefits in Kenya: An atlas of ecosystems and human well-being).[28]

Bilateral/Multilateral Institutions

DFID: Funded a study on the Economic Impacts of Climate Change in Kenya.[29]

FAO: Worked with MEMR on a Natural Resource Assessment (2006-2007).

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): Has funded several environmental or governance projects in Kenya, including: adapting to climate change by adopting risk management strategies;[30] green economy initiatives (employment for sustainable development in Africa);[31] supporting policy development and strengthening government institutions following the 2010 constitution;[32] support for public finance reforms;[33] and water sector reform.[21]

Miti Mingi Maisha Bora (MMMB) – Support to Forest Sector Reform Program: A bi-lateral program between Finland and Kenya that developed an Environmental Economic Account for Forestry in Kenya. Worked with the Kenya Forest Service (KFS) and the Ministry of Forestry and Wildlife (MFW). A 2013 program document indicates that the MMMB project aims to support the compilation and utilization of forestry data for environmental accounting in Kenya's national system of accounting.[34]

UNDP-UNEP Poverty-Environment Initiative (PEI): Partners with the government for the Kenya Poverty Environment Initiative (PEI).[6] The PEI seeks to contribute to poverty reduction and improve well-being of poor and vulnerable groups through the inclusion of environmental concerns into national development processes.[35] The program was initiated in 2005 and is implemented by the Ministry of Planning and National Development (MoPND) in collaboration with the Ministry of Environment and Mineral Resources (MEMR) and the National Treasury (formerly the Ministry of Finance). Other ministries (Forestry and Wildlife, Local Government, Agriculture, Livestock and Fisheries, and the National Environment Management Authority and Kenyan National Bureau of Statistics) are involved in implementation.[36]

UNEP: Assisted NEMA and the MEMR with the most recent State of the Environment report.[6] Hosted the 2013 International Conference on Valuation and Accounting of Natural Capital for Green Economy (VANTAGE) in Nairobi; Ambassador Martin Kimani from the Kenya Permanent Mission to UNEP and UN-Habitat attended the meeting.[10] Supported the Ministry of Environment, Water, and Natural

Resources in commissioning a Green Economy Assessment Report.[10] The UNEP Green Economy initiative intends to work with the government to undertake macro-economic assessments to spur green investments.[35] Undertook a sub-national analysis of the economic value of mangrove forests.[37] UNEP also undertook the Kenya Montane Forest Ecosystem Services and Economy-Wide Project and supported the development of the Forest Accounts.[38]

The World Bank: The World Bank has funded many environmental programs in Kenya with sub-national and national impacts (e.g. Lake Victoria Environmental Management Project, P36557; Arid Lands Resource Management Project) as early as 1969. The bank has also financed capacity building projects relevant to natural capital accounting (e.g. Institutional reform and capacity building technical assistance project, P090567; Development of the National Statistical System project, P085414[22])

Ecosystem valuation, natural capital accounting, and ecosystem accounting

Over the past two decades, several program documents have provided information on Kenya's capacity to undertake economic valuation of natural resources. In 2000, the Ministry of Environment and Natural Resources indicated that biodiversity was not valued in economic terms as a key national resource and that capacity building programs (including the provision of training in environmental economics, resource accounting and audit, and valuation of biodiversity at tertiary levels) were needed.[39] A follow-up report in 2009 by the Government of Kenya (related to the CBD) indicated that almost no ecosystem valuation programs had been initiated and that it was still "necessary (to) develop in economic terms the value of standing, unexploited natural resources and ecological functions of the resident biodiversity in target ecosystems and habitats. It is also necessary to recognize and quantify the local economic value of wild plants and microorganisms in development and land-use planning".[40] It was noted that the government did not have coordinated effort in environmental valuation, and that technical and financial support for this work was hard to secure.[40] A 2010 policy brief by the Ministry of State for Planning, National Development, and Vision 2030 (related to the PEI program) reiterated that, "a clear economic assessment and demonstration of the contribution of the environment and natural resources to the total value of goods and services in Kenya's overall economy would be a convincing reason for the sector to get the attention of political leaders, policy-makers, planners, and other important decision makers."[41] In this report, the development of Natural Resource Accounting was specifically mentioned as a policy recommendation.[41] In the same year, the State of the Environment report noted that a statutory amendment could be used to ensure that the national accounting system would embrace environmental accounting.[42] The report indicated that, from a regulatory perspective, environmental accounting would enable Kenya businesses to better internalize their externalities.[42] Finally, in 2011, a report by the bi-lateral Miti Mingi Maisha Bora program indicated that a persistent factor influencing negative stability of the forest sector

institutions in Kenya was the undervaluation of the contribution of the sector in the economic statistics, especially in terms of GDP.[9] This report noted that the omissions relate to: 1) value addition of the sector through manufacturing; 2) provision of goods and services to the subsistence economy; and 3) supply of critical cultural and environmental services.[9]

However, despite an apparent lack of progress (albeit relatively high awareness) in ecosystem valuation, the Kenya Forest Services (KFS) and Kenya National Bureau of Statistics (KNBS) developed an Environmental Economic Account for Forestry in 2009.[44] This work was done in collaboration with UNEP, FAO,[24] and Miti Mingi Maisha Bora (a bi-lateral program between Finland and Kenya). After this initial governmental push in forest accounting, UNEP undertook a multi-part study that aimed to, broadly: 1) update natural resources data including forest, hydrological, and relevant scientific data on the production of ecosystem services; 2) construct hybrid physical and monetary Input-Output models to feed into the activity of building resource accounts for Kenya; 3) conduct a regulating service valuation exercise; 4) construct monetary resource accounts as part of the country's satellite accounts; and 5) to strengthen national institutional capacities to construct and manage input-output tables, carry out data collection, and ecosystem services valuation.[18] This larger project resulted in several reports. For example, in 2009, the UNEP produced a preliminary report on the role of forest-related regulating services, assigning value to several regulating services.[18] Later, in 2012, UNEP produced a second report that focused on Kenya's montane forests and their input into the economy of Kenya.[18,38] The report recommended that Kenya needed to ensure it had a fully functioning forest account in place in order to capture the various benefits provided by forests.[43] The report also recommended the development of a water environmental economic account.[18] Most recently, a 2015 article about the forest account indicated that Kenya's Forest Service and the National Bureau of Statistics are discussing how to incorporate annual updates to the forest account into their regular statistics activity.[24]

Kenya has expressed its support for NCA in recent years through the participation in various training or policy initiatives. First, in December 2013, UNEP hosted the International Conference on Valuation and Accounting of Natural Capital for Green Economy (VANTAGE) in Nairobi where delegates participated in a policy dialogue on VANTAGE and discussed issues pertaining to the valuation and accounting of natural capital for a green economy. Several staff members from the Ministry of Devolution and Planning spoke at this event. Second, in July 2014, the Ecosystem Alliance organized a TEEB for Water and Wetlands professional training workshop in Nairobi.[44] The workshop was organized with the University of Nairobi, UNEP, Ecosystem Alliance Kenya, and several other organizations.[44] Participants included: Kenya Wildlife Service Training Institute, Kenya Water Towers Authority, the LAPSSET Corridor Development Authority, NEMA, East Africa Wildlife Society, Nature Kenya, University of Nairobi, and Kenya Water Partnership.[44] Third, Kenya has signed the communiqué for natural capital accounting (related to Rio+20).[45]

Finally, Kenya is a member of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES); the members of IPBES are committed to building IPBES as the leading intergovernmental body for assessing the state of the planet's biodiversity, its ecosystem, and the essential services they provide to society.[46]

It should be noted that some studies have been undertaken that are only loosely related to this scoping effort but might be useful to examine more closely in the future, including reports on the economic value to pastoralism[47,48] and sheep genetic resources.[49]

Past and current efforts relevant to this scoping are detailed, below.

Ecosystem Valuation

National efforts:

Economic Costs of Climate Change Impacts in Kenya: This was a study funded by DFID and the Danish Ministry of Foreign Affairs (DANIDA) and undertaken by the Stockholm Environment Institute (in Oxford) working with local partners (study finished in 2009).[29] The analysis involved: 1) the impacts and economic costs of climate change; 2) the costs of adaptation; and 3) the potential for low carbon growth.[29] The study found that the net economic costs of climate change could be a loss of 2.6% of GDP each year by 2030.[29]

Economic Value of Kenya's Environmental Resources: In 1998, a study was carried out to review the state of knowledge on the economic value of Kenya's environmental resources.[50] The study estimated the value of different forest types and in 1996, the contribution of forests to the GDP was estimated at USD$4 million per year.[50]

Estimation of the costs of soil erosion: A research initiative involving the World Agroforestry Center/International Center for Research in Agroforestry in Nairobi estimated that annual soil erosion losses at a national scale were equivalent to USD$390 million per year.[51]

UNEP: UNEP undertook a multi-part project that aimed to, broadly: 1) updating natural resources data including forest, hydrological, and relevant scientific data on the production of ecosystem services; 2) to construct hybrid physical and monetary Input-Output models to feed into the activity of building resource accounts for Kenya; 3) to conduct a regulating service valuation exercise; 4) to construct monetary resource accounts as part of the country's satellite accounts; and 5) to strengthen national institutional capacities to construct and manage input-output tables, carry out data collection, and ecosystem services valuation.[18]

This project produced several reports relevant to this scoping study. First, in 2009, the UNEP produced a preliminary report on the role of forest-related regulating services, through valuation of the priority regulating services.[18] Second, in 2012, a report was published that focused on the of Kenya's montane forests play in producing regulating services and on their input into the economy of Kenya.[18] A presentation noted that the objectives of this report were to: 1) demonstrate how key economic sectors are dependent on ecosystem services such as forests and forest-related ecosystem services; 2) highlight the contribution of these

services to the real economy; 3) construct resource account to supplement national accounts to monitor and report on forest trends and contribution to national GDP; 4) and understand and propose some responses (including policy instruments) that would institutionalize incentives to internalize the benefits of sustainable management of forests.[38] This report was considered a first step towards integrating regulating services into the national accounting framework with subsequent phases moving forward with the incorporation into the national accounts of Kenya.[24] The report also recommended the development of a water environmental economic account.[24]

UNEP Green Economy: The UNEP Green Economy Initiative will support the Ministry of Environment and Mineral Resources and a national research institute in Kenya to undertake macro-economic assessments. The aim is to identify areas for green investments in order to contribute to economic growth and development, job creation, and environmental improvement.[35]

World Resource Institute (WRI): In 2007, WRI published the Kenya Atlas, which includes spatial data on population and household expenditures as well as ecosystems and their services (e.g. water, timber, wildlife). The resulting report details: ecosystems and ecosystem services; spatial patterns of poverty and human well-being; spatial statistics related to water, food (agriculture, livestock, fishing, hunting-gathering), biodiversity, tourism, wood). These data were explicitly compiled in order to allow decision-makers in Kenya to "initiate a comprehensive accounting of ecosystem services for the country". This work was undertaken together with the Department of Resource Surveys and Remote Sensing (Ministry of Environment and Natural Resources) and the Central Bureau of Statistics (Ministry of Planning and National Development).[28]

UNDP-UNEP Poverty-Environment Initiative (PEI): This program is designed to facilitate implementation of the Vision 2030. One of the achievements of this program has been an increased understanding and capacity in using economic valuation of environmental and natural resources among ministries, institutions, and other stakeholders as a result of the numerous poverty-environment studies carried out with PEI support.[36] This program has also worked to enhance collaboration between the environment, finance, and planning sectors. [36]

Under this program, the Ministry of Planning and National Development was funded $50,000 by the UNDP as part of the PEI project to "conduct economic assessment of the links between environmental and natural resource management" in 2005/6.[25] Then, in 2007, the PEI initiative along with the Ministry of Planning and National Development produced a report on the contribution of Kenya's environment and natural resources to economic growth and development.[52] The lessons learned from this report were presented in a national symposium (MoPND/MENR) on economic valuation in 2008; this symposium served to identify follow-up actions.[53] It was subsequently decided that together with the United Nations Development Assistance Framework (UNDAF) an additional output of the program would

be "strengthened national capacity in economic valuation of environment and natural resources and integrated (economic, social, and environment) assessment methods." [52]

In 2008, PEI worked with the government of Kenya to draft a National Environmental Policy. One of the proposed aspects of this policy was to provide guidelines for environmental accounting.[11]

In 2011, the Ministry of State for Planning, National Development, and Vision 2030 released a Poverty and Environment Indicators Report, as part of a broader objective to develop tools for the integration of environment into development plans and budget processes; the report proposed several indicators that could be included in the national monitoring and evaluation framework.[54]

Sub-national efforts:

Compensation for environmental services program/Payments for Ecosystem Services (PES): Developed through the Vision 2030 project and the Kenya Poverty Environment Initiative that is run by the Ministry of State for Planning, National Development.[3]

Some examples of watershed PES programs (managed both through the Ministry of State for Planning, National Development and other projects as well) include a PES for watershed services in Lake Naivasha as well as for wildlife habitat in the Mara ecosystems.[7] In addition, the Kenya Nairobi Water Fund and the Sasumua Water Treatment Plans are examples of different types of watershed PES projects in Kenya as well.[7,55]

The Kitengala Land Lease Program is organized by the Government of Kenya, the Kenya Wildlife Service, the Department of Resource Surveys and Remote Sensing, GEF, and other partners. In this program, landowners sign a one-year Wildlife Conservation Lease that allows wildlife access to some of their land. Landowners receive an annual opportunity cost payment based on the foregone income from livestock grazing; average household makes $400-800 per year. Program covers over 100 households and 8,500 acres.[55]

Finally, in regards the REDD+, there are PES initiatives under the national REDD+ program in which incentives will compensate for prevented deforestation. It was noted in a UNEP presentation that for this program, any compensation under a carbon value should be above USD$20/ton in order to prevent deforestation.[38]

Regional participatory environment valuation (Mbeere District): Research initiative by researchers from the National Museums of Kenya and the Kenyatta University.[26] The project found that the average annual household forest value was USD$251. The use of participatory environment valuation was important in assigning monetary value to biodiversity elements in a non-cash economy.

Recreational value of wildlife viewing: A research initiative involving researchers at Moi University found that the annual recreational value of wildlife viewing at Lake Nakuru National Park was USD$7.5-15 million.[27]

Economic valuation of the Mau Forest Complex: The total economic value of the Mau Forest complex (tourism, hydropower, agriculture, and the tea industry) is as much as USD$1.5 billion

per year. This valuation triggered a multi-million-dollar restoration initiative by the government to restore the Eastern Mau catchment area ("Mau Forest Reforestation Project").[35]

Economic analysis of mangrove forests: Funded by UNEP, this case study quantified the total economic value of the Gazi Bay mangrove forest. The total economic value was estimated at USD$1092 per hectare per year. The lack of primary data and appropriate peer reviewed studies was noted as a limitation of the research.

Economic valuation of Kenya's Water Towers (i.e. montane forests): Currently undertaking a program to calculate value of all Kenyan water towers; starting with five major ones and working with the KWS and the KFS.[7] A 2012 report by UNEP on the economic valuation of the water towers noted that montane forests have been consistently undervalued in conventional national accounting.[56]

Natural Capital Accounting

National efforts:

Forest Resources Accounts: In 2009, the Kenya Forest Service and the Kenya National Bureau of Statistics (in collaboration with the UNEP and FAO) developed an Environmental Economic Account for Forestry.[7,18,24] The account was part of the Ministry of Forest and Wildlife's Forest Mainstreaming Initiative.[15] The Kenya Forest Research Institute (KEFRI) and the Department of Resource Survey and Remote Sensing (DRSRS) were also involved.[15] The account focused on provisioning services, the timber and non-timber forest products produced by the forests of Kenya.[18]

The accounts revealed that forests contributed around 3.6% of GDP versus the 1.1% listed in Kenyan national accounts.[24] This resulted in an increase in budgetary allocations to improve forest management and were presented at meetings held by the World Bank in Washington, DC in 2013.[57] A 2015 article indicated that the Kenya Forest Service and National Bureau of Statistics are in the advanced states of discussing how to include annual updates of the forest accounts into their regular statistical activity.[24] The maintenance of the Forest Resource Account will be managed by the Forestry Mainstreaming Committee.[9] Moving forward, the MMMB program will be attempting to move the government towards ecosystem accounting for its forests.[14]

National Carbon Accounting System Project: This program is being instituted as part of Kenya's REDD+ work.[34] The program is financially supported by the Government of Australia with technical support from the Clinton Climate Initiative.[34]

Ecosystem Accounting

National efforts:

Forest Ecosystem Accounting: The MMMB program, under Component 1 of their overall plan of work in Kenya, indicated in 2013 that they would be supporting environment accounting of forestry data for integration into Kenya's National System of Accounting.[14] The Ministry of Environment and Natural Resources (formerly the Ministry of Environment, Water, and Natural Resources) will be responsible for executing this component.[14] It is likely

that this is still an ongoing project as a 2014-2015 MMMB work plan did not note the development of environment accounting specifically, but noted several other capacity building objectives related to environmental accounting.

Priorities within the country

Kenya is a country that is trying to simultaneously diversify its GDP, increase its Real GDP growth rate, lift its people out of poverty (42.4% live before the poverty line), while acknowledging that drought, pollution, poor land practices, and climate change must be managed. Furthermore, it must achieve these goals in the context of a government structure that is relatively new (the new constitution was adopted in 2010) and within the reality of the government's governance landscape (Appendix B). Nevertheless, the government has signaled its understanding of the importance of the environment in reaching its sustainable development goals through its participation in the UNDP-UNEP PEI program) and by incorporating provisions on sustainable environment into the national constitution. Sustainable development has been institutionalized into the framework of the country (e.g. into the constitution).

As per the 2015 Gaborone Declaration workshop, various government representatives have indicated that Kenya wants to take a leadership role both in the Gaborone Declaration and in the wider scope of bringing their natural accounting efforts into the development planning process.[7] Kenya is interested in being able to account for natural resources in a way that is currently not being accomplished.[7] Specifically, individual government officials indicated that they would like to have a roadmap with milestones/timeline so that changes of government, such as Kenya has experienced in the past decade, do not disrupt natural capital accounting process.[7]

More broadly, Kenya has indicated its priorities in the environment in several of its policy documents. First, the 2010 State of the Environment report emphasizes the importance of the environment and natural resource management in Kenya especially in terms of long-term development and reaching the larger goals of the Vision 2030.[42] Second, the draft environment policy of 2008 identified the following key environment and natural resource issues: harmonization of sectoral policy instruments with EMCA; implementation of land policy; valuation of environmental and natural resources; rehabilitation of degraded areas; loss of biodiversity; concessions and incentives; urbanization and waste management; pollution; energy; climate change and disaster management; conservation of shared natural resources; invasive and alien species; and public participation, environmental education, and awareness.[2] Third, the Green Economy Assessment Report of 2014 identified agriculture, energy, manufacturing, and transport as areas to alleviate poverty while increasing sustainable development.[10] The government is currently drafting a Green Economy strategy.[7] Greening the economy was also acknowledged as important to mitigation climate change in the Second Medium Term Plan (2012-2017).[6]

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LIBERIA

The Republic of Liberia is a low-income country that relies heavily on foreign assistance.[1] After years of war, businesses began returning to Liberia in 2006 and the economy grew from 2010 to 2013.[1] United States Agency for International Development (USAID) considered Liberia to be transitioning from emergency relief to development in 2008.[2] However the Ebola epidemic of 2014-15 caused a decline in the economy and government resources were reallocated towards managing the public health burden from this virus.[1] Liberia's 2014 Gross Domestic Product (GDP) is estimated to have been USD$3.69 billion and the 2014 GDP per-capita (PPP) was USD$900.[1] Real GDP growth was just 0.5% in 2014, down from 8.7% in 2013 and 8.2% in 2012.[1] In 2012, the contributors to Liberia's GDP were agriculture (38.8%), industry (16.4%), and services (44.7%).[1] In 2000 it was estimated that 70% of the labor force was involved in agriculture, 8% was involved in industry, and 22% was involved in services.[1] Important agricultural products include rubber, coffee, cocoa, rice, cassava, palm oil, sugarcane, bananas, sheep, goats, and timber.[1] Approximately 4.2 million people live in Liberia, 50% of the population lives in rural areas, and 63.8% of the population was below the poverty line in 2007.[1] In 2003, the unemployment rate was 85%.[1] In 2011, agriculture, fisheries, and forestry sectors represented ~72% of GDP.[3]

Acronyms

CBD: Convention on Biological Diversity
CI: Conservation International
EPA: Environmental Protection Agency
ETOA: Environmental Threats and Opportunities Assessment
FCPF: Forest Carbon Partnership Facility
FDA: Forestry Development Authority
FFI: Flora and Fauna International
GDP: Gross Domestic Product
GDSA: Gaborone Declaration for Sustainability in Africa
GIS: Geographic Information Systems
GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit
IUCN: International Union for Conservation of Nature
LCAF: Liberia Conservation Area Fund
LISGIS: Liberia Institute for Statistics and Geo-Information Services
MDGs: Millennium Development Goals
MOA: Ministry of Agriculture
NBSAP: National Biodiversity Strategies and Action Plans
NCA: Natural Capital Accounting
NGOs: Non-Governmental Organizations
NTFP: Non-Timber Forest Product
PRS: Poverty Reduction Strategy
REDD+: Reducing Emissions from Deforestation and Forest Degradation
SNA: System of National Accounts
TEEB: The Economics of Ecosystems and Biodiversity
UNDP: United Nations Development Program
UNEP: United Nations Environment Program
USAID: United States Agency for International Development
WWF: World Wide Fund for Nature

Ecosystem extent and condition

Liberia's area covers a total of 111,369 km^2 and the country has 579 kilometers of coastline.[1] In 2011, land uses included agricultural land (28.1%), forest (44.6%), and other uses (27.3%).[1] Liberia's terrain is mostly flat to rolling coastal plains rising to rolling plateaus and low mountains in the northeast.[1] Liberia's coastline is characterized by lagoons, mangrove swamps, and river-

deposited sandbars.[1] The inland grassy plateau supports only limited agriculture.[1] Liberia has one of the largest protected area networks in networks in the region covering approximately 30% of the country.[6] Liberia accounts for more than half of West Africa's remaining Upper Guinean tropical forests.[2]

Ecosystem services and natural resources

Liberia's important natural resources include its iron ore, timber, diamonds, gold, hydropower, and fauna and flora.[1] Liberia is richly endowed with water, mineral resources, and forests; the government has encouraged raw timber extraction and oil exploration.[1] Liberia is one of the world's 14 centers of global plant endemism and contains over 2,900 different vascular plant species.[3]

Nearly 700,000 households depend directly on the country's forest resources and agricultural biodiversity for their livelihoods.[3] Aquatic ecosystems provide protein for nearly 70% of the population.[3] Over half (58%) of the population lives within 40 miles of the coast, putting extensive pressure on this ecosystem for food and other resources (thereby negatively impacting mangroves).[2] The potential for eco-tourism is large but has not been assessed yet.[3] In 2008, USAID noted that the government was hoping to grow its mining sector as a strategy for decreasing unemployment and poverty and to spur infrastructure development.[2]

Threats to ecosystem services and natural resources

Liberia's natural hazards include dust-laden harmatten winds blown from the Sahara.[1] Environmental issues include tropical rainforest deforestation, soil erosion, loss of biodiversity, hunting/poaching, mining, invasive species, overfishing, and pollution of coastal waters from oil residue and raw sewage.[1,3] These are exacerbated by human population growth, a lack of capacity, weak enforcement of existing laws, and a low level of community awareness of policies and legislation.[3,4] These pressures on the environment are increasing; ecosystem-specific threats are detailed in a 2008 report by USAID.[2] Liberia is unusual in the high importance of bushmeat to local communities because of the lack of alternative animal protein. As such, bushmeat has a high economic value (similar to pre-war timber revenues).[2] Liberia is vulnerable to climate change due to high poverty levels and its reliance on natural resources.[4]

Policy

Liberia's first democratic elections took place in 2005 and the constitution was last amended in 2011.[1] Liberia is divided into 15 counties.[1]

Liberia is party to several international environment agreements (Appendix A). At the national level, it has been noted that there are limited institutions, institutional capacity, and frameworks in place for environmental management.[4] For example, there is no land-use planning.[4] USAID produced an extensive report in 2008 on Liberia's environmental policies and legal frameworks.[2] This report indicated that the policy and legislative framework for managing and conserving natural resources was overly comprehensive, complicated, and too detailed to facilitate implementation; simplification of policies and legislation was therefore

suggested.[2] Specific policies relevant to this scoping study are discussed in more detail, below.

National policies/programs:

Forest Reformed Law (2006): This law requires a national forest management strategy as a pre-requisite for forestland use in the country.[3]

National Adaptation Program of Action (2008, NAPA): The NAPA was developed in order to address the impact of climate change. Specifically, the NAPA highlights the following climate change related issues as priorities for the country to address: loss of biodiversity, degradation of agricultural land, and reduced activity in economic sectors such as fisheries, agriculture, forestry, and energy.[4]

National Biodiversity Strategies and Action Plan (NBSAP, 2003): Liberia's NBSAP contains six goals, which include: 1) taking appropriate measures to protect critical ecosystems against harmful effects or destructive practices; 2) creating biodiversity awareness among sectors of society; 3) committing Liberians to the sustainable use of biodiversity; 4) promoting rational use of biodiversity; 5) promoting access to genetic resources and the fair and equitable sharing of benefits arising from their use; and 6) contributing to the fulfillment of the MDGs in biodiversity conservation.[3] The NBSAP has not resulted in a mainstreaming of biodiversity in development processes because there has not been a financial mechanism/resource mobilization plan to support the implementation of the NBSAP.[3] The NBSAP is being/has been revised to extend to 2020.[3] The objective of the new NBSAP is to promote biodiversity mainstreaming in sectoral, cross-sectoral planning, and national accounting systems through development policies, plans, and programs.[3]

National Environment Policy (2002): This policy acknowledges the link between poverty alleviation and environmental conservation. In addition, this policy emphasizes that Liberia's approach to environmental sustainability is to alleviate pressure on natural resources by providing alternatives to communities that would otherwise be dependent on nature.[4]

Poverty Reduction Strategy II (2008 - 2011): Liberia's Poverty Reduction Strategy (PRS) articulates the government's overall vision and major strategies for moving toward rapid, inclusive, and sustainable growth and development.[4]

REDD+ Programs in Liberia: Liberia's Forestry Development Authority received USD$2 million in 2010 from the Forest Carbon Partnership Facility (FCPF) to assist in the establishment of a REDD+ program.[3] In 2008, the International Union for the Conservation of Nature (IUCN), Flora and Fauna International, and Conservation International (CI) were all developing REDD+ initiatives in Liberia.[2]

The Agenda for Transformation: This Agenda is a medium-term economic growth and development strategy to guide development activities in the country between 2012 and 2017. This agenda provides the roadmap for Liberia's transformation from post-conflict toward a long-term vision of becoming an inclusive middle-income

county in 2030.[3] The government's strategy is based on building a strong economy around natural resources extraction/exploitation.[5]

Vision 2030: Vision 2030 is Liberia's national vision framework, which aims to achieve a national vision of "one people, one nation, united for sustainable peace and development".[6] In early 2014, however, the President of Liberia publicly expressed doubt that the Vision would be implemented.[7]

Data Availability and Monitoring

Few natural resource assessments have been conducted in Liberia.[4] For example, in some national parks, no biodiversity assessments were made between the 1960's and 2002.[8] The lack of data was also highlighted by the Liberia Environmental Threats and Opportunities Assessment (ETOA) which reported that: technical skills are scarce in environmental agencies which would be responsible for sustainability functions; there is almost no coordination between these environmental agencies; and a lack of infrastructure (e.g. office buildings, electricity) hamper the capability of staff to execute their functions.[4] This report, published in 2008, also identified environmental spatial data gaps and provided recommendations for strengthening data collection and management.[2] At the time, the Liberian government faced shortages of scientific information pertaining to environmental management (tabular and spatial environmental data had been compromised as a result of the civil war).[2] It was also noted that existing data was not typically kept in analog or paper formats, thereby limiting external investigator access.[2] In response to its findings in this 2008 report, USAID recommended to the Liberian Environmental Protection Agency (EPA) that it: 1) establish a data storage and management system to collect data given to the EPA from various projects and activities (and eventually incorporate data from ambient monitoring); 2) work with the Forestry Development Authority (FDA) to use Geographic Information Systems (GIS) and periodically update satellite imagery to monitor core land use indicators; and 3) to create a series of environmental indicates for land, biodiversity, water, and air.[2] It is not clear whether any of these suggestions were implemented. A few potential data sources for natural capital accounting are listed in Table 13.

Table 13: Data availability from different sources. This is not a comprehensive list and is simply illustrative of the kinds of data that may be available.

Type of Data	Data Source
Biodiversity	
Biodiversity Country Study	UNEP[4]
Land cover	
Forest resources map	European Space Agency[4]
Land cover	U.S. Department of Agricultural Forest Service[2]

Statistical capacity

The Liberia Institute of Statistics and Geo-Information Services (LISGIS) is responsible for reporting economic statistics in the country.[9] LISGIS uses the 1993 System of National Accounts (SNA) reporting methodology though the institution is in the process of adopting the 2008 SNA.[9] The International Monetary Fund (IMF) has a comprehensive review of the methods used by Liberia in the development of their national accounts.[9]

In regards to statistical capacity, the United Nations Development programme (UNDP) provided logistical support for LISGIS to undertake its first post-war National Accounts and Establishments Survey in 2007 (the goal was to assist Liberia in updating their National Accounts figures).[9] LISGIS has also received logistical and training support from the IMF and the World Bank in order to reconstruct national accounts and socioeconomic statistical databases.[9]

Currently, the World Bank is providing financial support to Liberia for the National Statistics System focusing on the Household Expenditure Survey.[10] This project, which has a total budget of USD$2.35 million, will be closing at the end of 2015.[10] The project is being implemented by LISGIS.[10] Little other information is available about the project online.

Relevant Actors

Government

There are several government institutions that have experience in fields relevant to this scoping effort (Table 14). However, a 2008 USAID report indicated that Liberia's government institutions are constrained by a number of factors, ranging from inadequately trained personnel and lack of basic infrastructure to a lack of coordination and cohesion.[2] The following issues were noted with respect to the capacity of Liberia's government institutions to manage and protect the environment: dependence on foreign expertise and resources; lack of infrastructure and administration; lack of human resources; shortages of scientific information and lack of data; absence of law enforcement on environmental laws; overlapping mandates between different government agencies; lack of financial support for core costs (beyond donor-financed projects costs); and a lack of coordination among and between NGOs, government, and donors.[2]

Civil Society

University of Liberia: Has a College of Agriculture and Forestry, though USAID has noted that extensive capacity building might be required to update the curriculum and help the program meet international educational standards.[2]

Non-profit organizations: There are several non-profit organizations that have implemented large projects in Liberia in the past (e.g. CI, Flora and Fauna International, Jane Goodall Institute, World Wide Fund for Nature).[2] Aside from Conservation International, it is unclear whether (or in what form) these organizations continue to work in Liberia following the Ebola epidemic.

Table 14: Government ministries/agencies that have appeared to have had past roles relevant to this scoping effort.

Ministry	Notes
Agriculture	
Ministry of Agriculture (MOA)	Has developed a food security and monitoring strategy/program.[3]
Environment	
Environmental Protection Agency (EPA)	Mandate includes environmental concerns.[2]
Fisheries	
Bureau of National Fisheries	Mandate includes environmental concerns.[2]
Forests	
Forestry Development Authority (FDA)	Mandate includes environmental concerns.[2]
Statistics/Finance	
Liberian Institute of Statistics and Geo-Information Services (LISGIS)	This institute has an Environmental Statistics Section, which falls under the Social Statistics Division.[4] Currently implementing a World Bank funded program to strengthen their Household Expenditure Survey.[10]

Bilateral/Multilateral Institutions

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): Has funded a few projects in Liberia including the energizing development Liberia country program (distribution of cooking stoves and solar lamps/systems)[11] and a program focused on regional resource governance in the extractive sector (elements of this project are co-financed by the Australian government).[12]

TEEB Liberia: Liberia is one of five countries participating in a three-year TEEB project, funded by the European Commission, to undertake a country study that responds to their policy needs. A TEEB country study identifies the ecosystem services that are vital to meeting the country's policy priorities and makes recommendations on how these services can be integrated into policies.[13] TEEB Liberia compares alternative scenarios for coastal planning and management with particular focus on mangrove ecosystems and local community engagement.[13] The TEEB study is designed to result in awareness-raising of environmental, social, and economic impacts of coastal zoning planning and management on communities and ecosystems.[13]

The World Bank: The World Bank has funded several environmental, development, and governance programs in Liberia with sub-national and national impacts (e.g. Consolidation of Liberia's Protected Area Network;[14] Liberian Bank for Development and Investment).[15]

USAID: USAID has undertaken several environmental projects in Liberia, many of which were detailed in a 2008 document authored by USAID on the state of the environment in Liberia.[2]

Ecosystem valuation, natural capital accounting, and ecosystem accounting

Liberia has not undertaken any work in natural capital accounting and it does not appear that there are any organizations currently working on national-level ecosystem valuation or natural capital accounting projects in Liberia at this time. However, the government is

interested in undertaking this type of work. Evidence of this can be seen in the fact that Liberia has signed the communiqué for natural capital accounting (related to Rio+20).[8] In addition, Liberia suggested its willingness to undertake natural capital accounting (NCA) during the 2015 GDSA Roadshow. NCA would help the government meet some of its international commitments (e.g. the revised NBSAP includes the mainstreaming of biodiversity into national accounting systems as one of several objectives).[3]

In 2008, USAID published an extensive report on the state of the environment in Liberia. In this document it was noted that there was little appreciation by the government or by communities for the economic value of non-timber forest products (NTFPs, including bushmeat, which is a high-value NTFP in Liberia).[2] As a result of their findings, USAID suggested that Liberia's forests be managed based on their holistic value, including the value of NTFPs and ecosystem services.[2] It is not clear whether these suggestions were implemented by the government.

Ecosystem Valuation

Sub-national efforts:

TEEB study on the value of mangroves (five study sites in Liberia): TEEB is currently undertaking study on the economic and cultural benefits gained from the conservation or restoration of wetlands and mangroves in five study sites along the coast of Liberia.[16] This study has been designed to highlight both the importance of mangroves and the importance of funding conservation programming in-country.[16]

Priorities within the country

Liberia is a country that faces many social, political, and economic challenges; these were exacerbated by the 2014-15 Ebola epidemic.[1] Even before the Ebola crisis – in 2008 – Liberia's infrastructure was described as being almost completely destroyed following years of conflict. For example, public services were not operating (including piped water, drainage, wastewater, and solid waste management systems).[2] More recently, as a result of the Ebola epidemic, large amounts of government resources have been re-allocated to decreasing the public health burden of Ebola and funds available for other public investment remain low.[1] Very little of the national budget is allocated to conservation efforts.[16] In the context of this need to focus on development, it is notable that in 2008 there was an absence of a strategy that addressed the compromises between the environment and economic development (the Poverty Reduction Strategy was not considered to address this trade off well enough).[2] However, balancing development (e.g. rubber plantations, mineral extraction) with environmental sustainability will be important for Liberia's growth. It is not clear what the environmental priorities are of the Liberian government, given the clear need to address several other complex and inter-related development issues.

Minerals may be one area that the Liberian government will prioritize in terms of natural resource extraction. A 2013 report noted that the management of mineral and energy resources for sustainable development has been a priority of the World Bank in Liberia.[17]

This priority was also noted in a 2008 USAID document.[2]

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MADAGASCAR

Following a period of instability between 2009-2013, the Republic of Madagascar experienced economic growth and saw the return of some development assistance in 2014.[1] Madagascar is part of the Common Market for Eastern and Southern Africa (COMESA). Madagascar is considered one of the poorest countries in the world.[2] Madagascar's 2014 Gross Domestic Product (GDP) is estimated to have been USD$11.19 billion and the 2014 GDP per capita (PPP) was USD$1,400.[1] Real GDP growth is approximately 3% per year.[1] Agriculture (including fishing and forestry) accounts for more than one-fourth of the GDP and employs 80% of the population; both agricultural and mining sectors expanded in 2014. In 2014, the largest contributors to Madagascar's GDP were: agriculture (28.1%), industry (17.4%), and services (54.5%). Important agricultural products include coffee, vanilla, sugarcane, cloves, cocoa, and rice.[1]

Approximately 23.2 million people live in Madagascar, 65.5% of the population lives in rural areas, and 50% of the population was below the poverty line in 2004.[1] In 2010, absolute poverty was at 92.8%.[3] The population and the economy is highly reliant on natural resources;[3] up to 75% of the population directly depends on plant resources.[4] The contribution of selected environmental assets to country total wealth was estimated as 33% in Madagascar in 2006.[5]

Acronyms

ANCR: Self-Assessment of Capacities to be Reinforced Project
ANS: Adjusted Net Savings
CAZ: Akenhiheny-zahamena Forestry Corridor
CI: Conservation International
CHM: Clearing House Mechanism
COMESA: Common Market for Eastern and Southern Africa
CTE: Technical Evaluation Committee
EIA: Environmental Impact Assessment
GDP: Gross Domestic Product
GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit
GNI: Gross National Income
ICZM: Integrated Coastal Zone Management
INSTAT: The National Statistics Institute
IUCN: International Union for Conservation of Nature
MECIE: Making Investments Compatible with the Environment
MEI: Ministry of Economy and Industry
MFB: Ministry of Finance and Budget
MNP: Madagascar National Parks
NSSMB: National Strategy for Sustainable Management of Biodiversity
NCA: Natural Capital Accounting
NGO: Non-Governmental Organization
ONE: National Office of the Environment
SEEA: System of Environmental-Economic Accounting
SERIEE: European System for the Collection of Economic Information on the Environment
SNA: System of National Accounts
UNDP: United Nations Development Program
WAVES: Wealth Accounting and the Valuation of Ecosystem Services
WWF: World Wide Fund for Nature

Ecosystem extent and condition

Madagascar is the fourth largest island in the world with an area that covers a total of 587,041 km^2.[1] The country has 4,828 kilometers of coastline.[1] The marine zone (over 1 million km^2) is almost twice the area of the national land surface.[6] In 2011, land uses included: agricultural land (71.1%), forest (21.5%), and other uses (7.4%).[1] The terrain in Madagascar generally involves

a narrow coastal plain with a high plateau and mountains in the center of the country.[1] The World Bank's Wealth Accounting and the Valuation of Ecosystem Services (WAVES) program has classified Madagascar's land cover types into dense dry forest, dense humid forest, spiny forest, mangrove, woodland, tapia, pine plantation, eucalyptus plantation, other plantation, other vegetation (e.g. savannah), open land, and water bodies.[2] In 2013, dense humid forest occupied the largest natural forest surface area in Madagascar.[2]

Ecosystem services and natural resources

Madagascar's important natural resources include its flora and fauna, graphite, chromite, coal, bauxite, rare earth elements, salt, quarts, tar sands, semiprecious stones, mica, fish, and hydropower.[1] Half of Madagascar's assets lie in its natural capital.[3] Hydroelectric plants provide 25.8% of electricity in the country.[1] The mineral sector could underpin the country's economy in the future; the sector contribution of minerals to GDP could grow from <1% to 14% by 2025.[3] Madagascar is one of 25 global biodiversity hotspots in the world;[7] 90% of the plant and animals found on the island are endemic.[8] More than 95% of the population relies on timber for fuelwood, charcoal, and construction purposes.[2] Fisheries contribute more than 2% to GDP.[6] The potential economic benefits from tourism and watersheds are USD$48 million per year, of which USD$28 million could be generated by ecotourism and USD$20 million by watershed protect (in 2003 USD).[9] However, only USD$0.5 million per year are captured by tourist visitation fees for protected area management.[9] It is estimated that from 2002 to 2012, avoided deforestation in Madagascar will ensure the storage of 46.6 million tons of carbon dioxide.[4] There are 2,300 plants used for medicinal purposes in the country, 90% of which have not been commercialized.[10]

Threats to ecosystem services and natural resources

Madagascar's natural hazards include periodic cyclones, drought, locust infestations, and flooding.[1] Environmental issues include soil erosion (as a result of deforestation for firewood and overgrazing), desertification and surface water contaminated with raw sewage and other organic wastes, hunting, and overexploitation.[1,10] Between 1950 and 2000, Madagascar lost half of its forest cover and the population is expected to double by 2010.[3] Because of the high rate of plant and animal endemism, the loss of one hectare of forest in Madagascar has a larger effect on biodiversity than forest loss elsewhere in the world.[10] Ecosystem degradation is primarily caused by destructive human practices, such as clearing of natural habitats and overexploitation of natural resources.[10] The main causes of habitat clearing are expansion of agriculture (due to human population growth), charcoal production, energy needs, forest/bush fires, mining, forestry, and overexploitation.[10] Climate change will impact Madagascar; the changes will first be felt in marine and coastal ecosystems.[10]

Policy

Madagascar's most recent constitution was passed in 2010.[1] Madagascar is divided into six provinces, which are further divided into regions and districts.[1]

Madagascar is party to several international environment agreements (Appendix A), and also participated/s in: the South West Indian Ocean Fisheries Project; the Western Indian Ocean Marine Ecoregion Project; the Indian Ocean South-East Asian Marine Turtle Memorandum of Understanding; and the ISLANDS project.[11] At a national level, there is an Environmental Unit within each ministry which ensures the integration of the environmental into the respective sector policies.[11] These Environmental Units participate in various committees/environmental focus groups and represent their Ministries within the Technical Evaluation Committee (CTE) responsible for the evaluation of EIAs.[11] They are also responsible for distributing environmental information within the Ministry. Environmental Units are coordinated by the Ministry of Environment via an Environmental Unit Platform.[11]

Regarding fisheries, there is no current official sector policy though a fisheries policy and law have been drafted but not adopted (due to a lack of consensus).[6] The policy and legal framework governing the sector is incoherent and ambiguous.[6] The prevailing legal framework is made up of a large number of non-integrated instruments that, for the most part, date back to the early 1990s.[6] There are a lack of robust data on stocks, catch volumes, and economic values of resources.[6] There are no stock assessment for Madagascar's fisheries apart from initial estimates for shrimp; official data on catch volumes underestimate real data by up to 30%.[6] Economic data are limited and widely dispersed throughout a large number of agencies, many of which are unwilling to share data deemed confidential.[6]

Policies in other sectors may also need to be updated. First, in terms of water policies, a 2012 report indicated that national water policy dates from the mid 1990s and was developed without full consideration of the economic values of water resources, nor of equity in terms of pricing policy and availability of water.[9] Second, in regards to development and poverty mitigation plans, several plans were introduced in the mid-2000s (e.g. Policy Paper for Rural Development in 2004; National Rural Development Program in 2005) though the interim government (from 2009 to 2013)[11] did not undertake long-term planning and it is not clear whether these programs are being implemented by the newly elected government or whether they are being revised. Third, reviews of policies on specific species exist though it is not clear whether they are still accurate given the newly elected government.[11]

A few national and sub-national policy/programs are listed, below, and examples of data resources are listed in Table 15.

National policies/programs:

Environmental Impact Assessments: Processes linked to protected area creation, large mining projects, petrol and oil projects, large-scale agricultural exploitation, aquaculture projects, forestry projects, road construction,

textiles, tourism, wetlands, and sensitive areas are subject to Environment Impact Assessments (EIA).[10] This is decreed by the MECIE (Making Investments Compatible with the Environment) which is a legal instrument requiring public or private investors to from EIAs on investments that are potentially harmful to the environment.[10]

General State Policy (Politique Générale de l'Etat): Presented in 2014, this policy is being translated into action plans for each sector. Natural Capital Accounting is featured prominently in this policy.[2]

Integrated Coastal Zone Management (ICZM) Policy: This national strategy was adopted in 2010 with the establishment of both a national and several regional committees. This program is overseen by the Prime Minister's Office.[6] In 2012 it was noted that there had been little realization of concrete ICZM activities.[6]

National Tourist Plan: Adopted in 2005, this policy aims to support the growth of the tourism sector.[11] Among its specific objectives are to make tourism, especially ecotourism, a provider of direct and sustainable benefits for village communities while preserving the environment.[11]

National Strategy of Scientific Research: Developed by the Ministry of Scientific Research in 2013.

National Strategy for Sustainable Management of Biodiversity (NSSMB, 1996): The principles of the NSSMB are to: 1) contribute to the improvement of the living conditions of the entire population by reducing poverty; 2) be part of the development process (at the local, regional, and national levels); 3) take development of international trade into account; and 4) to promote realistic alternatives to environmental degradation.[10] The NSSMB is structured around three strategic objectives: 1) conservation of biodiversity; 2) valuation of biodiversity (improved knowledge regarding economic, ecological, and sociocultural values of biodiversity; improve the situation of under-valued and under-used biodiversity products; develop ecotourism); and 3) reduction of the pressures on biodiversity resources.[10] This strategy was partially revised in 2008 and additional revisions are ongoing.[10] This program is partially implemented via an environmental program with a duration of 20 years.[10] An action plan was developed from 2002-2012 and was expected to be updated at the end of 2014; action plans for implementation are developed for each province.[11]

REDD+/Carbon Markets: A 2013 report indicated that the policy framework for participation in international carbon markets/performance payment mechanisms are in the initial stages of development.[12] Little is known about the value of carbon stocks in Madagascar, though carbon credit sales from the Makira protected area raised USD$600,000 in 2008 (at USD$5 per unit).[12] The Malagasy government intends to sell 9 million tons of carbon over 30 years in exchange for protection of the Akenhiheny-zahamena Forestry Corridor (CAZ) forest corridor.[11] In addition, Madagascar plans to develop the REDD+ mechanism though the acquisition of funding for this project has been limited due to political unrest.[11]

The FORECA Project (Madagascan-Swiss-German partnership) has been initiated for some years now to fight against deforestation and forest resources degradation integrating the approach of forests dedicated as carbon pools. The program has four objectives: 1) develop methods to quantify carbon stock and monitor carbon emissions; 2) develop and test methods for efficient land use options in buffer zones; 3) socio-economic analyses of key actors and their role in deforestation; and 4) establishment of mechanisms for good forest management and revenue sharing.[12]

REDD+ is a large part of the national conservation strategy.[13] Four REDD+ pilot projects have been launched, each with the help of large non-government organizations (NGOs).[13]

Sub-national policies/programs

Regional Environmental Policies: To integrate environmental concerns into decision-making, policies related to the environment were designed in order to be applied within regional development policies.[4] More than half of the 22 regions in Madagascar have such policies.[4]

Data Availability and Monitoring

Challenges in data availability and a paucity of monitoring programs have been consistently noted in program documents. For example, in 2007, the World Bank reported that key statistical surveys needed to be undertaken (and the World Bank was providing funding for this to occur) as the government had not undertaken an economic and social census since 1993.[14] As a consequence, in 2007, many baseline data were outdated.[14] The World Bank report noted that it was undertaking a cartographic survey of Madagascar and that the government was in the process of soliciting support from development partners to support a population census.[14] In the same year, the World Bank established six regional, technical units to provide regional spatial analysis assistance (as part of a larger, 15-year program).[15] However it is not clear that this program was able to satisfactorily build up technical expertise in this area.[15]

In 2012 and 2013, the World Bank WAVES program published several reports related to data availability as it related to the natural capital accounts they were planning on developing. Regarding fisheries, there were no reliable data on fisheries stocks.[6] This is because regional fisheries directorates are charged with a wide range of surveillance, education, and regulation activities but are often staffed by only one or two personnel with very few resources.[6] In the water sector, data availability is weak due to the number of actors in the sector and the lack of a coordinated approach to data collection and analysis.[9,16] For the mineral accounts, there was a lack of data collected by the government and private companies were hesitant to share data due to confidentiality concerns. For the forestry accounts, data were abundant but were dispersed and incoherent both spatially and temporally.[16] Nevertheless, a scoping report provided a detailed list of data availability for key sectors including: mining, water resources, forest ecosystems and protected areas, and fisheries and coastal resources.[12] This supplements another scoping effort undertaken by the Self-Assessment of

Capacities to be Reinforced Project (ANCR) project (in 2013 and 2014) for national data on biodiversity, desertification, and climate change topics.

Madagascar does have a Clearing-House Mechanism (CHM) as well as a knowledge management system on biodiversity which is managed by the National Office for the Environment (ONE).[10] The Clearing House National Strategy and Action Plan on Biodiversity Convention was published in 2012.[11] The objective of the CHM is to promote/facilitate communication, technical, and scientific cooperation between national and international stakeholders involved in the management and conservation of biodiversity.[11] There is also a national environmental dashboard system (see below).

A few national data collection programs are listed, below, and examples of data resources are listed in Table 15.

National government data sources:

National Environmental Dashboard (Tableau de Bord Environnemental): This is a national environmental dashboard which regularly generates reports on environmental status.[4] The dashboard was designed as a decision-making tool and has proven useful to research and training initiatives within the country.[4] Environmental dashboards are now available at the regional level with 90% of regions having their own dashboard.[4,10]

TEAM (Tropical Ecology, Assessment, and Monitoring) Initiative: TEAM has been operating in Madagascar since 2009.[11] The purpose of the initiative is to make consistent data on the status of global biodiversity available to the international scientific community. Center ValBio hosted the first TEAM site in Madagascar and this program works in cooperation with Madagascar National Parks.[11]

Statistical capacity

The National Statistics Institute (INSTAT) is responsible for reporting economic statistics in the country.[12,18] The framework used is based on the 1968 System of National Accounts (SNA) and uses a base year of 1984.[12,18] The process to re-base the SNA to the year 2007 was initiated in 2008 due to the adoption of a new statistical accounting system (*Plan Comptable General 2005*) but halted due to the political crises in 2009.[12] The World Bank provided technical support in 2013 for the production of national accounts for the period from 2008 to 2011.[12] The International Monetary Fund has a comprehensive review of the methods used by Madagascar in the development of their national accounts.[18]

The World Bank has undertaken several projects to build the capacity of Madagascar's national statistical system. Between 1981 and 1989, the World Bank undertook a project in Madagascar to encourage the practice of modern accounting and auditing by upgrading the professional skills of accountants and auditors.[19] The project had four components: 1) the enactment of modern accountancy legislation; 2) the establishment of an accounting school; 3) the strengthening of qualifications of the national auditing firm through training and assistance; and 4) strengthening of the management services capability of selected consulting firms through technical assistance in the fields of financial systems and

proceduers.[19] As a result of the project, modern accounting legislation adapted to the country's needs was put in place, rules governing the accountancy profession were updated, and local accountancy qualifications were established.[19]

Table 15: Data availability from different sources. This is not a comprehensive list and is simply illustrative of the kinds of data that may be available.

Type of Data	Data Source (notes)
Biodiversity	
Global Amphibians and Mammals Assessments in 2004 and 2005	
Lemur Action Plan	IUSN SSC Primate Specialist Group
Lemur Atlas	ONE
Plants	Plants Specialist Group of Madagascar[4] Missouri Botanical Garden The Tzimbazaza Zoo[4]
Biodiversity databases	REBIMO/CHM/GBIF/ARSIE[11]
Flora catalogue (online)	Madagascar Catalogue (www.tropicos.org/project/MADA)[11]
Land cover	
Deforestation mapping for 1990, 2000, 2005, and 2010	Conservation International and the National Environment Agency (ONE)[2]
Land Use/Environmental Assessments	
Agricultural census	Malagasy government[12]
Natural Resources	
Forest inventory	Malagasy government (2006)[2]
Socio-economic/Administrative	
National household survey	Malagasy government[12]
Tourism	
Tourism (visits, expenditure, jobs created by tourism, etc.)	Ministry of Tourism[4]
National park visits/expenditure during park visits	Madagascar National Parks
Water/Hydrology	
Climatological data	Le service Météorologique de Madagascar[17]
Water use data	Ministry of Agriculture[2]
Water use data	Jirama (the electricity and water management agency)[2]
Inventories of water accessibility and demand (southern area of the country)	UNDP[12]

More recently, a 2007 World Bank report noted that a National Strategy for Statistical Development was in preparation.[14] This strategy was described as including the development of a revised regulatory and procedural framework for government statistics that would integrate responsibilities of the relevant government activities. In addition, it noted that the institutional responsibilities of relevant government institutions (e.g. President's Office, Prime Minister's Office, Ministry of Plan, Ministry of Finance and Budget, Structural Adjustment Secretariat, and National Statistics Office) needed to be clarified in this regard.[14] A World Bank project (closing in 2009, Project ID: P074448 and P105026) aimed to provide technical assistance to address these issues and to modernize the relevant organizations.[14] Specifically, this project

aimed to: 1) improve the transparency and economic governance through supporting a comprehensive reform of the public finance system in Madagascar (mainly at the central level); 2) capacity build and strengthen local training institutions which focused on institutional development and capacity building activities in selected government institutions such as the Ministry of Finance and Budget and the Ministry of Justice; and 3) establish a project management system for the change process to ensure effective implementation of the reforms.[4] This project was consistently rated as "satisfactory".[14] This project provided financing to strengthen the capacity of the National Statistic Office to develop and implement statistical surveys in order to implement government strategies related to trade and production (e.g. External Trade Index; Consumer Price Index; Industrial Production Index; Index of Industrial, Energy, and Mining Related Production).[14]

In 2012, it was noted that Madagascar's system of national accounts and macro-economic indicators make scant reference to natural capital values.[9] In 2013, a WAVES scoping report noted the following regarding the SNA: 1) the informal sector is not considered in the fisheries, forestry, tourism, and mining sectors (though it is accounted for in the agricultural sector); and 2) regarding taxes, royalties, and fees, data are only available at the sector level (fisheries, forestry, and mining) and not by product or scale of activity.[12] Macro-economic indicators are confined to measures of GDP and Gross National Income (GNI) and there are no complementary indictors that incorporate natural capital values (such as Adjusted Net Savings, ANS).[12] This report provided a detailed overview of the types of natural resources data that is being captured in the Malagasy SNA.[12]

Madagascar is a member of the Southern African Development Community (SADC), which is currently implementing its Regional Indicative Strategic Development Plan (RISDP).[20] The RISDP has four intervention areas: 1) development of legal framework in Statistics; 2) harmonization of statistics in the SADC region; 3) provision of relevant statistics for regional integration; and 4) statistical capacity building development in SADC.[20] As part of this work, SADC coordinates, enhances, and promotes national statistical systems in member states. As such, SADC has undertaken several projects with its member countries to expand their capacity in this regard.[20]

Relevant Actors

Government

At the national level, the Malagasy government has several ministries and parastatal organizations relevant to this scoping effort (Table 16). The government also has several inter-ministerial committees that facilitate synergy across different ministries. These inter-ministerial committees include the: Forest- Land Inter-Ministerial Committee, and DGSF and DGF Collaborative Protocol (*Comité Interministériel Forêt - Foncier et Protocole de collaboration DGSF et DGF*); Hydrocarbon Environment Forest Commission (*Commission Hydrocarbure Environnement Forêt*); Precious wood steering committee; and the Mines and Forests Inter-Ministerial Commission (*Commission interministériel Mines – Forêts*).[11]

Table 16: Government ministries/agencies that have had roles related to ecosystem valuation and natural capital accounting.

Ministry	Notes
Agriculture	
Ministry of Agriculture	Part of the WAVES technical group for Natural Capital Accounting (NCA).[2]
Environment	
Ministry of Environment, Water, and Forests	Part of the WAVES technical group for NCA.[2] Administrates environmental regulation and marine protected area planning.[6]
National Office for Environment (ONE)	Serves as a clearinghouse and knowledge management function on biodiversity and the environment.[4] The National Environment Office (ONE) is an important actor in REDD+ activities in Madagascar, and in environmental regulation and environmental data management activities.[12] Representatives of ONE have been involved in environmental valuation exercises in Madagascar (prior to WAVES).[12]
Madagascar National Parks (MNP, formerly ANGAP)	Madagascar National Parks (MNP) is an association, chaired by the Minister for Environment, which is charged with the management of 54 protected areas in Madagascar.[12] MNP is a technical partner in the implementation of WAVES activities related to protected area valuation.[12]
Fisheries	
Ministry of Fisheries and Aquatic Resources	Comprised of over 40 separate directorates, services, and agencies that are responsible for the fisheries sector.[6]
Planning/Finance	
Ministry of Economy and Industry (MEI)	The Ministry of Economy and Industry (MEI) has overall responsibility for economic policy and planning in Madagascar and is charged with: (i) the design, coordination, monitoring and evaluation of the implementation of Government policy regarding economic and social development, and economic forecasts; and (ii) private sector development, particularly for industry development, technology transfer and the competitiveness and integration of Madagascar into the world economy.[12] Houses the NCA unit, associated with the WAVES program.[3] Will participate in WAVES training programs on macro-economic indicators.[2] WAVES lead government agency.[8]
Ministry of Finance and Budget (MFB)	The Ministry of Finance and Budget (MFB) is responsible for the development, implementation and monitoring of the financial, budgetary and fiscal policies of the Government.[12] The MFB has had little practical experience in natural resource accounting and will be targeted for involvement in WAVES capacity building and awareness raising activities related to the development and interpretation of macro-economic indicators and natural resource accounts, and in the use of natural

	resource accounting outcomes in policy development, including fiscal policy development.[12] The MFB is represented on the national WAVES Steering Committee.[12]
Prime Minister's Office	Oversees Integrated Coastal Zone Management.[8]
Statistics/Science	
The National Statistics Institute (INSTAT)	Instat is the national statistical office that operates as a semi-private entity under the stewardship of the Ministry of Economy and Industry.[12] Instat is a key stakeholder in the implementation of WAVES activities as it is responsible for developing and maintaining the national System of National Accounts.[12] Received training on the structure of natural capital accounts and methods to assess the monetary value of natural capital.[2] Received World Bank funding in 2007 to increase capacity to undertake statistical surveys.[14] Is represented on the national WAVES Steering Committee.[12]
Ministry of Scientific Research	Aims at making national research a pillar of social progress and economic development.[11]
Water	
Ministry of Water Resources	Part of the WAVES technical group for NCA.[2]

Private Sector

Rio Tinto Mining Corporation: Has partnered with the International Union for Conservation of Nature (IUCN) to estimate the monetary value of the expected biodiversity benefits of a rainforest conservation project in Madagascar.[7] One of the first large-scale mining companies to proceed with its investments in Madagascar.

Civil Society

University of Antananarivo: Contains the fauna scientific authority (within the Animal Biology Department) and the flora scientific authority (within the Plant Biology Department) which undertake work related to national strategies for biodiversity management.[4] The University of Antananarivo has a partnership with the University of Bordeaux in France with a dual degree being offered that in part addresses environmental economics.[12]

Conservation International (CI): Has developed several deforestation maps for Madagascar and is co-president of the WAVES Madagascar National Steering Committee.[2] Has undertaken case studies in ecosystem valuation in Madagascar in the past.[12]

Blue Ventures: Has undertaken case studies in ecosystem valuation in Madagascar in the past.[12]

Wildlife Conservation Society: Has undertaken case studies in ecosystem valuation in Madagascar in the past.[12] Undertakes fish catch and productivity surveys.[12] Also undertakes carbon credit projects with the government, which have provided long-term financing for conservation projects.[21]

World Wide Fund for Nature (WWF): Has undertaken case studies in ecosystem valuation in Madagascar in the past (e.g. working on tuna industry valuation).[12]

National Oceanographic Research Center: A national research center that has looked into natural resource knowledge and management.[11]

National Research center on Environment: A national research center that has looked into natural resource knowledge and management.[11]

Tsimbazaza Botanic and Zoological Park: A national research center (located within the national zoo) that has looked into natural resource knowledge and management.[11]

Tany Meva Foundation: The Tany Meva Foundation is the first Malagasy environmental community-based foundation dedicated to mobilize and manage financial resources in order to promote environmental sustainable management involving local communities' participation.[11]

Bilateral/Multilateral Institutions

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): Has funded several environmental or governance projects in Madagascar including: advisory services for the Ministry of Finance,[22] micro-irrigation systems, organic farming, and sericulture.[23]

The World Bank WAVES program: The World Bank Wealth Accounting and Valuation of Ecosystem Services (WAVES) program is a global partnership led by the World Bank that aims to promote sustainable development by mainstreaming natural capital in development planning and national economic accounting systems, based on the System of Environmental-Economic Accounting (SEEA).[2]

The World Bank: The World Bank has funded several projects in Madagascar relevant to this scoping report (e.g. Irrigation and Watershed Management Project; Mineral Resources Governance Project, P104983*; Assistance technique pour l'intégration de la gestion des risques climatiques et des catastrophes dans le développement économique à Madagascar*; and the Ankeniheny Mantadia Zahamena (CAZ) Biodiversity Conservation and Restoration Corridor Carbon Program, P108943). Notably, the Environment Programs Phase II and Phase III focused on integrating biodiversity conservation into development (1997-2003) and mainstreaming conservation into macroeconomic management and sectors programs and establishing sustainable conservation financing mechanisms (2004-2008).[15]

Ecosystem valuation, natural capital accounting, and ecosystem accounting

Madagascar has a fairly long history of undertaking ecosystem valuation work, though only a few projects have been implemented at the national scale and a 2015 report noted that no robust quantitative analyses of the country's total wealth exists.[2] In 1996, the National Strategy for Sustainable Management of Biodiversity was established; one of the objectives of this strategy was to initiate sustainable valuation of biodiversity by improving knowledge of economic, ecological, and

sociocultural values of biodiversity.[10] In 1997, satellite accounts (biophysical and monetary accounts) were developed for forest management and water management.[12] The satellite accounts were developed in accordance with the European System for the Collection of Economic Information on the Environment (SERIEE) methodology of EUROSTAT. However, these accounts were not updated following creation.[12]

The World Bank has played a large role in Madagascar's environmental valuation work. From 1997 to 2015, the World Bank undertook its Environment Program II and Phase III (World Bank program: P074235) which aimed to: 1) integrate biodiversity conservation with development (Phase II); and 2) mainstream environment conservation into macroeconomic management and sectors programs and establishing sustainable conservation financing mechanisms (Phase III).[15] It was noted that Phase II lacked genuine local and community-level ownership.[15] However, it did establish conditions for mainstreaming sustainable environmental and natural resource management at the national level and policy reform into economic sectors (with greatest impact on mining, fisheries, aquaculture, and industry sectors).[15] Phase III allowed the Government of Madagascar to provide USD$0.5 million in co-financing to the World Bank WAVES program (see below).[9] Phase III is currently scheduled to close at the end of 2015.

Starting in 2011, Madagascar began participating in the World Bank WAVES program.[2,3] During the initial stages of the WAVES program, priority issues selected for consideration included: 1) rent capture, distribution, and reinvestment in the mining sector; 2) integrated water resource management planning; 3) sustainable management of timber resources; 4) understanding the contribution of the tourism sector to the economy; 5) sustainable financing of the national protected area network; 6) natural capital accounting for fisheries and coastal resources; and 7) macro-economic performance monitoring.[2] However, due to intensive data collection requirements and other issues, the fisheries account was dropped from the WAVES program and it was decided that an ecosystem account would be constructed later or only for a select protected areas.[2]

Via the WAVES program, the following accounts are being produced (following the UN SEEA Central Framework): 1) macro-economic indicators; 2) mineral accounts; 3) timber accounts; and 4) water resources accounts.[3] A satellite tourism account is also being developed.[2] In each sector, two parallel processes of account elaboration are being implemented simultaneously: one for which data is readily available and one which requires further methodological and conceptual work and for which data is less accessible.[2] A 2015 presentation on the WAVES program indicated that there have been challenges in the creation of the accounts.[3] However, the presentation also indicated that the government has supported the WAVES program by establishing a Steering Committee and Technical Working Groups for each priority issue and providing UDS$0.5 million in co-financing (as noted before, in relation to the World Bank Phase III Environmental Program).[3] This presentation also noted that a Natural Capital Accounting (NCA) unit was created in 2014 within the Ministry of Economy[3] which is a 5-person team that

will eventually take on the roles/attributions of the national WAVES coordinator.[2]

Aside from the WAVES program, there are few other national programs that aim to integrate biodiversity/ecosystem values into national/local strategies and planning processes.[11] There are also apparently no other programs that aim to incorporate the value of natural resources/biodiversity into national accounts.[11] However, NCA was recognized as important in the National Development Plan.[3] In addition, in 2013, Madagascar endorsed a communiqué and declaration arising from the Summit on Sustainability held in Gaborone, Botswana related to the implementation of natural capital accounting.[2] Madagascar is a member of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES); the members of IPBES are committed to building IPBES as the leading intergovernmental body for assessing the state of the planet's biodiversity, its ecosystem, and the essential services they provide to society.[24]

There are gaps in ecosystem valuation in Madagascar. In 2010, and as part of the preparatory work for WAVES Madagascar, a literature review of 23 existing research studies containing data on ecosystem valuation in Madagascar was carried out.[12] This review concluded that: 1) all but two studies focused on terrestrial ecosystems; 2) 40% of studies focused on humid forest ecosystems; 3) hydrological function was the most commonly studied ecosystem service followed by soil fertility/erosion and tourism; 4) only about half of the studies collected primary data; 5) most of the studies involved demonstration case studies that aimed to highlight the value of ecosystem services.[12] There were a lack of: studies on coastal ecosystems; data on timber as an ecosystem service; research into carbon sequestration values; or research at the national scale.[12]

Past and current efforts relevant to this scoping are detailed, below.

Ecosystem Valuation

National efforts:

Economic and policy aspects of the Malagasy fisheries and coastal resources sector: As reported in 2012, the World Bank WAVES program used the fisheries and coastal resources sector as a case study to demonstrate the economic importance of national economic development and subsistence resource use.[12] Objectives of the study included: 1) characterization of economic activity in the sector including contribution to national and local economic development; 2) identification of data availability and data gaps in the economic activity of the sector; and 3) analysis of strengths and weaknesses of current policy framework.[12] The case study concluded that fisheries and coastal resources are an important part of the national economy, representing 2% of GDP in 2010.[12] However, it was noted that a lack of data prevented accurate estimates of the annual flows.[12]

World Bank estimates of national wealth: Two estimates of comprehensive wealth were prepared by the World Bank in 2005 and 2010; the first was as part of "The Changing Wealth of Nations" analysis and the second was developed using data from 2005 for a Madagascar Country Environmental Analysis.[12] These estimates used readily available

data from global databases and excluded sub-soil assets and produced differing results of Adjusted Net Savings (ANS, from +7% to -6.5% of Gross National Income) and estimates of comprehensive wealth (USD$2,056 per capita to USD$3,489 per capita).[12]

Sub-national efforts:

Valuing ecosystem services in the CAZ Forest Corridor in eastern Madagascar: As reported in 2012, the World Bank WAVES program used the Akenhiheny-zahamena Forestry Corridor (CAZ) as a case study to demonstrate the economic importance of key ecosystem services including water supply, sediment regulation, and climate regulation.[25] This program utilized biophysical modeling and economic analysis methods to address the complex nature of ecosystem service provision as well as the role of ecosystem services as inputs to economic sectors such as agriculture, mining, tourism, and hydroelectricity.[25] The case study highlighted the potential economic importance of water services in the eastern humid forests of Madagascar in relation to mining, tourism, and agricultural activities.[12] The case study also highlighted the potential economic importance of carbon services in these forests and on issues relate to carbon markets.[12]

Economic valuation of the Rio Tinto rainforest conservation project: The Rio Tinto mining company partnered with the IUCN in 2011 to calculate the monetary value of the biodiversity benefits from a rainforest conservation project (aimed at compensating for the residual impacts of their mining operations).[7] Specifically, the project focused on the Tsitongambarika forest complex in southeastern Madagascar.[7] Detailed methodology for the ecosystem valuation can be found in the project report.[7] The ecosystem benefits considered in the study included wildlife habitat (USD$2.9 million), hydrological regulation (USD$470,000), carbon storage (USD$26.8 million), and ecotourism (USD$2.9 million).[7] The study found that there were significant net economic benefits associated with conservation (approximately USD$17.3 million net of all costs), mainly due to carbon storage services.[7] The study underscored the need for, and potential scale of, compensation for local populations (for example through Payments for Ecosystem Services).[7]

Cost-benefit analysis of sub-regional projects implemented by ANAE (National Association for Environment Management Support Component): As part of the Environment Program Phase II, the World Bank undertook cost-benefit analyses in 2001 for four different types of mini-projects implemented by ANAE.[15] The analysis considered four types of mini-projects; 1) slope cultivation using terraces; 2) small dams and irrigation systems; 3) reforestation; and 4) agricultural extension.[15] The analyses showed that for all mini-projects except reforestation, the benefits exceeded the costs.[15] However, it was noted that the analyses did not factor in the benefits of positive downstream impacts of reforestation and soil conservation.[15]

Natural Capital Accounting

National efforts:

Macro-economic indicators: Macro-economic indicators are being developed via the World Bank WAVES program.[3]

This will improve the country's ability to: 1) monitor the sustainability of its economic development; and 2) manage key natural resource based sectors.[2] In a 2015 presentation, the WAVES program reported that the: 1) focus was on adjusted net savings (ANS) and natural capital wealth (depletion of natural capital represented 2.7% of the country's GDP in 2010; total wealth is declining and ANS has been negative since the 1980s); 2) a macro-economic policy note has been drafted; and 3) communication and training workshops are planned in order to build capacity.[3] This presentation noted that the next steps would involve updating the indicators and updating the policy note.[3]

Forest Management Accounts: In 1997, satellite accounts (biophysical and monetary accounts) were developed for expenses in forest management.[12] The satellite accounts were developed in accordance with the European SERIEE methodology of EUROSTAT. These accounts were not updated following creation.[12]

Timber Accounts: Timber accounts are being developed via the World Bank WAVES program.[3] The timber accounts are expected to inform policy on sustainable exploitation of timber resources and household energy use (the population is highly reliant on fuel wood for energy and timber for construction purposes).[3]

WAVES Madagascar will develop physical and monetary forest stock accounts for the whole of Madagascar.[2] In a 2015 presentation, the WAVES program reported that: 1) data has been collected on timber stocks for different forest types both inside and outside of protected areas (extent of different forest ecosystem types); 2) there is ongoing work to calculate the monetary value for the different forest types; and 3) there is ongoing work to calculate the yearly formal and informal consumption of timber.[3] This presentation noted that the next steps would involve: 1) compiling the monetary account for legal and illegal extraction; 2) publishing a policy brief on timber physical and monetary accounts.[3] Outside consulting firms are being recruited to undertake data compilation tasks as well as some of the analyses for this account.[2]

Tourism Account: A full tourism satellite account is being developed by the WAVES program.[2] This account will provide information on: 1) tourism's contribution to GDP; 2) employment in tourism; and 3) tourism expenditure and consumption data.[2] These data will be further disaggregated among visitors that visited a protected area, and those that did not, to provide information on the contribution of nature-based tourism.

To date, a visitor and enterprise tourism survey was conducted between September and November 2014 to generate information on the size and economic contribution of protected area tourism to national economic development.[2] These data will be extrapolated in order to build the first tourism satellite account with the help of outside technical assistance.[2]

Mineral Accounts: Mineral accounts are being developed via the World Bank WAVES program.[3] The identified policy entry points for the information from a Minerals Accounts are: 1) maximizing resource rent; 2) investment of resource rents in productive assets; and 3) managing land use conflicts and to

control other adverse effects.[3]

WAVES Madagascar will provide technical assistance in developing industrial mineral physical and monetary stock accounts.[2] In a 2015 presentation, it was noted that a mineral physical stock account had been created for Ilmenite, Nickel, Cobalt, and Chrome for 2008-2012.[3] This presentation noted that the next steps would involve: 1) refining the physical stock account; 2) calculating rent; and 3) a policy analysis related to mineral rent recovery, distribution, and investment.[3]

Water Management Accounts: In 1997, satellite accounts (biophysical and monetary accounts) were developed for expenses in water management.[12] The satellite accounts were developed in accordance with the European SERIEE methodology of EUROSTAT. These accounts were not updated following creation.[12]

Water Resources Account: A water resources account is being developed via the World Bank WAVES program.[3] This account is being developed because while there are abundant water resources in Madagascar, there are major seasonal and subnational differences, water exploitation is low, and although agriculture uses 97% of water resources, it only contributes 27% of the GDP.[3]

In a 2015 presentation, the WAVES program noted that: 1) data on physical stocks had been collected for 2001-2013 (including renewable water stocks for the country's 530 sub-basins[2]); 2) a first attempt had been made at compiling values for national water assets and flows; and 3) data collection is ongoing for the flow account.[3] This presentation noted that the next steps would involve: 1) refining priority policy questions; 2) selecting a pilot basin for flow accounts; 3) compiling the water accounts; and 4) publishing a policy brief on stock and flow accounts.[3] Data will be progressively added on: 1) extractive, manufacturing, and constructing industries; 2) electricity, gas, steam, and air conditioning production; 3) waste water collection and treatment, water distribution; 4) sanitation; 5) waste collection and treatment, services; and 6) domestic use.[2]

Priorities within the country

Madagascar faces a series of complex economic, political, and environmental challenges. In 2014/15 alone, the country welcomed a new government to power, there was flooding in the highlands while families in the south faced high levels of hunger, there was an outbreak of the bubonic plague and a locust infestation, and poverty levels remained high. Meanwhile, environmental degradation has resulted in the removal of 80-90% of the country's primary vegetation; further unsustainable use of natural resources will continue until the economy is diversified. There are several important social and political issues that the government views as important priorities and these often take precedence over the environment. Nevertheless, the government is a strong supporter of the environment and has signaled its support in policies and program implementation. The government also recognizes that environmental protection could be linked to poverty reduction and sustainable development.

Madagascar has indicated its priorities for the environment in several of its policy documents. First, EIAs are now required before any large-scale

projects are undertaken that could impact the environment.[10] Second, the ICZM policy is a promising step forward in coastal zone management given that Madagascar's fisheries policies are otherwise outdated, that 2% of the country's GDP comes from fisheries, and that the marine surface of Madagascar is more than twice its land surface.[3,6] Third, the NSSMB explicitly links biodiversity protection and valuation with poverty-reduction and sustainable development; an update to the plan was expected in 2014.[10,11] Fourth, there has been progress in REDD+ programming; the government, in partnership with non-profit stakeholders, successfully sold carbon credits to fund the creation of a protected area. REDD+ programming is expected to become a major cornerstone of Madagascar's environmental programming. It should be noted, though, that some of these environmental policies were created before the current government and it is not clear how they will be implemented moving forward. In addition, some of the policies mentioned above were adopted into law but implementation has been weak.

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MOZAMBIQUE

The Republic of Mozambique has undergone large economic growth from 1994 (Gross Domestic Product, GDP of $4 billion) to 2014 (GDP of $30.9 billion) thanks to macroeconomic reforms and donor assistance.[1] This growth rate has been one of the strongest in Africa.[1] Nevertheless, and despite Mozambique being one of the most stable countries, politically, in the region, it is also one of the poorest.[2] Mozambique's 2014 GDP is estimated to have been USD$31.1 billion and the 2014 GDP per-capita (PPP) was USD$1,200.[1] Real GDP growth was approximately 7.4% in 2013 and 2014.[1] In 2014, the largest contributors to Mozambique's Gross Domestic Product (GDP) were agriculture (28.9%), industry (24%), and services (47.1%); 81% of the labor force is involved in agriculture, 6% is involved in industry, and 13% is involved in services.[1] Important agricultural products include cotton, cashew nuts, sugarcane, tea, cassava, corn, coconuts, sisal, citrus, potatoes, sunflowers, beef, and poultry.[1] Approximately 25 million people live in Mozambique, 67.8% of the population lives in rural areas, and 52% of the population was below the poverty line in 2009.[1] Much of the population depend on natural resources for their livelihoods.[3,4] Renewable and non-renewable natural capital have been calculated as 49% of the total wealth of the country.[3]

Acronyms

CBD: Convention on Biological Diversity
CEEPA: Centre for Environmental Economics and Policy in Africa
CIFOR: Center for International Forestry Research
CONDES: National Council for Sustainable Development
DANIDA: Danish Ministry of Foreign Affairs
DFID: Department of International Development (UK)
DNTF: National Directorate of Land and Forestry
FAO: Food and Agriculture Organization of the United Nations
Forest Carbon Partnership Facility: FCPF
FCA: Environmental Accounting Forum
FUNAB: National Environment Fund
GDP: Gross Domestic Product
GDSA: Gaborone Declaration for Sustainability in Africa
GEAP: Green Economy Action Plan
GEF: Global Environment Facility
GHD: Green Human Development Program
GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit
INE: National Statistics Institute
MICAO: Former incarnation of the Ministry of Lands, Environment, and Rural Development.
MPD: Ministry of Planning and Development
MPF: Ministry of Planning and Finance
MozBio: Mozambique Conservation Areas for Biodiversity and Development
NAPA: National Adaptation Program of Action
NatCap: WWF's Natural Capital Project
NBSAP: National Biodiversity Strategies and Action Plans
NCA: Natural Capital Accounting
NGOs: Non-Governmental Organizations
NRAESA: Natural Resource Accounting Program in East and Southern Africa
PEAV: Action Plan for the Green Economy
PEER: Public Environment Expenditure Review
PEI: Poverty Environment Initiative
PGQ: Five-Year Government Program
PARP: Poverty Reduction Action Plan
REDD+: Reducing Emissions from Deforestation and Forest Degradation
SEEA: System of Environmental-Economic Accounting
SEN: National Statistical System
SIDA: Swedish International Development Agency
SNA: System of National Accounts
UEM: University Eduardo Mondlane
UNDP: United Nations Development Program
UNEP: United Nations Environment Program
WWF: World Wide Fund for Nature

Ecosystem extent and condition

Mozambique's area covers a total of 799,380 km^2 and the country has 2,470 kilometers of coastline.[1] In 2011, land uses included agricultural land (56.3%) and forest (43.7%).[1] Mozambique's important ecosystems include: woodlands, coral reefs, mangroves, and seagrass meadows.[5] Mozambique's terrain is mostly coastal lowlands, with uplands in the center, high plateau in the northwest, and mountains in the west.[1] Lake Niassa is the largest and most biologically diverse freshwater lake in the world.[3] The Gorongosa Mountain is the last remaining tropical montane ecosystem in the country.[3]

Ecosystem services and natural resources

Mozambique's important natural resources include its coal, titanium, natural gas, hydropower, tantalum, graphite, and wildlife (fauna and flora).[1] The government is planning to expand its hydropower capabilities and natural resources are expected to increase government revenues.[1,6] In 2011, 89.7% of the country's electricity came from hydroelectric plants.[1] A full scoping of ecosystem services in Mozambique (as well as the regions of the country where ecosystem services provided critical services to human populations) was conducted by the United Nations Environment Programme (UNEP) in 2005 by the Poverty-Environment Initiative (PEI).[7]

Threats to ecosystem services and natural resources

Mozambique's natural hazards include severe droughts, cyclones, and floods (especially in the central and southern provinces).[1] Environmental issues include increased migration of the population to urban and coastal areas (resulting in adverse environmental consequences), desertification, pollution of surface and coastal waters, hunting, and elephant poaching for ivory.[1,5] As the human population increases, so does human-wildlife conflict.[6] Mozambique is one of the countries most affected by climate change;[8] climate change may cause the GDP to fall between 4 and 14% with significant declines in welfare by 2050.[4]

Policy

Mozambique adopted a new constitution in 2004 with amendments drafted in 2013 (though these have not yet been instituted).[1] The country has 10 provinces.[1] The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) recently funded (2007-2014) a project to help decentralize the government in order to spur rural development together with the Ministry of Planning and Development.[9] The gradual decentralization process has helped 53 autonomous municipalities come into existence since 1998; a 2009 detailed review of the local government system exists.[9,10]

Mozambique is party to several international environment agreements (Appendix A). Recent reviews of policy related to biodiversity conservation and Reducing Emissions from Deforestation

and Forest Degradation (REDD+) have been published.[11,12] Specific policies relevant to this scoping study are discussed in more detail, below.

National policies/programs:

Action Plan for the Green Economy (PAEV, 2013): Approved by the government in 2013.[4]

Agenda 2025: Agenda 2025 details the vision and strategy by which the citizens of Mozambique can move into the 21st century and spur a revolution in science and technology.[13,14] The objectives of the Agenda are to: 1) create a long-term national vision through a participatory process; and 2) prepare a National Development Strategy through a participatory process, defining the necessary policies and programs for responding to the objectives identified in the national development strategy.[14]

Environmental Strategy for Sustainable Development (2007): The strategy focuses on 1) the protection and management of ecosystems and biodiversity, 2) good management of the growing urban environment 3) control of atmospheric pollution and of climate change and 4) population and welfare, looking at health, knowledge, governance and equity to and sharing natural resources.

Five-Year Government Program (PGQ, 2015-2019): Calls for development to take into account the sustainable use and conservation of biodiversity.[4,11] However, it does not define targets for individual sectors by uses an "holistic and integrated approach".[15]

Green Economy Action Plan (2013, GEAP): This plan calls for the integration of natural capital planning and climate change adaptation in national development planning. It includes a strategy for moving Mozambique towards a green economy and the plan will be fully integrated into the country's Five Year Plan from 2015.[3]

Mozambique Conservation Areas for Biodiversity and Development Project (2014, MozBio): Supported by the World Bank and the Global Environment Facility (GEF), this project promotes innovative mechanisms to ensure sustainable financing of Conservation Areas. The project aims to address the most pressing challenges to conservation area management, including strengthening the institutional and policy framework for conservation.[3] More information regarding the program can be found in several World Bank reports.[16]

Mozambique Poverty Environment Initiative (PEI): This program supports the integration of environment into development policy, planning, and the budgeting process. Lead by the MICOA (now the Ministry of Lands, Environment, and Rural Development) and Ministry of Planning and Development (MPD) with assistance from the UNEP-UNDP PEI program (see below for more details).

National Adaptation Program of Action (NAPA): NAPA lays the foundation for addressing climate change issues in Mozambique in an integrated manner. Priority activities highlighted in the NAPA include early warning systems, strengthening capacity in the agricultural sector to adapt to climate change, reducing the impacts of climate change

in coastal zones, and managing water resources.[3]

National Biodiversity Strategies and Action Plans (NBSAP): Mozambique's NBSAP was originally drafted in 1998, revised in 2002, and adopted in 2003.[3] Activities on revision and updating the NBSAP have been initiated, which will integrate gender and climate change issues into the NBSAP as well as its national biodiversity targets into local development plans.[5]

National Environment Fund (FUNAB): Established in 2000 but with its goals adjusted in 2011, this fund encourages the use of clean technology and environmentally acceptable production practices to raise funds for the implementation of environmental activities.[3]

Poverty Reduction Action Plan (PARPI, PARPII, PARP 2011-2014): The PARPI was a medium-term strategy was followed by PARPII and then by PARP 2011-2014.[3,17] This government program aims to cut poverty, improve social development, and foster key sectors including agriculture, fisheries, minerals, transport, and tourism.[3] The primary goal of the PARPII was to reduce the incidence of food poverty to 42% by 2014.[17] The PARP 2011-2014 was aligned with Agenda 2025 and designed to help achieve the Millennium Development Goals (MDGs).[17]

REDD+ Programs in Mozambique: The government has issued an Interim Decree on REDD+; a REDD+ Working Group was established in 2009.[3,12] In 2012, Center for International Forestry Research (CIFOR) conducted an extensive overview of the REDD+ context in Mozambique including a synthesis of knowledge of the causes of forest carbon changes, a review of the legal and institutional context, and a description of the political process of REDD+.[15]

Data Availability and Monitoring

In Mozambique, data are not often available for monitoring.[3,4] For example, a 2014 report for the Convention on Biological Diversity (CBD) indicated that while several floristic and faunal surveys had been undertaken in conservation areas and biodiversity hotspots, there data were missing regarding the value of ecosystem services and that surveys had been restricted to specific ecosystems.[11] In addition, a 2012 CIFOR report on REDD+ indicated that little was known about land-cover changes at the national level and that a lot of baseline data required to undertake these types of analyses were missing.[12] Specifically, CIFOR indicated that the capabilities (specifically for REDD+) are limited due to a lack of available data on carbon, infrequent updates, and limited technical capacity.[12] In addition, relevant data for REDD+ were scattered across different ministries and that there was a need to invest in the harmonization of an infrastructure database.[12] During the 2015 Gaborone Declaration for Sustainability in Africa (GDSA) roadshow meeting, it was noted that the country needs to establish stronger frameworks for environmental monitoring, though some work does exist via the environmental statistics compendium and the monitoring system for climate change.[4] During this meeting, the government indicated that its priorities for environmental-economic monitoring would be to establish an

indicator system within the existing monitoring and evaluation framework.[4] In addition, the government aims to create a database of natural capital that will feed into the environmental statistics compendium.[4]

The World Bank is currently undertaking a program to enhance spatial data for flood risk management project.[18] Via this program, staff are being trained in Lidar processing and data management as well as in hydraulic and hydrological modeling.[23] This is being implemented by the National Director of Water and the National Institute for Meterology.[18]

A few national data collection programs are listed, below, and examples of data resources are listed in Table 17.

National government data sources:

Centers for Sustainable Development: There are three centers which deal with research, implement projects, and provide technical assistance on environmental issues at the province and district level.[5]

Environmental Statistics Compendium: Little information is available regarding this compendium but it seems to have been published at least once (hard copy) by the government.[4]

Table 17: Data availability from different sources. This is not a comprehensive list and is simply illustrative of the kinds of data that may be available.

Type of Data	Data Source
Agriculture	
Agricultural Census	INE[12]
Climate Change/Degradation	
Fire risks/locations of fires	Ministry of Agriculture[12]
Land cover	
Land area covered by forests	MICOA[12]
Deforestation statistics	Models developed by FAO[12]
Natural Resources	
Timber concessions/production	National Directorate of Land & Forestry (DNTF)[12]
Forest inventory	Government[12]
Socio-economic/Administrative	
Population/age data	National Statistics Institute (INE)[14]
Water/Hydrology	
Flood risk hazard maps	World Bank[19]

Statistical capacity

The National Statistics Institute (INE) is the central executive body of the National Statistical System (SEN) and is responsible for the overall collection, production, and dissemination of statistics in the country within the framework of the SEN.[20] The SEN is comprised of the INE, the High Council for Statistics, Bank of Mozambique, and the Co-ordination Council for the Population Census.[20] INE uses the 1993 System of National Accounts (SNA) reporting methodology.[21] The International Monetary Fund has a comprehensive review of the methods

used by Mozambique in the development of their national accounts.[21] In addition, in 2006, a consultant supported by Statistics Denmark, Statistics Norway, and Statistics Sweden undertook produced a detailed report on the National Statistical System of Mozambique as part of a Scandinavian Support Program to strengthen the institutional capacity of national statistics in Mozambique.[20]

Relevant Actors

Government

There are several government institutions that have extensive experience in fields relevant to this scoping effort (Table 18). An extensive overview of ministries working in environment was conducted by UNDP-UNEP PEI.[2]

Civil Society

An overview of civil society working in the environmental sector can be found in UNDP-UNEP PEI documentation.[2] In addition, a recent CIFOR publication comprehensively reviews all of the main actors involved in REDD+ implementation in Mozambique.[12] Several relevant civil society institutions are listed, below.

Faculty of Economics, University Eduardo Mondlane (UEM): Published a report with the World Bank launching the start of a Development Dialogue Series (also co-funded by UK Department of International Development, DFID) to discuss the sustainable management of natural resources.[3] This university is assisting in the country's Green Economy Plan.[3]
Rare: Rare is an NGO that is supporting the Government of Mozambique in implementing the World Bank-funded Artisanal Fisheries and Climate Change Project.[24]

World Wide Fund for Nature (WWF): Is providing technical support in baseline mapping and valuation of all natural resources in Mozambique. Also providing technical support for the zoning of territory according to natural capital management objectives and strengthening civil society organizations participation in the valuation process.[3] WWF's work is being conducted in Mozambique under the Natural Capital (NatCap) Project.[25]

Bilateral/Multilateral Institutions

An overview of development partners working in the environmental sector in Mozambique can be found in UNDP-UNEP PEI documentation.[2] Several relevant institutions are listed, below.

African Adaptation Program: Funded by Japan, this program supports annual provincial plans on social and economic statistics.[3]

African Development Bank: Providing assistance to the country's Green Economy Plan.[3]

Danish International Development Agency (Danida): Has committed $2.75 million for environmental and climate activities at the national and sub-national level (with matching funds from the government of Mozambique).[3]

DFID: Co-funding the Development Dialogue Series (alongside the World Bank) which discusses the sustainable management of natural resources.[3]

Table 18: Government ministries/agencies that appeared to have had roles in the past related to ecosystem valuation and natural capital accounting. Some of the ministries listed here may no longer exist or may have been folded into other ministries.

Ministry	Notes
Agriculture	
Ministry of Agriculture and Food Security	Responsible for monitoring and regulating water pollution; undertakes initiatives that link support of low-income communities with the environment.[21,22]
Environment	
Ministry of Lands, Environment, and Rural Development (formerly the Ministry of Coordination of Environmental Affairs, MICOA)	Participant in the 2015 GDSA roadshow event in Mozambique.[4] Under its former name: One of the managers of the UNEP-UNDP PEI.[3] Partnered with UN-PEI to release the Environmental Economic Analysis of Natural Resources Management in Mozambique report.[3] Coordinates environment and climate change programming.[3] Facilitates cross-sectoral integration of biodiversity.[5] Listed in a CBD document as having responsibilities related to natural capital accounting.[23]
Environmental Accounting Forum (FCA)	Listed in a CBD document as having responsibilities related to natural capital accounting.[23]
Planning	
National Council for Sustainable Development (CONDES)	Mandated to promote cross-sectoral dialogue and monitor the implementation of policies related to environmental management.[3] Coordinate sustainable development initiatives.[4] Hosts the GDSA focal point of Mozambique.[4]
Ministry of Planning and Development (MPD)	One of the primary managers of the UNEP-UNDP PEI.[3]
Statistics/Finance	
Ministry of Economy and Finance	
National Statistics Institute (INE)	Collects socio-economic data.[14]
Ministry of Planning and Finance (MPF)	Listed in a CDB document as having responsibilities related to natural capital accounting.[23]
Water/Meteorology	
National Institute for Meteorology	Implementing a World Bank training program on hydrological modeling and the development of a spatial layer on flood risk management.[19]
National Director of Water	Implementing a World Bank training program on hydrological modeling and the development of a spatial layer on flood risk management.[19]

GIZ: Has funded several environmental or governance projects in Mozambique including: adapting to climate change;[8] decentralization for rural development;[9] green economy initiatives (employment for sustainable development in Africa);[26] and improving natural resource governance.[6]

UNEP-UNDP Poverty-Environment Initiative (PEI): The UNEP-UNDP PEI in Mozambique began in 2005 and focused on building government capacity at national, provincial, and district levels to integrate the environment into social and economic plans.[3] Work is being conducted in three

pages (Phases I-II: 2005-2013; Phase III: 2014-2017).[27] The PEI seeks to contribute to poverty reduction and improve well-being of poor and vulnerable groups through the inclusion of environmental concerns into national development processes. The program is managed by MICOA (now called the Ministry of Lands, Environment, and Rural Development), the MDP, and the UNDP-UNEP PEI Mozambique team.[3] Sector ministries including Finance, Agriculture, Tourism, Health, Mineral Resources, Public Works, Women, and Social Affairs are involved in the implementation of program goals.[3] This program has successfully mainstreamed the concept of linked poverty-environment programming, as evidenced by the creation of the UNDP Green Human Development Program.[3]

United Nations Development Programme (UNDP): Providing assistance to the country's Green Economy Plan via the development of the UNDP Green Human Development Program (GHD).[3]

UNEP: Providing assistance to the country's Green Economy Plan.[3]

The World Bank: The World Bank has funded the evaluation of coal and gas resources in Mozambique using the wealth accounting framework.[28] The World Bank has also provided assistance to the country's Green Economy Plan.[3] The World Bank has funded many environmental programs in Mozambique with sub-national and national impacts (e.g. Cities and Climate Change Project;[29] Transfrontier Conservation Areas and Tourism Development Project[18]). Starting in 2008 (though this program was put on hold in 2010), the World Bank also managed the Scheme for Forest Carbon Partnership Facility (FCPF).[12]

Ecosystem valuation, natural capital accounting, and ecosystem accounting

Mozambique has long exhibited an interest in valuing nature. A 2003 report for the CBD noted the importance of recognizing environmental costs and the need for their inclusion into national accounts.[5] Objective 2.9 of the report was "to assess the economic, social, and environmental contribution of business developments and create a national accounting system integrating all three components."[5] The report specifically indicated that Mozambique should "strive for a gradual reduction in the over valuing of macroeconomic results, such as GDP for example, through the omission of environmental costs."[23] The report listed its 2010 goals as including: 1) the establishing a satellite national accounting system for environmental accounting; and 2) the formulation of a legal instrument to govern the production of information, making it available to the relevant entities and drawing up of the satellite environmental accounts.[23] Interestingly, the report identified specific activities, goals, responsible institutions, and indicators needed for setting up these satellite environment accounts.[23] The report estimated that the development of these accounts would cost $550,000 (it is not clear which currency this estimate was in). Activities that were linked to the establishment of the accounts, included: creating an inter-ministerial committee (private sector and NGOs included); defining priorities; approving legal instruments to regulate production and

exchange of the information contained within the accounts; training of multi-sectoral teams; creating a system to collect, process, and exchange multi-sectoral information; encouraging the development of university sources on relevant topics; working with private companies to gain access to data required for the accounts; and raising public awareness.[23]

A 2014 follow-up report to the CBD on these plans to create satellite environmental accounts indicated that not all prior goals and objectives had been achieved.[11] In the decade following the 2002 report, the national accounts were not updated to reflect the state of biodiversity and ecosystem services.[11] However, the following benchmarks had been achieved: some resource evaluation studies had been conducted in the field; the National Institute of Statistics (in coordination with MICOA, now called the Ministry of Lands, Environment, and Rural Development) had started to design a proposal to create some environmental national accounts; and the website of Agriculture and Forestry, Faculty of Engineering (Eduardo Mondlane University, EMU) listed some studies on resource valuation.[11] Of note, the five-year government plan (2010-2014) also called for development to take into account the sustainable use and conservation of biodiversity.[11]

In 2003, the NRAESA (Natural Resource Accounting Program in East and Southern Africa) was expanded into Mozambique.[30] With funding from the Swedish International Development Agency (SIDA), the Centre for Environmental Economics and Policy in Africa (CEEPA) at the University of Pretoria (South Africa) supported the implementation of natural resource accounting in four countries (Tanzania, Uganda, Ethiopia, and Mozambique). In Mozambique, the NRAESA project was implemented on a pilot basis in order to create sub-national accounts for the fisheries and water sectors.[30,31] While some information about these sub-national accounts has been published, it is not clear whether they have been institutionalized by the government of Mozambique.

In 2012, MICOA (now the Ministry of Lands, Environment, and Rural Development) partnered with UN-PEI to author the Environmental Economic Analysis of Natural Resources Management in Mozambique report.[3,32] This report included an assessment of the contribution of the environment to the economy as well as an assessment of the economic costs of degradation and inefficient use of resources.[3,32] This report noted that the contribution of natural resources to the economy is not captured in official statistics (e.g. subsistence agriculture, forestry, illegal/informal logging, and fisheries).[3,32] During the same year, the UN-PEI program also published the Public Environment Expenditure Review (PEER) document, which took an in-depth look at how the government in Mozambique was accounting for the environment in its national accounting systems and how this might be modified to better inform environmental initiatives.[2]

Several UNDP-UNEP PEI documents indicate that the Ministry of Finance opened a new budget classification code related to climate change in 2014.[33,34] In addition, MICOA (now the Ministry of Lands, Environment, and Rural Development) has decided to test the feasibility of using a wider range of budget codes (those related to land management and

physical and environment planning).[33] These budget codes should support the Ministry of Finance in analyzing the structure and effectiveness of the expenditure and coding on environment, natural resources, and climate in other sectors and its relation to economic development.[34] These new data could help with more accurate accounting and to identify investment gaps for sustainable environment and natural resource management.[34] It was noted that these sector analyses will inform the 2015 budget guidelines.[34]

In 2015 at the GDSA roadshow, it was noted that the contribution of natural resources to the Mozambican economy is not significantly captured in official statistics (including agriculture, forestry, fisheries, or informal logging).[4] It also reported that the country applied the Wealth Accounting Framework to identify the value of natural resources such as gas and coal to the economy of Mozambique.[4] Via this roadshow, the country's priorities with regard to natural capital accounting were that a comprehensive study on natural capital accounting needed to be conducted in order to know the value of the country's natural resources and how to utilize them.[4] Specifically, Mozambique was interested in: 1) capacity building in natural capital accounting especially in the areas of hydrocarbons and agriculture; and 2) a review of policy to incorporate natural capital accounting.[4] It was noted that the mapping, monitoring, and valuation of mangroves should be undertaken.[35]

Mozambique has signed the communiqué for natural capital accounting (related to Rio+20).[35] Other related (past and current) efforts relevant to this scoping are detailed, below.

Ecosystem Valuation

National efforts:

Sub-soil wealth in Mozambique: The Development Dialogue Series, funded by DFID and the World Bank and in partnership with EMU, uses the wealth accounting framework to examine the value sub-soil assets (coil and gas).[3,36] This exercise was not integrated into national policy and planning.

UNDP-UNEP Poverty-Environment Initiative (PEI): Outputs from this program have included the *Environmental Economic Analysis of Natural Resources Management in Mozambique*. This analysis was funded by UNDP-UNEP PEI and involved an assessment of the contribution of natural resources to the Mozambican economy.[32] The study estimated that the contribution of natural resources to the economy ranged between 47% and 50% of Mozambique's GDP.[32] The report also found that more than 82% of jobs available in the country depended directly on natural resources.[32] In addition, the *Public Environment Expenditure Review (PEER) was published* in 2012 jointly MICOA (now the Ministry of Lands, Environment, and Rural Development) and the PEI.[2,34]

WWF's NatCap Project: WWF plans to assess the risks to ecosystem services in Mozambique as well as work to identify steps to protect these services.[25]

Natural Capital Accounting

Sub-National efforts:

Fisheries Sectors: With funding from the Swedish International Development Agency (SIDA), the Centre for

Environmental Economics and Policy in Africa (CEEPA) at the University of Pretoria (South Africa) supported the implementation of natural resource accounting in four countries (Tanzania, Uganda, Ethiopia, and Mozambique). In Mozambique, the NRAESA (Natural Resource Accounting Program in East and Southern Africa) project was implemented on a pilot basis for the fisheries and water sectors.[37] It is unclear when this effort was initiated but report detailing some of the results were published in 2013.

The objective of the NRAESA project was to initiate a process leading to the institutionalization of natural resource accounting in the fisheries sector, with an emphasis on demonstrating the United Nations System of Environmental-Economic Accounting (UN SEEA) methodology and its practical applicability to developing satellite accounts for the sector.[31] The project established the classification to be used in constructing marine fisheries accounts for Mozambique and for estimating the physical and monetary accounts for fisheries.[31] The pilot was undertaken at a sub-national scale and were conducted for three species: gamba rosa, maguma, and line fish (though only the accounts for gamba rosa and maguma were considered complete). Data were sourced from the Ministry of Fisheries, the Fisheries Research Institute, the Small-Scale Fisheries Development Institute, provincial Departments within the Ministry of Fisheries, private fishing companies, and fisheries input suppliers.[31]

Water Sectors: With funding from the Swedish International Development Agency (SIDA), the Centre for Environmental Economics and Policy in Africa (CEEPA) at the University of Pretoria (South Africa) supported the implementation of natural resource accounting in four countries (Tanzania, Uganda, Ethiopia, and Mozambique). In Mozambique, the NRAESA project was implemented on a pilot basis (sub-national level) for the water sector.[30,31]

Priorities within the country

Mozambique is highly dependent on its resources and its population is predicted to double by 2030.[3] Key development challenges in Mozambique include the need to enhance inclusive growth and diversify the economy by boosting private sector productivity.[37] In addition, Mozambique will be strongly affected by climate change.[8] The country is especially vulnerable due to poverty, limited institutional development, and frequent extreme weather events.[8] For the World Bank, the management of mineral and energy resources for sustainable development has been a priority of the Bank's work in Mozambique.[22]

Via the 2015 GDSA roadshow, the country's priorities with regard to natural capital accounting were that a comprehensive study on natural capital accounting needed to be conducted in order to know the value of the country's natural resources and how to utilize them.[4] Specifically, Mozambique was interested in: 1) capacity building in natural capital accounting especially in the areas of hydrocarbons and agriculture; and 2) a review of policy to incorporate natural capital accounting.[4] However it is unclear whether potential projects related to natural capital accounting at the national level would be feasible due to financial and resource limitations; spending on the environment

is rather low (less than 1% of GDP, compared to the recommended 1.4%-2.5% for developing countries).[3] In addition, a study done on environmental institutions and their public expenditure in Mozambique found that the link between policy statements and budget allocations was weak.[3]

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NAMIBIA

The Republic of Namibia is considered an upper middle income country though its economy remains vulnerable to world commodity price fluctuations and drought.[1] Namibia's 2013 Gross Domestic Product (GDP) is estimated to have been USD$13.11 billion and the 2014 GDP per-capita (PPP) was USD$10,800.[1] Real GDP growth is approximately 5% per year.[1] In 2014, the largest contributors to Namibia's GDP were: agriculture (6.2%), industry (30%), and services (63.7%). In the year 2008, 16.3% of the labor force was involved in agriculture while 22.4% is in industry and 61.3% is in services.[1] About half of Namibia's people are unemployed and two-thirds of rural dwellers rely on subsistence agriculture.[1] Although mining and quarrying sectors employ less than 2% of the population, mining accounts for 11.5% of GDP and provides more than 50% of foreign exchange earnings.[1] Important agricultural products include millet, sorghum, peanuts, grapes, livestock, and fish.[1]

Approximately 2.2 million people live in Namibia, 54.3% of the population lives in rural areas, and 28.7% of the population was below the poverty line in 2010.[1] Much of the population depends on natural resources for their livelihoods (agriculture, fisheries, nature-based tourism, and indigenous natural plant products).[2] Around 70% of the population is directly dependent on natural resources for income.[2]

Acronyms

BCLME: Benguela Current LME
BIOFIN: Biodiversity Finance Initiative
CBD: Convention on Biological Diversity
CBNRM: Community Based Natural Resource Management
DEA: Directorate of Environmental Affairs
DWA: Department of Water Affairs
EIA: Environmental Impact Assessment
GDP: Gross Domestic Product
GEF: Global Environment Facility
GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit
GNP: Gross National Product
IEEA: Integrated Environmental-Economic Accounting
IUCN: International Union for Conservation of Nature
M&E: Monitoring and Evaluation
MAWF: Ministry of Agriculture, Water, and Forestry
MET: Ministry of Environment and Tourism
MFMR: Ministry of Fisheries and Marine Resources
MoF: Ministry of Finance
NBSAP2: Namibia's Second National Biodiversity Strategy and Action Plan
NDP: National Development Plans
NPC: National Planning Commission
NRASA: Southern African Natural Resource Account
NRA: Natural Resource Accounting
NSA: Namibia Statistics Agency
PoN: Polytechnic of Namibia
RC: Regional Committees
RISDP: Regional Indicative Strategic Development Plan
SADC: Southern African Development Community
SASSCAL: Southern African Science Service Centre for Climate Change and Adaptive Land Management
SEA: Strategic Environment Assessments
SEEA: System of Environmental-Economic Accounting
SNA: System of National Accounts
TEEB: The Economics of Ecosystems and Biodiversity
UNAM: University of Namibia
UNDP: United Nations Development Program
UNSC: United Nations Statistical Commission
USAID: United States Agency for International Development
VANTAGE: Valuation and Accounting of Natural Capital for Green Economy
WAVES: Wealth Accounting and the Valuation of Ecosystem Services
WWF: World Wide Fund for Nature

Ecosystem extent and condition

Namibia's area covers a total of 824,292 km^2 and the country has 1,572 km of coastline.[1] Namibia is the only continental country to have its entire unique coastline protected as a national park.[2] In 2011, land uses included: agricultural land (47.2%), forest (8.8%), and other uses (44%).[1] The terrain is mostly high plateau with the Namib Desert along the coast and the Kalahari Desert in the east.[1] Namibia has a wide range of ecosystems ranging from deserts to subtropical wetlands to savannas.[2] Namibia has four terrestrial biomes (Desert; Nama and Succulent Karoo; Acacia Savanna; and Broad-leafed Savanna) and two aquatic biomes (Coastal Marine; and Wetlands).[3] Namibia is home to the oldest desert in the world and Africa's largest river canyon.[2]

Ecosystem services and natural resources

Namibia's important natural resources include its flora and fauna, diamonds, copper, uranium, gold, silver, lead, tin, lithium, cadmium, tungsten, zinc, salt, hydropower, and fish (there are suspected deposits of oil, coal, and iron ore).[1,4] In 2013, hydroelectric plants provide 68.2% of electricity in the country.[1] Approximately 14% of land in Namibia is protected, including almost the entire Namib Desert coastal strip;[1] 43.5% of the land is under conservation management.[4] There is a significant socio-economic development potential attached to the country's natural resources and biodiversity; tourism is one of the top five contributors to GDP.[4] Travel and tourism, often linked to national parks, was estimated to have directly and indirectly accounted for 20.5% of the GDP in 2011.[3]

Threats to ecosystem services and natural resources

Namibia's natural hazards include prolonged periods of drought.[1] Namibia is a water scarce country; it is the driest country south of Sahara.[4] Environmental issues include limited natural freshwater resources, desertification, poaching, overgrazing, and land degradation.[1,4] Many of these issues arise as a result of population pressure, inefficient use of water resources, and overfishing.[4] Climate change will also impact Namibia; over the next 20 years, annual loses to the Namibian economy could be up to 6% of GDP due to the impact that climate change will have on its natural resources alone.[5]

Policy

Namibia's constitution was drafted in 1990 and was amended in 1998 and 2010.[1] Namibia was the first country in the world to incorporate the protection of the environment into its constitution[1] via a clause on the maintenance of biodiversity and the natural environment.[2] This clause states that the state must take measures to ensure "the maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and (utilize) living natural resources on a sustainable basis for the benefit of all Namibians, both present and future."[3]

Namibia is party to several international environment agreements (Appendix A). At the national level, environmental sustainability is well considered in the formulation of policies

by different sectors.[2] However, the translation of this policy into action is lacking due to shortages of human and financial resources and to the lack of a functioning, decentralized system.[2] Namibia has 14 administrative regions and 20 ministries.[1] Specific policies relevant to this scoping study are discussed in more detail, below.

National policies/programs:

Community Based Natural Resources Management (CBNRM) Program: This program was started in the early 1980's to provide communities with incentives that would promote sustainable management/use of wildlife/natural resources.[6] The CBNRM program has three pillars: 1) natural resource management; 2) institutional development and governance; and 3) business, enterprise, and livelihood.[7] Approximately 19% of Namibia's land mass is now managed via the CBNRM program.[2,6] Some of this work is funded by GIZ though it used to be funded by USAID, the World Bank, and WWF.[6,8] Between 1990 and 2011, the program attained a net present value of N$451 million.[6] This has been described as the only program in Namibia in which the linkages between biodiversity and poverty alleviation are systematically measured.[2]

Environment Investment Fund: This fund finances and promotes investments that protect and maintain nature.[9]

Environmental Management Act (2007): Passed with the support from GIZ; enforcement of the Act contributes to the reduction of negative environmental impacts and secures the sustainability of new developments.[10] Provides regulations for Environmental Impact Assessments (EIA) and Strategic Environmental Assessments (SEA).[10]

Namibia Vision 2030: Launched in 2004, the objectives of the Vision 2030 are to: reduce poverty; create employment opportunities; promote economic empowerment; stimulate and sustain economic growth; reduce inequalities in income distribution and regional development; promote gender equality and equity; enhance environmental and ecological sustainability; and combat further spread of HIV/AIDS.[4]

The Vision 2030 is implemented through five-year National Development Plans (NDP).[4] The third NDP (2007/8-2011/12) had eight key results areas, one of which was the productive utilization of natural resources and environmental sustainability.[4] The third NDP's aims were to consider the ways in which policy and legislative reform might advance natural resource management, monitoring, and conservation in nine key sub-sectors (agriculture, forestry, fisheries, water, lands, mining, energy, wildlife, and tourism) while strengthening indigenous capacity and introducing improved technologies.[4] The fourth NDP is currently in effect from 2012/2013 to 2016/17.[2] The fourth NDP focuses on three goals: high and sustained economic growth; increased income equality; and employment creation.[2] In terms of environmental management, the NDP4 focuses on implementing the Environmental Management Act, including Strategic Environmental Assessments.[11]

National Policy on Climate Change: Provides the legal framework to address climate change.[4]

Namibian Climate Change Strategy and Action Plan (2013-2020): Launched in 2013 by the Ministry of Environment and Tourism to help the country meet the Aichi Targets (as part of the CBD).[4] This plan was derived from the National Policy on Climate Change and has several objectives: 1) climate adaptation; 2) mitigation; and 3) addressing cross-cutting issues.[4]

National Environmental Policy (2012): One of the guiding principles of the environmental policy, among others, is to promote the concept of total economic valuation ("the benefits that ecosystems generate will be integrated into the national accounting system, programs, and projects").[12] The policy further notes that the government will develop and apply instruments and methodologies for integrating environment into national accounts and planning processes.[12]

Namibia's Second National Biodiversity Strategy and Action Plan (2013-2022, NBSAP2): Published by the Ministry of Environment and Tourism, the vision of the plan is for, "Namibia's biodiversity to be healthy and resilient to threats, and for the conservation and sustainable use of biodiversity to be key drivers of poverty alleviation and equitable economic growth, particularly in rural areas."[3] The valuation of biodiversity plays a prominent role in this strategy.[11]

Water Resource Management Act (2004): Uses the basin management approach, which promotes the management of water resources based on hydrological boundaries.[2]

Data Availability and Monitoring

Unlike other countries included in this scoping effort, few documents commented on monitoring systems in Namibia. However, it does appear that Namibia is working to increase its monitoring capabilities; it has been noted that there is a lack of a critical mass of experienced and skilled M&E staff within government offices, ministries, and agencies.[13] One example of capacity building in this regard includes a 2014 training on monitoring and evaluation which impacted 125 senior officials and M&E staff.[13] However, it was noted that additional training was needed and that leaders required more tools in order to effectively monitor programs.[13]

In terms of data availability, and because of Namibia's extensive natural capital accounting efforts in minerals and fisheries (managed by the Ministry of Environment and Tourism), several data sources (and data gaps) have already been identified.[14,15,16] Furthermore, in May 2015, the Gaborone Declaration Secretariat hosted a workshop to determine Namibia's priorities with regards to the Declaration. As a result of this workshop, the Namibia noted that they would move forward with environment-economic monitoring by determining the extent to which the country's Environmental Information Service and SASSCAL (Southern African Science Service Centre for Climate Change and Adaptive Land Management) may be used for monitoring.[17]

A few national data collection programs are listed, below, and examples of data resources are listed in Table 19.

Table 19: Data availability from different sources. This is not a comprehensive list and is simply illustrative of the kinds of data that may be available.

Type of Data	Data Source
Biodiversity	
Large Carnivore Atlas	Namibian government (produced in 2004 and 2012)[18]
Annual game counts	Namibian government (undertaken each year)[18]
Plant data	National Botanical Research Institute[18]
Fisheries	
Fisheries stocks	State of Stocks Reviews for 2011 and 2012[18]
Natural Resources	
Wildlife meat harvesting	CBNRM program[2]
Medicinal plant collection	CBNRM program[2]
Non-timber forest products	CBNRM program[2]
Tourism	
Tourism establishments/activities; trophy hunting	CBNRM Program[2]

National government data sources:

State of the Environment Reports: The country has published several of these reports, which are designed to provide a thorough understanding of trends and conditions in the environment so as to improve natural resource management. The reports provides an indicator of the quantity and distribution of national natural resources, the patterns of resource use, and a program to monitor resource conditions to guide management and policy decisions through the use of the indicators.[4]

Statistical capacity

The Central Bureau of Statistics is responsible for reporting economic statistics in the country.[19] The framework used is based on the 1993 System of National Accounts.[19] The International Monetary Fund has a comprehensive review of the methods used by Namibia in the development of their national accounts.[19]

Namibia is a member of SADC, which is currently implementing its Regional Indicative Strategic Development Plan (RISDP).[20] The RISDP has four intervention areas: 1) development of legal framework in Statistics; 2) harmonization of statistics in the SADC region; 3) provision of relevant statistics for regional integration; and 4) statistical capacity building development in SADC.[20] As part of this work, SADC coordinates, enhances, and promotes national statistical systems in member states. As such, SADC has undertaken several projects with its member countries to expand their capacity in this regard, including Namibia.[20]

Relevant Actors

Government

There are several government institutions that have extensive experience in fields relevant to this scoping effort (Table 20).

Table 20: Government ministries/agencies that appeared to have had roles in the past related to ecosystem valuation and natural capital accounting.

Ministry	Notes
Agriculture	
Ministry of Agriculture, Water, and Forestry (MAWF)	On the steering committee for the NBSAP.[3] Listed as a partner in undertaking valuation of biodiversity and ecosystem services for the second NBSAP.[3]
Environment	
Ministry of Environment and Tourism (MET)	The Directorate of Environmental Affairs (DEA) is undertaking valuation assessments of natural capital.[4] The ministry publishes the national reports for the Convention on Biological Diversity (CBD).[4] Designated as Namibia's National Authority on Climate Change.[4] Identified as the lead agency in quantifying biodiversity values and ecosystem services, related to the NBSAP.[3] Attended the 2015 Gaborone Declaration Roadshow.[9] Staff/Researchers within the Environmental Economics Unit within the Directorate of Environmental Affairs have published several peer-reviewed studies on the economic returns of nature for Namibia and in other Southern African countries as well.
Ministry of Mines and Energy	On the steering committee for the NBSAP.[3]
Fisheries	
Ministry of Fisheries and Marine Resources (MFMR)	On the steering committee for the NBSAP.[3] Listed as a partner in undertaking valuation of biodiversity and ecosystem services for the second NBSAP.[3]
Planning/Finance	
Ministry of Finance (MoF)	On the steering committee for the NBSAP.[3] Listed as a partner in undertaking valuation of biodiversity and ecosystem services for the second NBSAP.[3]
National Planning Commission (NPC)	On the steering committee for the NBSAP.[3] Listed as a partner in undertaking valuation of biodiversity and ecosystem services for the second NBSAP.[3]
Statistics	
Namibia Statistics Agency (NSA)	Listed as a partner in undertaking valuation of biodiversity and ecosystem services for the second NBSAP.[3]

Civil Society

Desert Research Foundation of Namibia: On the steering committee for the NBSAP.[3]

Namibia Nature Foundation: Attended the 2015 Gaborone Declaration Roadshow.[9]

Polytechnic of Namibia (PoN): On the steering committee for the NBSAP.[3] Listed as a partner in undertaking valuation of biodiversity and ecosystem services for the second NBSAP.[3]

University of Namibia (UNAM): On the steering committee for the NBSAP.[3] Listed as a partner undertaking valuation of biodiversity and ecosystem services for the second NBSAP.[3]

Bilateral/Multilateral Institutions

GEF: Attended the 2015 Gaborone Declaration Roadshow.[9]

GIZ: Concentrates on three focal areas in Namibia: management of natural resources; sustainable economic development; and street transport.[10] GIZ has funded several environmental or governance projects in Namibia since 1990[10] including: biodiversity management and climate change (outcomes include the use of strategic environmental assessments in the country);[8] and improvement of the management of the Namibian water resources.[10] Importantly, GIZ's "Resource Mobilization for Effective Implementation of the Updated Biodiversity Strategy in Namibia" (2014-2017) is funding natural capital accounting, resource mobilization, and skills development (e.g. network of environmental economists).[21] GIZ is on the steering committee for the NBSAP[3] and attended the 2015 Gaborone Declaration Roadshow.[9] GIZ is undertaking the ValuES project in Kenya, which is promoting methods for integrating ecosystem services into policy, planning, and practice.[22]

UNDP: On the steering committee for the NBSAP.[3]

USAID: Funded the Natural Resource Accounting project in the Ministry of Environment and Tourism in the 1990s.[15]

The World Bank: The World Bank has funded only a few environmental projects in Namibia (e.g. Namibian Coast Conservation and Management Project, P070885). Current World Bank staff members have undertaken natural capital accounting/valuation research projects in Namibia in the past.[14]

Ecosystem valuation, natural capital accounting, and ecosystem accounting

Namibia has a long history of undertaking natural capital accounting work. Beginning in the mid-1990s, Namibia began a Natural Resources Accounting project that aimed to document that status of the nation's resources and their economic use.[15] This project was organized through the DEA (Ministry of Environment and Tourism) and funded by USAID (as part of the regional Southern Africa Natural Resources Account project).[15,23] Accounts followed the UN SEEA approach though analyses were strongly influenced by the Norwegian system, with its emphasis on compilation of a

detailed physical database and the integration of NRA with economic models for policy analysis.[4,15] In addition to minerals and fisheries, the accounts constructed for Namibia included water, livestock, land, land degradation, forestry, energy, and wildlife.[15] It was noted, though, in a 2000 report by the IUCN that the primary output of this program was policy studies rather than the publication of accounting data.[24] Nevertheless, this same report also described Namibia as only one of two developing countries identified that had made an ongoing commitment to environment accounting.[24] During this time period, the country's first NBSAP (as part of the CBD) – which described a ten-year strategic plan from 2001-2010 for sustainable development through biodiversity conservation – included biodiversity valuation as a goal.[2] However, awareness of this plan was low.[2] It appears that Namibia continued to undertake work in natural capital accounting through the early and mid-2000s, though – as noted in the IUCN report – it does not appear that these accounts were incorporated into the national accounts.

In 2011, a World Bank report indicated that Namibia had been selected by the World Bank as a country to benefit from the WAVES program[6] though it is unclear how that partnership has moved forward given that Namibia is not a WAVES partner country. In 2012, a second World Bank report noted that the lack of an accounting system valuing Namibia's natural capital could lead to development decisions that do not acknowledge that coastal and terrestrial ecosystems provide critical ecosystem services.[25] However, in the same year, the National Environment Policy explicitly stated that one of the guiding principles of the environmental policy, among others, is to follow the concept of total economic valuation ("the benefits that ecosystems generate will be integrated into the national accounting system, programs, and projects").[12] The policy further noted that the government was planning to develop and apply instruments and methodologies for integrating environment into national accounts and planning processes.[12]

In December 2013 Namibia (Ministry of Environment and Tourism) attended the International Conference on Valuation and Accounting of Natural Capital for Green Economy (VANTAGE) in Africa where delegates participated in a policy dialogue on VANTAGE and discussed issues pertaining to the valuation and accounting of natural capital for a green economy.[26] Challenges to implementation and recommendations to overcoming these challenges were also discussed.[26] In the same year, Namibia's Second Biodiversity Strategy and Action Plan (2013-2022) noted that biodiversity values and certain ecosystem services should be quantified by 2018 as per the Aichi Targets.[3] The Ministry of Environment and Tourism was identified as the lead agency in this effort, though MAWF, MFMR, MoF, UNAM, PoN, NSA, NPC, and RCs were listed as partners.[3] To achieve the goal of natural resource accounting, the plan provided two indicators of success: 1) cross-sectoral environmental economics network in place and number of training programs and people trained (to be implemented from 2014-2022 at a total cost of N$2 million); and 2) budgetary allocations for biodiversity in national and regional plans (to be implemented in 2017 at a total cost of N$1 million).[3] A

2014 report indicated that there had been about 20% progress towards achieving the Aichi targets related to biodiversity valuation.[18]

In the past couple of years, it appears that Namibia has received financial support from at least one organization aiming to increase its capacity in natural capital accounting.[11] For example, GIZ is funding a project called *Resource Mobilization for Effective Implementation of the Updated Biodiversity Strategy in Namibia*. This project is taking place from 2014-2017, is led by the Ministry of Environment and Tourism, and has three priority areas: 1) Natural Capital Accounting (working with the World Bank's WAVES project, based on TEEB methodology, and using standards from the UNSC); 2) Resource mobilization (working closely with the United Nations BIOFIN program); and 3) Skills development (establishment of environment economist network in Namibia).[21]

A 2014 presentation on this program noted that other planned activities from this GIZ funding included: 1) the development of a summer school program at the Polytechnic of Namibia with ecosystem services integrated into the regular curriculum; 2) possible support to four studies that would look into the value of ecosystem services in major development initiatives; and 3) capacity building for environmental economists in collaboration with the Resource Mobilization project.[11]

In May 2015, the Gaborone Declaration Secretariat hosted a workshop to determine Namibia's priorities with regards to the Declaration. As a result of this workshop, Namibia endorsed Natural Capital Accounting as a priority area for implementation in the next four years.[17] Specifically, the country indicated it would aim to: implement the System of Environmental Economic Accounting and develop internationally agreed guidelines on ecosystem accounting.[17] It was noted during the meeting that the country still lacked capacity in relation to Natural Capital Accounting.[9]

Past and current efforts relevant to this scoping are detailed, below.

Ecosystem Valuation

Sub-national efforts:

Economic valuation of Namibia's Protected Areas: Study commissioned by the MET and funded by the UNDP and GEF in 2005.[8] This study examined the economic value of non-consumptive tourism and other activities attributable to the presence of the parks system.[27] It was estimated that the total annual economic contribution ranged between 3.1% and 6.3% of GDP.[27] Detailed methods are available.[27]

Economic value of Rhinos in Namibia and South Africa: This study found that in two conservancies in Namibia, the annual economic contribution of rhino to the GDP was USD$0.60 per hectare.[28]

Natural Capital Accounting

Regional (multi-country) efforts:

Southern African Natural Resource Account (NRASA) project: Funded by USAID in the early 2000's, this program aimed to assist and enhance the in-country capacity for Botswana, Namibia, and South Africa to prepare and utilize Natural Resource Accounts in the decision-making process to achieve sustainable natural resource

development.[23] The accounts that were developed from this regional effort were at the national level. This project resulted in extensive accounting efforts in fisheries and minerals with experimental work forestry resources, and wildlife (see below for more details).

Ecosystem goods and services valuation for Benguela Current LME (BCLME): An economic valuation of the Benguela Current along the Angolan, Namibian, and South African coasts.[29] The program undertook a partial cost-benefit analyses for formal sectors (did not look at informal sectors) and focused on direct use values or provisioning services.[29] Sectors examined included: 1) biodiversity; 2) fisheries; 3) marine recreational activities; 4) mariculture; 5) oil and gas; 6) coastal marine mining; 7) desalination; and 8) ports.[29] The total economic value for fisheries across all three countries was estimated at USD$2.2 billion per year, USD$303 billion per year for oil and gas, USD$49.9 million per year for marine aquaculture, and USD$942 million per year for coastal marine mining.[29] Values could not be estimated for biodiversity, ports, and desalinization due to lack of data.[29] Other hurdles included limited time available for in-depth valuation.[29]

National efforts:

Energy Accounts: Constructed in the 1990s by the Natural Resources Accounting project of the DEA (within the Ministry of Environment and Tourism).[15]

Fisheries Accounting:[4] Commercial fisheries accounts were first developed from 1980-2000 by the Natural Resources Accounting project of the DEA (within the Ministry of Environment and Tourism).[14,15] These data were later updated and expanded to the year 2005 following SEEA guidelines.[14] The analyses focused on the three most important fisheries: hake (*Merluccius capensis* and *Merliccius paradoxus*), horse mackerel (*Trachurus capensis*), and pilchard (*Sardinops ocellatus*) which account for more than 80% of the value of fish production.[14,15]

The following analyses were undertaken from 1990 to 2005: 1) physical accounts: stock and catch of the three main fisheries; 2) resource rent and taxes from fisheries; and 3) monetary accounts: the value natural capital for fisheries.[14] Detailed methods for accounts are available.[14,15,16]

These analyses showed that in constant 1995 prices, the value of fisheries have remained roughly constant albeit fluctuating considerably.[14] Obstacles in the calculation of fisheries resource rent included a lack of sufficiently disaggregated economic data by fish species.[15]

Forestry Resources Assessment: Conducted in 2005 by the DEA (within the Ministry of Environment and Tourism) after the completion of the national forest inventory in 2004.[4,30] This was an experimental, one-time account.[14] Asset and flow accounts (both physical and monetary) were developed in accordance with the Integrated Environmental-Economic Accounting (IEEA) methodology.[4] Detailed methods for accounts are available.[30]

The study found that in 2004, the value of forest use in terms of gross output was N$1.2 billion (or 3% of GNP).[30] In addition, the study found that Namibia's standing forest assets (natural

capital stock) were estimated to have a value of N$19 billion.[30]

Land Degradation Accounts: Constructed in the 1990s by the Natural Resources Accounting project of the DEA (within the Ministry of Environment and Tourism).[15]

Land Accounts: Constructed in the 1990s by the Natural Resources Accounting project of the DEA (within the Ministry of Environment and Tourism).[20] These land accounts may be the Namibian accounts that move the closest towards Ecosystem Accounting, though they are not considered as such.[31]

Minerals Accounting:[4] Mineral accounts were first developed from 1980-1995 by the Natural Resources Accounting project of the DEA (within the Ministry of Environment and Tourism).[14,15] These data were later updated and expanded to the year 2005 following SEEA guidelines.[14] The analyses focused on the three most important minerals: diamonds, uranium, and gold (which provide more than 95% of mining GDP).[14] There was insufficient information about other minerals to include them in accounts.[14]

The following analyses were undertaken: 1) physical accounts: volume of annual extraction and reserves of minerals for diamonds, uranium, and gold; 2) resource rent and taxes from minerals; and 3) monetary accounts: the value natural capital for minerals.[14] Detailed methods for accounts are available.[14,15]

These analyses showed that in constant 1995 prices, the value of Namibia's natural capital fell by 36% from N$11,330 million in 1980 to N$7,179 million in 2005. The loss of asset value is almost entirely due to depletion of minerals.[14] Some of the stock accounts for minerals could not be publicly reported.[15] Major hurdles in the calculation of resource rent for these minerals included: 1) information about stocks of the most important minerals was/is confidential; 2) certain economic information needed to calculate rent for each mineral was/is confidential (i.e. value-added information for uranium); and 3) economic information needed to calculate rent was not available for the national accounts.[15]

Water Accounts: Constructed starting in 1995 by the Natural Resources Accounting project.[15] The program was initiated by the Ministry of Environment and Tourism in cooperation with the Department of Water Affairs (DWA, within the Ministry of Agriculture, Water, and Forestry).[32] The first set of water accounts, for 1993, included both stocks and flows of water, but information was limited.[32] In the first accounts, the available water resources could only be quantified for the annual volumes of surface water stored in dams.[32] In addition, water flow accounts included annual water usage by each economic sector, the cost of providing water, tariffs paid, subsidies received, and the socio-economic benefits of water use in each sector.[32] The first water accounts classified water into nine categories based on a combination of institutions supplying water.[32]
The accounts document the sustainable amount of water available from various sources and the economic benefits that can be derived from using water.[32] Major hurdles in the initial development of accounts included a lack of data and much of the data had to be estimated.[32]

In 2001, the Ministry of

Agriculture, Water, and Forestry took over responsibility for compiling the natural resource account for water.[32] In 2002, the Swedish International Cooperation Agency provided funding to help institutionalize the NRA for Water by the DWA and planned to compile these accounts on an annual basis.[32] This funding also aimed to increase the accuracy and breadth of the accounts.[32] This project was guided by a Steering Committee which included various government, academic, and private stakeholders.[32] Detailed methods for the development of the water accounts are available.[32,33]

Moving forward, a 2015 presentation by GIZ indicated that they were working with Namibia on Water Accounts via the "resource mobilization for an effective implementation of updated biodiversity strategy in Namibia" program.[34]

Wildlife Resource Accounting:[4] In 2004, with the completion of a national wildlife inventory, a set of wildlife accounts were created for Namibia by the Environmental Economics Unit in the Ministry of Environment and Tourism.[35] This was calculated as part of an experimental, one-time account.[14] The accounts included both physical and monetary asset accounts as well as production or flow accounts.[35] The accounts are structured according to the country's wildlife utilization zones, which reflect the differences in the possible us and combinations of uses of land.[35] Detailed methods for accounts are available.[15,35]

The 2.04 million larger wild animals that made up the physical wildlife asset base produced a gross output of N$1.5 billion and directly contributed N$700 million to Gross National Product (GNP).[35] Non-consumptive wildlife-viewing tourism generated 62% of the total wildlife sector GNP contribution.[35] Hunting tourism and live game production generated 19% and 10%, respectively.[35] The wildlife use sector represented 2.1% of national GDP in 2004; its contribution will likely triple in the next 30 years.[35] In 2004, the value of standing wildlife assets was estimated at N$10.6 billion; a value comparable with fisheries and minerals.[4,35]

Priorities within the country

Namibia, as a country, is trying to simultaneously diversify its GDP and stabilize its economy, while undertaking programs that manage drought, desertification, and climate change. Namibia is somewhat unique among the countries included in this scoping effort as it is not only relatively stable but is advanced in its incorporation of the environment into development planning; it was the first country in the world to include protection of the environment in its constitution. Its CBRNM program, which covers 19% of Namibia's land mass is an example of its progress in tackling environmental and poverty alleviation issues simultaneously. Furthermore, the country is advanced in its NCA programming, having been described as one of only two developing countries to have systematically undertaken NCA.

In May 2015, the Gaborone Declaration Secretariat hosted a workshop to determine Namibia's priorities with regards to the Declaration. As a result of this workshop, Namibia endorsed Natural Capital Accounting as a priority area for implementation in the next four years.[17] Specifically, the country indicated it would aim to:

implement the System of Environmental Economic Accounting and develop internationally agreed guidelines on ecosystem accounting.[17] It was noted during the meeting that the country still lacked capacity in relation to Natural Capital Accounting.[9] This is interesting given Namibia's long history with NCA and with developing accounts based on the SEEA framework.

More broadly, Namibia has indicated its priorities in the environment in several of its policy documents. For example, the National Environmental Policy of 2013 explicitly states that the benefits of ecosystems should be integrated into the national accounting systems, programs, and projects.[12] In addition, the NBSAP2 (2013-2022) specifically mentions biodiversity valuation as way to increase the health of Namibia's biodiversity while allowing for sustainable growth.[11]

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RWANDA

The Republic of Rwanda has made substantial economic progress since the 1994 genocide and aims to become a regional leader in information and communication technologies.[1] Rwanda is part of the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA). Rwanda's 2014 Gross Domestic Product (GDP) is estimated to have been USD$8.002 billion and the 2014 GDP per-capita (PPP) was USD$1,700.[1] Real GDP growth is approximately 7-8% per year.[1] In 2014, the largest contributors to Rwanda's GDP were agriculture (32.5%), industry (14.8%), and services (52.7%); in the year 2000, 90% of the labor force was involved in agriculture while 10% was in industry and services.[1] Important agricultural products include coffee, tea, pyrethrym (insecticide made from chrysanthemums), and bananas.[1] The coffee and tea sectors are national priorities for development.

Approximately 12.3 million people live in Rwanda, 72.2% of the population lives in rural areas, and 44.9% of the population was below the poverty line in 2011.[1] Rwanda is the most densely populated country in Africa and is highly dependent on natural ecosystems.[1,2,3]

Ecosystem extent and condition

Rwanda's area covers a total of 26,338 km^2.[1] In 2011, land uses included agricultural land (74.5%), forest (18%), and other uses (7.5%).[1] The terrain is mostly grassy uplands and hills (savanna grassland); the relief is mountainous

Acronyms

ARCOS: Albertine Rift Conservation Society
CBD: Convention on Biological Diversity
CI: Conservation International
COMESA: Common Market for Eastern and Southern Africa
DFID: Department of International Development (UK)
EAC: East Africa Community
EDPRS: Economic Development and Poverty Reduction Strategy
EWSA: Energy, Water, and Sanitation Authority
FORNERWA: A national climate change and environment fund.
GEF: Global Environment Facility
GDP: Gross Domestic Product
GIS: Geographic Information Systems
GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit
MICEOFIN: Ministry of Finance and Economic Planning
MINAGRI: Ministry of Agriculture and Animal Resources
MINECOFIN: Ministry of Finance and Economic Planning
MINIRENA: Ministry of Natural Resources
MINITERE: Ministry of Lands Environment, Forests, Water, and Mines
NCA: Natural Capital Accounting
NISR: National Institute of Statistics of Rwanda
NSDS: National Strategy for the Development of Statistics
ORTPN: Rwanda Office of Tourism and National Parks
PEI: Rwanda Poverty Environment Initiative
PES: Payments for Ecosystem Services
RDB: Rwandan Development Board
REMA: Rwanda Environment Management Authority
RNRA: Rwanda Natural Resources Authority
RWA: Rwanda Wildlife Agency
SEEA: System of Environmental-Economic Accounting
SIDA: Swedish International Development Corporation
SOE: State of the Environment and Outlook
TEAM: The Tropical Ecology Assessment and Monitoring network
UNDAF: United Nations Development Assistance Framework
UNDP: United Nations Development Program
UNECA: United Nations Economic Commission for Africa
UNEP: United Nations Environment Program
USAID: United States Agency for International Development
WASAC: The state water utility
WAVES: Wealth Accounting and the Valuation of Ecosystem Services

with altitude declining from west to east.[1] Rwanda's vegetation types include: savanna with grasses, bushes, and trees; mountain rainforest and mountain meadows; forest galleries; swamps and aquatic vegetation.[4] It should be noted that the small size of the country and the high population make land a scarce resource.[5]

Ecosystem services and natural resources

Rwanda's important natural resources include its fauna and flora, gold, tin ore, tungsten ore, methane, hydropower, and arable land.[1] In 2011, hydroelectric plants provide 59.8% of electricity in the country.[1] Rwanda is one of the top birding countries in the world and is home to more than 151 different types of mammal species.[4]

The tourism sector, which is concentrated in national parks, is estimated to have generated USD$293.6 million in 2013 and provided employment for 23,000 people in 2010 and 2011.[6] In 2013, it was estimated that up to 73% of the population derives its livelihood directly from natural capital.[7]

Threats to ecosystem services and natural resources

Rwanda's natural hazards include periodic droughts and occasional volcanic activity.[1] Rwanda is a water scarce country.[3] Environmental issues include deforestation due to the need for firewood, overgrazing, soil exhaustion, soil erosion (Rwanda is among three African countries experiencing unusually heavy soil losses[3)], and poaching.[1,6] Some of the most acute environmental problems have involved: the loss of forests through clearing for development or conversion to agricultural land; allocation of wetlands for construction and industrial development; and degradation of freshwater wetlands due to pollution and siltation from unsustainable land use.[4] Rwanda is highly vulnerable to climate change as it is strongly reliant on rain-fed agriculture and on hydropower.[5] Rwanda has experienced a temperature increase of 1.4 degrees Celsius since 1970 and rainfall may increase up to 20% by the 2050s.[5]

Since independence in 1962, land areas under protection have been halved and forest cover within reserves has also rapidly decreased (e.g. the Gishwatri Forest Reserve only has 7 km^2 of its 1980 land cover of 280 km^2).[8] Regarding wetlands, at least 93,754 ha of 164,947 ha have been cultivated and almost 50% of agricultural land in Rwanda shows evidence of soil erosion.[8] In 2003, the direct cost of land degradation in Rwanda was estimated as 3.5% of the agricultural GDP.[9]

Policy

Rwanda's constitution was adopted in 2003 and last amended in 2010.[1] Rwanda has 4 provinces and 1 city as an administrative division.[1] The government is comprised of 17 ministries; each ministry has several departments that undertake specific functions. The functions of the ministries and other governmental agencies are described on the government's website.[10]

Rwanda is party to several international environment agreements (Appendix A). At the national level, there are many policies related to the environment (see below). Environmental Impact Assessments are mandatory and environmental indicators are being

mainstreamed into financial budgeting and planning.[5] Recent policy reviews exist for land tenure and planning (i.e. the National Land Policy),[11] biodiversity,[6] natural capital accounting,[12] and PES schemes.[8] Specific policies relevant to this scoping study are discussed in more detail, below.

National policies/programs:

Economic Development and Poverty Reduction Strategy: This strategy is the framework for achieving Vision 2020 and the Millennium Development Goals.[5] The initial strategy lasted from 2008 to 2012.[5] A second strategy (EDPRSII; 2013-2018) aims to build upon the first strategy.[13] Notably, the EDPRSII uses a green economy approach to economic transformation[13] and biodiversity has been mainstreamed into the strategy.[4] In addition, the strategy aims to increase the effectiveness of public finance management (e.g. Integrated Financial Management Information Systems).[13] The EDPRSII will "accelerate progress to middle income status and better quality of life for Rwandans through sustained growth of 11.5% and accelerated reduction of poverty to less than 30% of the population".[13]

FORNERWA: FORNERWA is a national climate change and environment fund that serves as a long-term, cross-sectoral financing mechanism and funding source for environmentally focused programs (e.g. environmentally sustainability, climate resilience, and green economic growth initiatives).[14] The fund serves to facilitate access to international financing while streamlining external aid. The fund is open to line ministries and districts, charitable and private entities, civil society and research institutions.[14] FORNERWA is expected to make a significant contribution (20-30%) to Rwanda's financing gap (approximately US$100 million per year).

Green Growth and Climate Resilience Strategy: This strategy promotes cross-sector interventions to maintain the environment and combat climate change while addressing national priorities.[13] The strategy is supported by FORNERWA.[13]

Rwanda Poverty Environment Initiative (PEI): This program has developed poverty environment indictors under the global UNDP-UNEP PEI initiative.[15,16] The intended outcome is to integrate the environment into national policy and planning processes so as to better implement the Economic Development and Poverty Reduction Strategy (EDPRS and EDPRSII).[4] Led by REMA and MINIRENA.[17]

Rwanda Vision 2020: Vision 2020 aims to transform Rwanda from a subsistence agriculture economy to a knowledge-based society earning USD$900 per capita (i.e. a middle income country).[5] Vision 2020 is supported by the EDPRS (2008-2012) and the EDPRSII (2013-2018) and presents a framework/key priorities for Rwanda's development.[18]

Rwanda National Strategy on Climate Change and Low Carbon Development: Developed in 2011 and coordinated by the Ministry of Natural Resources as well as a steering committee, this is Rwanda's strategy for addressing climate change.[5] The strategy aims to guide the process of mainstreaming climate resilience and low carbon

development into key sectors of the economy.[5] The strategy includes a framework for implementation (including a vision for 2050).[5]

Data Availability and Monitoring

Challenges in data availability and a paucity of monitoring programs have been consistently noted in program documents. First, a 2003 study found that detailed economic data were sparse.[9] Second, a 2005 study noted that many data related to poverty and the environment exist but are often inconsistent in their content (scattered across various institutions, not easily disaggregated to sub-national levels, and difficult to integrate).[19] This report indicated that a major challenge to data availability was inadequate human resources and institutional capacity in information management.[19] In addition, the report noted that the appreciation for the need for statistical information in decision-making was low.[19] Third, in 2009, the fourth national report to the Convention on Biological Diversity (CBD) indicated that inventories of biodiversity had not been successfully created.[4] The report noted that there had not been enough national capacity building on the access, use, and exchange of information through a central clearing house/database.[4] Numerous other, more recent, examples of data limitations exist.[5,17,20] It has recently been noted that NCA could actually be used as tool to monitor data gaps and strengthen data collection strategies.[21]

There are some indications that data-sharing systems are being developed. For example, in 2011, it was noted that Rwanda needed to develop a National Spatial Data Infrastructure to manage the nation's land information resources and identify additional datasets required to manage land and water resources, monitor land use and environmental change, support economic development, and enable Rwanda to better plan, monitor, and respond to the impacts of climate change.[5] As a result, the report indicated that Rwanda would establish a National Information Sharing and Access Policy, a National Spatial Data Infrastructure Strategy, a detailed national features map, and ongoing monitoring of land use and environmental change.[5] In addition, a 2011 World Bank project report indicated that a Biodiversity Catalog and a Biodiversity Information System had been developed.[22]

A few national and sub-national data collection programs are listed, below, and examples of data resources are listed in Table 21.

National government data sources:

State of the Environment and Outlook (SOE): This report on the state of natural resources in Rwanda has been published bi-annually since April 2006.[23] The SOE was established as a legal requirement by REMA.[23]

National Forest Monitoring System: Will be responsible for the overall needs of the country in matters regarding monitoring, measurement, reporting, and verification of forest cover and REDD+ activities.[24]

Sub-national government data sources:

Conservation International Vital Signs Data: Vital Signs provides metrics, decision-support indicators, and analytical tools to guide agricultural development decisions. Data are being collected in the Lake Victoria

Watershed. In April 2015, the Gaborone Declaration Secretariat hosted a workshop to determine Rwanda's priorities with regards to the Declaration. As a result of this workshop, the Republic of Rwanda indicated that the development of building Vital Signs would be a priority, as related to the larger goal of increased environmental-economic monitoring.[25]

Conservation International TEAM: The Tropical Ecology Assessment and Monitoring (TEAM) network conducts monitoring on ecosystem services in the context of agricultural intensification and climate change over the course of three years. Goal of the project is to lay the groundwork for applying incentive-based conservation tools.

Table 21: Data availability from different sources. This is not a comprehensive list and is simply illustrative of the kinds of data that may be available.

Type of Data	Data Source
Agriculture	
National Agricultural Survey	NADA, an Open Data Portal[26]
Biodiversity	
Biodiversity inventories	Rwandan government[27]
Land cover	
Land cover	Lands and Mapping Department, Ministry of Natural Resources[11]
Land use/land cover maps (spatial)	Africover
Socio-economic/Administrative	
Population and Housing Census	NADA, an Open Data Portal (only 10% available online)[26]
Tourism	
Visits to National Parks	ORTPN[28]
Water/Hydrology	
Meteorological data	Rwanda Meteorological Service[5] Mt. Karisimbi climate observatory project[5]
Water use	WASAC (State Utility)
Pollution data (spatial)	REMA[29]

Statistical capacity

The National Institute of Statistics of Rwanda (NISR) is responsible for reporting economic statistics in the country.[30] The framework used is based on the 1993 System of National Accounts.[30] The International Monetary Fund has a comprehensive review of the methods used by Rwanda in the development of their national accounts.[30]

In the 1990s, there were three major institutions responsible for generating statistics: the National Census Service (population and housing census); Rwanda's National Office of Population (Ministry of Health); and the Directorate of Statistics (Ministry of Planning).[31] In 1997, the Ministry of Finance and the Ministry of Planning were merged into order to improve coordination; this resulted in the Ministry of Finance and Economic Planning (MICEOFIN), and the Directorate and Statistics and the National Census Service were moved into this new ministry.[31] In 2005, the National Institute of Statistics of Rwanda (NISR) was created and the Rwanda's National Office of Population and the National Census Service ceased to exist.[31] By October 2007, NISR had

72 permanent staff and they were responsible for compiling administrative statistics at the district level (there are 30 districts in Rwanda).[31] However, district statistics were later given to the districts to manage. In 2010, NISR restructured and it staffing was increased to 100 people. Following this restructuring, the first National Strategy for the Development of Statistics (NSDS) was created.[31] In 2012, NISR was noted to still be developing the capacity it needed to provide authoritative statistical information. There is low coordination, collaboration, networking, and information sharing among NISR, data producers, and users of statistics.[31] There is a shortage of skilled staff, especially statisticians, within the national statistical system. There is an absence of sector-wide statistical frameworks; therefore, different public institutions use different definitions, procedures, data collection method, and compilation of official statistics. This has led to poor data quality and duplication of efforts across multiple agencies.[31]

In 2009/10, the World Bank provided a small amount of funding (USD$200,000) to the National Institute of Statistics within the Ministry of Finance to fund economic statistics and economic growth analyses.[32] More recently, the World Bank just finished their Statistics for Result Facility (P124629) program in June 2015; it was rated as a "satisfactory" project.[26] The development objective of the program was to improve the quality and timeliness of statistical information in Rwanda as well as make it accessible to users at the national level.[26] It noted that all key economic statistics had been published according to the project's timetable and that statisticians in all 30 districts had been trained on web-based software systems.[26]

Relevant Actors

Government

Conservation International (CI) has been working in Rwanda for several years on Conservation Agreements and Payments for Ecosystem Services (PES) programs. Conservation International is also undertaking their Vital Signs and TEAM projects in country as well. As such, CI has existing relationships with several government ministries and local non-profit organizations. In addition, there are several government institutions that have extensive experience in fields relevant to this scoping effort (Table 22).

Civil Society

Albertine Rift Conservation Society: The Albertine Rift Conservation Society (ARCOS) is undertaking work to identify buyers for watershed services, carbon, and non-timber forest products in the Mukuru Forest Landscape. Mapping, quantification, and valuation of ecosystem services will be conducted using the InVEST method and ARCOS intends to pilot PES transactions in the region (using CI's Conservation Agreement Model).[34]

University of Rwanda: Attended a workshop in May 2014 that introduced the WAVES/NCA concept to a wide set of stakeholders.[12] The Centre for GIS at the university may have spatial data for the country.[19]

Table 22: Government ministries/agencies that appeared to have had roles in the past related to ecosystem valuation and natural capital accounting.

Ministry	Notes
Agriculture	
Ministry of Agriculture and Animal Resources (MINAGRI)	Was on steering committee that helped develop the National Strategy on Climate Change and Low Carbon Development in 2011.[5]
Environment	
Rwanda Environment Management Authority (REMA)	Established in 2005 to ensure environmental issues are clearly integrated/mainstreamed in all sectors of development.[33] In regards to PES: provides high-level guidance on monitoring framework, design of conservation agreements, and alignment with ongoing national PES efforts; chairs the National Task Force on PES; and has been exploring PES since 2008. In 2009, a Climate Change Unit was set up within REMA, overseeing the Designated National Authority to coordinate carbon market activities.[5] The Technical Committee within REMA assists in climate financing programs and carbon accounting.[5] The Research Department of REMA is coordinating research on the economic valuation of goods/services from protected areas.[4] Houses the FORNERWA secretariat.[8] Represented on the National Steering Committee for Natural Capital Accounting.[21] REMA is supported by the UNDP-UNEP Poverty Environment Initiative.[17] Attended the 2015 Gaborone Declaration Roadshow meeting.[20]
Ministry of Natural Resources (MINIRENA)	Members of the ministry are part of the National Task Force on PES. Coordinated the development of the National Strategy on Climate Change and Low Carbon Development in 2011.[5] The Lands and Mapping Department within the Ministry authored the Lands Administration Procedures.[11] Involved with the World Bank WAVES program.[21] Helps lead the UNDP-UNEP Poverty Environment Initiative.[17] Attended the 2015 Gaborone Declaration Roadshow meeting.[20]
Rwanda Natural Resources Authority (RNRA)	Established in 2011 from a merger of the National Land Centre, the National Forestry Authority, and the Rwanda Geology and Mines Authority. Leads the management of natural resources (land, water, forests, mines, and geology).[11] Represented on the National Steering Committee for Natural Capital Accounting.[21] Attended the 2015 Gaborone Declaration Roadshow meeting.[20]
Planning	
National Task Force on Payments for Ecosystem Services	Founded in 2010 with support from the Wildlife Conservation Society. Chaired by REMA; other task force members include the Water Resources Department and Forest Departments (within the Ministry of Natural Resources); the Energy, Water, and Sanitation Authority (EWSA); and private sector partners. Purpose of the task force is to

	identify critical structures needed for PES as well as institutional hurdles facing PES.
Ministry of Finance and Economic Planning (MINECOFIN)	Was on steering committee that helped develop the National Strategy on Climate Change and Low Carbon Development in 2011.[5] Was tasked with undertaking Cost-Benefit Analyses (including ecosystem service valuation) in order to prioritize programs for the government as part of the 2011 Green Growth Strategy.[5] Represented on the National Steering Committee for Natural Capital Accounting.[21] Attended the 2015 Gaborone Declaration Roadshow meeting.[20]
Ministry of Infrastructure	Represented on the National Steering Committee for Natural Capital Accounting.[21]
Statistics	
National Institute of Statistics of Rwanda (NISR)	Represented on the National Steering Committee for Natural Capital Accounting.[21] Attended the 2015 Gaborone Declaration Roadshow meeting.[20]
Tourism	
Rwandan Development Board (RDB)	Development of unique tourist products including natural and cultural attractions.[8] Represented on the National Steering Committee for Natural Capital Accounting.[21]
Rwanda Office of Tourism and National Parks (ORTPN)	Undertakes research on the methods/techniques for the economic valuation of goods/services from protected areas.[4]
Water	
Energy, Water, and Sanitation Authority (EWSA)	Is represented on the National Task Force for PES.
Wildlife/Biodiversity	
Rwanda Wildlife Agency (RWA)	Responsible for preserving Rwandan biodiversity.[8]

Wildlife Conservation Society: Leads field-level data collection and maintenance of monitoring systems related to CI's PES programs. Assisted REMA in starting the National Task Force on PES. Represented on the National Steering Committee for Natural Capital Accounting.[21] Attended a workshop in May 2014 that introduced the WAVES/NCA concept to a wide set of stakeholders.[12]

Bilateral/Multilateral Institutions

DFID: Funded the development of the Rwanda National Strategy on Climate Change and Low Carbon Development and studies on the economies of climate change in Rwanda.[5,35] Attended a workshop in May 2014 that introduced the WAVES/NCA concept to a wide set of stakeholders.[12] Funded the National Climate and Environment Fund (FONERWA).[36]

GEF: Attended the 2015 Gaborone Declaration Roadshow meeting.[20]

GIZ: Has funded several environmental or governance projects in Rwanda including a micro-hydro power supply project aimed at increasing rural development.[37]

SIDA (Swedish International Development Corporation): Attended a workshop in May 2014 that introduced the WAVES/NCA concept to a wide set of stakeholders.[12] Helped author best practices guidelines from a UNDP-UNEP PEI demonstration project and

subsequent scale-up of the project.[36]

UNECA: Attended a workshop in May 2014 that introduced the WAVES/NCA concept to a wide set of stakeholders.[12]

UNEP: Attended a workshop in May 2014 that introduced the WAVES/NCA concept to a wide set of stakeholders.[12]

UNDP-UNEP Poverty-Environment Initiative (PEI): Partners with the Government of Rwanda for the Rwanda Poverty Environment Initiative (KPEI) to support the EDPRSII.[2]

United Nations Development Assistance Framework (UNDAF): The UNDAF provided an integrated United Nations system response to Rwanda's national priorities and needs as described in its poverty reduction and economic growth plan, the EDPRS, and the Vision 2020.[38] The creation of the United Nations Development Assistance Framework (2008-2012) in Rwanda took place amidst a backdrop of the country's ambitious development plan, the Economic Development and Poverty Reduction Strategy (EDPRS), as well as its Vision 2020 *Umurenge* Programme.[38]

The World Bank: The World Bank has funded many environmental programs in Rwanda with sub-national and national impacts (e.g. Landscape Approach to Forest Restoration and Conservation, P131464; Arid Lands Resource Management Project) since 1969. The bank has also financed capacity building projects related to the national statistics system.

World Bank WAVES (Wealth Accounting and the Valuation of Ecosystem Services) Program:[21] Wealth Accounting and Valuation of Ecosystem Services (WAVES) is a global partnership led by the World Bank that aims to promote sustainable development by mainstreaming natural capital in development planning and national economic accounting systems, based on the System of Environmental-Economic Accounting (SEEA).[12]

Ecosystem valuation, natural capital accounting, and ecosystem accounting

In recent years, several program documents have provided information on Rwanda's capacity to undertake economic valuation of natural resources. In a 2009 report to the CBD, it was noted that although progress had been made towards the integration of economic valuation and natural resource accounting tools into national planning processes, there was a need to strengthen national capacity this regard.[4] However, the report also noted that REMA's research department and the Rwanda Office of Tourism and National Parks had undertaken some interdisciplinary research to promote understanding of methods/techniques for valuation of goods/services from protected areas.[4] REMA's role in NCA was further described in a MINIRENA report published in the same year which noted that REMA would undertake public environmental education and training on green accounting.[39] The document indicated that a total economic valuation of selected natural resources would be undertaken and used to facilitate green accounting, though the document did not specify a baseline or targets for these outcomes.[39] One of the aims of the document (which was a five-year strategy for the environment and natural

resources sector) was to, "structure accounting and financial management systems to facilitate analyses of benefits/achievements and costs of environment and natural resources."[39]

The following year (in 2010), REMA (supported by the UNDP-UNEP Poverty Environment Initiative) published a review of existing and potential environmental fiscal reforms and economic instruments. This review indicated that government analysis often excluded extended cost-benefit analyses, which resulted in the government being unable to attach true value to natural resources.[17] REMA suggested that this could be addressed through training models on impact assessments, extended cost-benefit analyses, and resource valuation.[17] It was noted that the increased workload in REMA for natural resource valuation and environmental impact assessments necessitated the hiring of an environmental economist.[17] In 2011, Rwanda's Green Growth Strategy document indicated that ecosystem services were still not being valued.[5] This document also reiterated the utility cost-benefit analyses in prioritizing programs for the government.[5] In 2012, Rwanda became a signatory of the Natural Capital Accounting Communiqué (related to the Rio +20).[23]

Rwanda's desire to undertake NCA was noted again in several 2013 documents. For example, the Economic Development and Poverty Reduction Strategy (2013-2018, EDPRSII) wrote that the government would place attention "on robust monitoring and evaluation systems, such as the green accounting framework, which will be essential in ensuring more effective policy implementation and to demonstrate the economic benefits of environmental protection."[13] Second, a 2013 Public Environment Expenditure Review noted that Rwanda was preparing to pilot "environmental (green) accounting in order to adjust their Gross Savings for benefits from and costs to the environment."[7] The expenditure review indicated that there was a need to build capacity in individuals in MINIRENA/MINECOFIN for environmental/green accounting.[7] Third, a 2013 Rwanda United Nations Development Assistance Plan (2013-2018) specifically noted that "the strategic support of the UN…will also entail…promoting natural capital accounting."[40] Fourth, in December 2013, members of the Ministry of Natural Resources presented at the International Conference on Valuation and Accounting of Natural Capital for Green Economy (VANTAGE) in Africa where delegates participated in a policy dialogue on VANTAGE and discussed issues pertaining to the valuation and accounting of natural capital for a green economy. Challenges to implementation and recommendations to overcoming these challenges were also discussed.[41] However, and despite all of this clear enthusiasm for NCA, the 2014 report to the CBD indicated that progress towards the integration of natural capital accounts into the national accounting system was "low" and reiterated that capacity for ecosystem services valuation was insufficient.[42]

Since that time, there appears to have been notable progress. A National Steering Committee for Natural Capital Accounting has been formed to set priorities for NCA and to oversee preparation and implementation.[42] In addition, the World Bank is coordinating

the WAVES program in the country. The planned accounts to be developed include: forests, land, wetlands, water, lakes and rivers.[27] A 2015 WAVES presentation (given by a representative of the Ministry of Natural Resources) indicated the government was, "committed to developing NCA as one of the tools to boost the country's sustainable development".[21] The presentation further indicated that NCA was expected to add value to Rwanda's national development planning process and that attention was being focused on economically important natural resource sectors. It was explicitly stated that the accounts being developed would be politically aligned with the Vision 2020 and the EDPRSII.[21]

Accounts that were selected for implementation via the WAVES program represent areas where natural resources are under pressure or in high demand.[21] Early scoping estimated that forest accounts would have limited relevance for national policies and that the institutional engagement and coordination would be demanding (these accounts were therefore not pursued).[12] Likewise, an energy sector analysis was not pursued because the institutional engagements would be demanding and because the relevance for non-electricity energy sources would be low.[12] The implementation phase began in 2015 (the scoping phase was completed in December 2014[12]), with the National Steering Committee on Natural Capital Accounting approving the work plan for the implementation phase. The implementation phase have four key elements: 1) sectoral focus for developing NCA; 2) capacity building workshops and on-the-job training; 3) policy analysis based on analytical work; and 4) communications and outreach.[21]

Hurdles facing the implementation phase of the WAVES project include: a lack of data; engaging the technical working group (they are only partially trained, it is hard to reach an agreement, there is not enough time for NCA); and differing reactions to the accounts chosen for initial NCA work.[21] The institutional arrangements supporting this work include: 1) a National Steering Committee under the Ministry of Natural Resources (Rwanda Natural Resources Authority, Ministry of Finance and Economic Planning, Rwanda Environment Management Agency, Ministry of Infrastructure, National Institute of Statistics of Rwanda, Rwanda Development Board, and Wildlife Conservation Society are also involved); 2) a Technical Working Group that helps ensure that NCA products are understood; and 3) a NCA Country Coordinator who is the key contact point for NCA initiatives across the government.[12] Extensive outreach projects have been undertaken within the country in relation to this project.[12]

In April 2015, the Gaborone Declaration Secretariat hosted a workshop to determine Rwanda's priorities with regards to the Declaration. As a result of this workshop, the Republic of Rwanda endorsed natural capital accounting as a priority area for implementation in the next four years.[25] Specifically, the country indicated they would aim to: increase capacity in natural capital accounting; and adopt Ecosystem Accounts (Tourism) in addition to the already-identified priority sectors of water, minerals, and land accounts.[25] It was noted that there was a need to demonstrate the value of natural capital accounting to the Ministry of Finance and to increase willingness to assign an economic value to the

environment.[20] It was also emphasized that a plan for NCA continuity beyond the WAVES program is needed, and that capacity building across sectors should be continued.[20]

There currently appears to be a political desire by the Government of Rwanda to properly account for natural capital (and to undertake related programs, such as Payments for Ecosystem Services). However, there are likely still hurdles facing NCA programs. A global review of NCA determined that three important challenges to the advancement and implementation of NCA in the country are: 1) insufficient expertise in environmental economics and NCA methodologies; 2) insufficient financial means for regular data collection to support NCA system; and 3) identifying priorities for development (managing trade-offs) and ownership by all development sectors.[27]

Past and current efforts relevant to this scoping are detailed, below.

Ecosystem Valuation

National efforts:

Carbon Markets/REDD+ Programs: The Climate Change Unit within REMA oversees the Designated National Authority that coordinates carbon market activities; a Technical Committee (within REMA) assists in climate financing and carbon accounting.[5] The 2011 Green Growth Strategy noted that a training program would be developed in order to increase capacity related to carbon trading, including: baseline calculations, carbon accounting, and monitoring, reporting, and verification.[5]

UNDP-UNEP Poverty-Environment Initiative (PEI): The Government of Rwanda established a partnership with the UNDP-UNEP PEI in 2005 to mainstream environment into national development strategies and sectoral plans.[2]

Program achievements from the PEI are numerous. First, the Rugezi Public Payment Scheme Payments for Ecosystem Services (PES) project was initiated.[8] Second, a pilot integrated ecosystem assessment of Bugesera was undertaken. This study assessed the linkages between human wellbeing and ecosystem services at regional and local levels (methods based on the Millennium Ecosystem Assessment framework).[2] The results of the assessment were designed to assist policy makers and other stakeholders to appreciate environment and poverty linkages, contribute to the development of indicators for monitoring the ecosystem-human wellbeing changes, and generate advocacy tools for mainstreaming environment into the sectoral and national planning frameworks.[2] In total, the project focused on three ecosystem services: food, water, and firewood/energy.[2] Economic value, however, was not quantified for the ecosystem services.

Sub-national efforts:

Compensation for environmental services program/Payments for Ecosystem Services (PES): There has been extensive work throughout Rwanda on PES programs; CI has undertaken some of this work. The interest of Rwanda in PES is demonstrated by the existence of a National Task Force on PES (established in 2010 with help from the Wildlife Conservation Society) and the REMA's publication of guidelines for the implementation of payments for

ecosystem services in Rwanda in 2014.[8]

Some examples of PES programs include PES schemes in the Gishwati and Nyungwe forests. Other known PES projects are listed, below:

CI Monitoring in Gitarama and Nyungwe National Park: Tracking ecosystem service flows over time and using direct incentives for community-based conservation.

Yanze Watershed Management PES: Involving the Kimisagara water treatment plant, local communities in the Yanze watershed, REMA, and EWSA.[8]

Rugezi Public Payment Scheme: Private businesses directly pay local landowners to relocate and/or improve management practices. Involves EWSA, MINITERE, UNDP-UNEP PEI, and several other stakeholders.[8]

Conservation Incentives by International Gorilla Conservation Programme: Supported by multiple international donors (USAID, UNDP) to support a number of successful conservation incentives.[8]

Mukuru Forest Landscape: The Albertine Rift Conservation Society (ARCOS) is undertaking work to identify buyers for watershed services, carbon, and non-timber forest products. Mapping, quantification, and valuation of ecosystem services will be conducted using the InVEST method and ARCOS intends to pilot PES transactions in the region (using CI's Conservation Agreement Model).[34]

Contribution of protected areas to the national economy: Assessments of the contribution of protected areas to the national economy have been conducted.[4]

Economic Analysis of Natural Resources Management: This analysis demonstrated that 15 million tons of soil are lost annually, which is an economic loss of USD$34 million or 2% of the GDP.[29] This analysis examined provisioning, regulating, and enriching ecosystem services using poverty and environmental mapping.[28]

Economic valuation of the Nyungwe Forest: A research project estimated the value of ecological goods and services as being a minimum of USD$285 million per year.[6,42]

Economic Valuation of the Mukura Forest: This research project estimated the value of the Mukura Forest to be USD$1.7 million. This resulted in the adoption of the law establishing the Gishwati-Mukura National Park.[6,42]

Economics of Climate Change in Rwanda: Study funded by DFID and undertaken by the Stockholm Environment Institute (in Oxford) working with local partners (study published in 2010).[35] The analysis involved: 1) assessing climate change impacts and their economic costs for Rwanda; 2) analyzing the costs and benefits of adapting to these effects over different timescales; 3) assessing the potential for low carbon growth; 4) building national capacity; and 5) using results to inform decision-making.[35]

Opportunities for carbon asset development in Nyunge National Park: This study found that forest conservation, avoided deforestation, and reforestation in the national park could generate a 30-year net revenue of US$11.8 million.[8]

Natural Capital Accounting

National efforts:

Land Account:[21] Developed as part of the WAVES program, this account will help track land value trends and assess tradeoffs. So far, data for the creation of an asset account (land use and cover) and a land use change matrix (reduction and additions over one year; looking at 2011, 2012, 2013, and 2014) have been compiled. The policy relevant outputs have been a summary of the most rapid types of conservation by sector and province. The program is currently investigating other data sources that could be overlaid with land cover maps (e.g. agricultural census data; data on realty values; business register; and data from hedonic pricing studies).[21] Preliminary results are based on available data sources and do not represent a complete land account.[12]

Tourism Accounts: At the 2015 Gaborone Declaration Roadshow, it was agreed that a Tourism Account would be implemented over the next four years.[20] There is hope that this account will help other sectors understand the value of natural capital accounting, leading to an augmented GDP.[20]

Water Account: Developed as part of the WAVES program, this account will help track water values and trends in competing uses. So far, a physical supply use table and a physical asset account for water have been compiled using existing data from the water resource master plan and the WASAC (state water utility).[21]

Exploratory work on a Minerals Account: Developed as part of the WAVES program, this account could help to optimize resource rents and reinvestments. Exploratory work involves producing early policy outputs while preparing for the eventual development of mineral accounts.[12]

Sub-national efforts:

Wildlife Conservation Society: Has been funded by MacArthur to undertake a natural capital accounting effort (regional focus on Nyungwe and Rugezi). Work is facilitated by professors of Forestry and Environmental Management at Virginia Tech and Mount Claire University.

Priorities within the country

Rwanda has made tremendous progress in the last decade in its social and economic development, and is aiming to become a regional leader in information and communication technologies. Specifically, Vision 2020 states that Rwanda aims to transform from a subsistence agriculture economy to a knowledge-based society earning USD$900 per capita. However, and despite the country's high rate of Real GDP growth, a large proportion of the population (which is growing) lives in rural areas, is below the poverty line, and depends on natural resources. Rwanda is experiencing soil erosion at one of the highest rates in Africa, is one of the most densely populated countries on the continent, and is water and land scarce. Nevertheless, Rwanda has become a leader in the environmental sector, especially in regards to the Payments for Ecosystem Services programs and REDD+.

Rwanda has indicated its environmental priorities in several of its

policy documents and programs. First, the current Economic Development and Poverty Reduction Strategy aims to develop a green economy approach and biodiversity has been mainstreamed into the strategy. The strategy states that it will "accelerate progress to middle income status and better quality of life for Rwandans through sustained growth of 11.5% and accelerated reduction of poverty to less than 30% of the population".[13] Second, the Rwanda Poverty Environment Initiative aims to integrate the environment into national policy and planning processes.

In April 2015, the Gaborone Declaration Secretariat hosted a workshop to determine Rwanda's priorities with regards to the Declaration. As a result of this workshop, the Republic of Rwanda endorsed natural capital accounting as a priority area for implementation in the next four years.[25] Specifically, it was indicated that Rwanda would aim to increase capacity in natural capital accounting and adopt Ecosystem Accounts (Tourism) in addition to the already-identified priority sectors of water, minerals, and land accounts.[25] It was noted that there was a need to demonstrate the value of natural capital accounting to the Ministry of Finance, to increase willingness to assign an economic value to the environment.[20] It was also emphasized that a plan for NCA continuity beyond the WAVES program is needed, and that capacity building across sectors should be continued.[20]

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SOUTH AFRICA

The Republic of South Africa is a middle-income country with an abundant supply of natural resources and well-developed financial, legal, communications, energy, and transport sectors.[1] However, economic growth has decelerated in recent years and unemployment, poverty, and inequality remain a challenge.[1] South Africa's 2014 Gross Domestic Product (GDP) is estimated to have been USD$704.5 billion and the 2014 GDP per-capita (PPP) was USD$13,000.[1] Real GDP growth was 1.5% in 2014 down from 2.2% in 2013 and 2012.[1] In 2014, the largest contributors to South Africa's GDP were agriculture (2.4%), industry (28.5%), and services (69.1%). In addition, 4% of the labor force is involved in agriculture while 18% is in industry and 66% is in services.[1] Important agricultural products include corn, wheat, sugarcane, fruits, vegetables, beef, poultry, mutton, wool, and dairy products.[1] Approximately 53.7 million people live in South Africa, 35.2% of the population lives in rural areas, and 35.9% of the population was below the poverty line in 2012.[1] The majority of South Africans are highly dependent on natural resources for their livelihoods, well-being, and healthcare (e.g. 70% of South Africans use traditional medicinal plants for their primary source of health care).[2]

Ecosystem extent and condition

South Africa's area covers a total of 1,219,090 km^2 and the country has 2,798 kilometers of coastline.[1] In 2011, land uses included: agricultural land (79.4%),

Acronyms

BCLME: Benguela Current LME
BIOFIN: Biodiversity Finance Initiative
CBD: Convention on Biological Diversity
CI: Conservation International
CSIR: Council for Scientific and Industrial Research
DAFF: Department of Agriculture, Forestry, and Fisheries
DEA: Department of Environmental Affairs (formerly DEAT)
DEAT: Department of Environmental Affairs and Tourism (now known as DEA)
DFID: Department of International Development (UK)
DMR: Department of Mineral Resources
DoE: Department of Energy
DWA: Department of Water Affairs
DWAF: Department of Water Affairs and Forestry
FAO: Food and Agriculture Organization of the United Nations
GDP: Gross Domestic Product
GDSA: Gaborone Declaration for Sustainability in Africa
GEF: Global Environment Facility
GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit
IPBES: Intergovernmental Platform on Biodiversity and Ecosystem Services
IUCN: International Union for the Conservation of Nature
MPA: Marine Protected Area
NBA: National Biodiversity Assessment
NBBN: National Biodiversity and Business Network
NBF: National Biodiversity Framework
NBSAP: National Biodiversity Strategy and Action Plan
NCA: Natural Capital Accounting
NRASA: Southern African Natural Resources Account
NSSD: National Strategy for Sustainable Development
ProEcoServ: Project on Ecosystem Services
REDD+: Reducing Emissions from Deforestation and Forest Degradation
RISDP: Regional Indicative Strategic Development Plan
SADC: South African Development Community
SAEON: South African Environmental Observation Network
SAfMA: Southern African Millennium Ecosystem Assessment
SAM: Social Accounting Matrices
SANBI: South Africa National Biodiversity Institute
SARB: South African Reserve Bank
SASQAF: South African Statistical Quality Assessment Framework
SEEA: System of Environmental-Economic Accounting
SIC: Standard Industrial Classification of all Economic Activities
SNA: System of National Accounts
TEEB: The Economics of Ecosystems and Biodiversity
UNDP: United Nations Development Program
UNEP: United Nations Environment Program
UNSD: United Nations Statistical Division
USAID: United States Agency for International Development
WWF: World Wide Fund for Nature

forest (7.6%), and other uses (13%).[1] The terrain is characterized by a vast interior plateau rimmed by rugged hills and narrow coastal plains.[1] Of note, most freshwater resources in Southern Africa are located in trans-boundary watercourse systems or shared river basins, necessitating regional management efforts.[3]

Ecosystem services and natural resources

South Africa's important natural resources include its gold, chromium, antimony, coal, iron ore, manganese, nickel, phosphates, tin, rare earth elements, uranium, gem diamonds, platinum, copper, vanadium, salt, natural gases, and its wildlife (fauna and flora).[1] South Africa's reserves of gold, coal, and platinum group metals are the largest in the world.[4] Mineral industries contributed 9% of the country's GDP in 2009.[4]

In addition to sub-soil assets, other ecosystem services also add significant value to the economy. A recent estimate placed the total value added to the economy by the provisioning, regulating, and cultural ecosystem services in South Africa (excluding marine environment and the value generated by the extraction of water resources) at approximately R$73 billion per year or ~7% of the country's annual GDP.[2] Fisheries are important but account for a small percent of GDP; this is because South Africa has a broad-based economy.[5]

South Africa is one of the world's 17 mega-diverse countries and is home to over 95,000 species.[6] Its wildlife and national parks draw millions of tourists to the country each year.[6] The country has 19 national parks and a large number of private reserves.[6]

Threats to ecosystem services and natural resources

South Africa's natural hazards include prolonged droughts.[1] South Africa is a water scarce country; only 4.5% of the electricity produced in South Africa comes from hydroelectric plants.[1,7,8] Environmental issues include a lack of arterial rivers and lakes (thereby leading to extensive water conservation and control measures), unsustainable water use, pollution of rivers from agricultural runoff and urban discharge, air pollution, soil erosion, desertification, invasive species, and wildlife poaching.[1,2,9] The degradation threat to different ecosystems in South Africa is as follows: 34% of terrestrial ecosystems, 65% of marine bio zones; 80% of wetlands, and 82% of rivers are under degradation threat.[10] The degradation of ecosystems will be exacerbated by climate change in South Africa.[9]

Policy

South Africa adopted a new constitution in a national referendum in 1997, which was last amended in 2013.[1] South Africa is split into 9 provinces.[1] A full review of the government's ministries and departments can be found online.[11]

South Africa is party to several international environment agreements (Appendix A) as well as the Convention on Biological Diversity (CBD).[12] Recent reviews of policies are available for biodiversity protection.[12] Specific national policies relevant to this scoping study are discussed in more detail, below.

National policies/programs:

National Biodiversity Strategy and Action Plan (2005, NBSAP): South Africa published its NBSAP in 2005 and intended to complete a revised and updated NBSAP by 2014.[2] The NBSAP makes provisions for integrating the value of biodiversity into national accounting and reporting systems.[8] These documents serve as the basis for the National Biodiversity Framework (NBF) which is updated every five years.[2] The NBF identifies 33 priority actions to guide the work of the biodiversity sector.[2]

National Climate Change Response Strategy: Combats land degradation and incorporates biodiversity in its efforts.[2]

National Development Plan 2030 (2011): In this plan, the South African government has analyzed the challenges facing the country.[13] Environmental sustainability, poverty eradication, and greening the economy all feature prominently in the plan.[14] Implementation of this plan is being facilitated by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).[15]

National Environmental Management Act (1998): Establishes the overarching principles for environmental legislation, with separate acts passed to further define and support its objectives in relevant functional areas such as protected areas, coastal management, air pollution, and waste management.[2]

National Strategy for Sustainable Development (2011-2014; NSSD1): The National Planning Commission's strategy has identified green economy planning as one of five key strategic priorities.[14]

National Protected Area Expansion Strategy (2008): Published in 2010, this is being actively implemented by national and provincial conservation authorities.[12]

National Sustainable Development Framework (2009): This framework quantified degradation threats in South Africa and appears to recognize the important role that healthy ecosystems play in sustainable development.[10,2]

National Water Act (1998): Requires reforms that span almost all aspects of water management and allocation, including changes in defining and granting right to water, reorienting investment and allocation priorities and strategies to strongly pro-poor and environmentally sustainable approaches.[16]

Presidential Delivery Agreement (2010): Adopted by the Cabinet in 2010. Outcome 10 of the Agreement deals with the environment sector including biodiversity, with the aim that "environmental assets and natural resources are well protected and continually enhanced."[12] This agreement has catalyzed increased cross-sector collaboration between these various institutions.[12]

REDD+ Programs in South Africa: There are several REDD+ programs in South Africa. For example, GIZ is currently funding (2011 to 2015) the development of integrated REDD+ monitoring systems in the Southern African Development Community (SADC) which includes South Africa.[17]

Prior to this effort, and in 2012, a peer-reviewed paper was published which discussed several national options and opportunities for REDD+ mechanisms in South Africa.[18]

White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity (1997): This document creates the foundation for South Africa's policies framework for biodiversity management.[2]

Data Availability and Monitoring

Compared to other countries included in this scoping effort, data availability and monitoring initiatives are well developed in South Africa. Various documents illustrate the recent growth in these types of programs and provide insights into areas where there may still be data gaps within the country. First, in the early 2000's, and during the first attempts to create sub-national water accounts, it was noted that certain types of information remained unavailable, including data on water use.[7] Later, in 2006, it was noted that State of the Environment reporting in South Africa is undertaken as a stand-alone process. "Reports are completed and disseminated but do not logically fit into any specific decision-making process, thereby reducing the impact of their primary purpose." Third, in 2010, a report on the water accounts – which had first been created in 2004 – noted that the reliance of various government bodies created a significant data availability hurdle to the ongoing creation of water accounts.[3] Specifically, the report indicated that: 1) data were being used that did not qualify as official statistics (as defined by the South African Statistical Quality Assessment Framework, SASQAF); 2) data limitations have meant that only physical water accounts can be created because data from line departments are expressed in physical units only; 3) data from line departments are not classified according to the Standard Industrial Classification of all Economic Activities (SIC); and 4) the time series of data are not comparable with the official statistics produced by Stats SA.[3]

Nevertheless, it is clear that there has been progress on data availability and that monitoring and data collection are priorities within the government. In 2012/13, monitoring and evaluation was deemed a priority by the Department of Water Affairs and Forestry.[14] A 2014 report for the CBD indicated that progress had been made on data availability for several biodiversity indicators (e.g. amount of natural habitat lost, number of invasive species).[2] In 2015 at the Gaborone Declaration for Sustainability in Africa (GDSA) Roadshow meeting, the it was noted that physical data are collected by: Department of Mineral Resources (DMR); Department of Water Affairs (DWA); Department of Energy (DoE); Department of Environmental Affairs (DEA); and Department of Agriculture, Forestry, and Fisheries (DAFF). At this meeting it was also indicated that South Africa has a wealth of foundational data on ecosystems which could provide the building blocks needed for ecosystem accounting, given that South Africa is the fourth largest producer of biodiversity information.[8] This data has been gathered by the science community over decades, and much of it feeds into the National Biodiversity Assessment (NBA).[8] A few national data collection programs are listed, below, and examples of data resources are listed in Table 23.

National government data sources:

Environmental Sustainability Indicator Technical Reports: Developed by DEAT/DEA. The reports aim to provide information on the ability of the country to protect its environment and to provide an indication of whether or not the country is progressing in an environmentally sustainable manner.[14]

National Biodiversity Assessment (NBA): Part of SANBI's mandate is to monitor and report on the state of biodiversity. The NBA assesses ecosystems across terrestrial, river, wetland, estuarine, and marine environments (also includes assessments of indigenous and invasive species). The assessment is conducted every 5-7 years and will next be conducted in 2018.[8]

State of the Environment Reports/South Africa Environment Outlook Report: Authored by the (then) Department of Environmental Affairs and Tourism (DEAT) and more recently by the Department of Environmental Affairs (DEA). The aim of these reports are to provide comprehensive and science-based information on environmental conditions and trends considered important for decision-making.[14]

South African Environmental Observation Network (SAEON): A research facility that establishes and maintains nodes (environmental observatories and field stations) linked through an information management network to support research and education platforms.[14]

Table 23: Data availability from different sources. This is not a comprehensive list and is simply illustrative of the kinds of data that may be available.

Type of Data	Data Source
Biodiversity	
Biodiversity	National Biodiversity Assessment[12,19] National Spatial Biodiversity Assessment[12,19]
Municipal Biodiversity Summaries	DEA and SANBI[12]
Fisheries	
Fisheries data	DAFF-Fisheries[20]
Land cover	
South African National Land-Cover Project	CSIR Satellite Application Centre[21]
Tourism	
Tourism	South African Tourism[15]
Water/Hydrology	
Level of dams; transfers into/out of dams	DWAF[7]
Outflow from dams	DWAF[7]

Statistical capacity

The National Accounts Division in Statistics South Africa (Stats SA) and the South African Reserve Bank (SARB) are responsible for the compilation of the GDP, supply and use tables, satellite accounts (including natural resource accounts and tourism satellite accounts), and social accounting matrices (SAMs) for South Africa.[20,22] Stats SA is responsible for compiling the production side of the national accounts while SARB is responsible for compiling the expenditure side of the account.[22] The

2008 System of National Accounts (SNA) reporting methodology is used.[22] The International Monetary Fund has a comprehensive review of the methods used by South Africa in the development of their national accounts.[22]

South Africa is a member of SADC, which is currently implementing its Regional Indicative Strategic Development Plan (RISDP).[23] The RISDP has four intervention areas: 1) development of legal framework in Statistics; 2) harmonization of statistics in the SADC region; 3) provision of relevant statistics for regional integration; and 4) statistical capacity building development in SADC.[23] As part of this work, SADC coordinates, enhances, and promotes national statistical systems in member states. As such, SADC has undertaken several projects with its member countries to expand their capacity in this regard.[23]

Table 24: Government ministries/agencies that appeared to have had roles in the past related to ecosystem valuation and natural capital accounting.

Ministry/Agency	Notes
Agriculture	
Agricultural Research Council	Contracted in 2004 to establish procedural guidelines for the implementation of a long-term land-cover updating and change monitoring program for South Africa.[21]
Environment	
Department of Agriculture, Forestry, and Fisheries (DAFF-Fisheries)	Collects fish stock data for over 200 species and provides data for fisheries accounts.[15]
Department of Environmental Affairs and Tourism (DEA/DEAT)	Performs the role of lead agents in environmental governance.[2] Works with the UNDP BIOFIN program.[6] Conducted a baseline valuation report on biodiversity and ecosystem services in 2012.[9] Involved in Ecosystem Accounting efforts.[24]
South Africa National Biodiversity Institute (SANBI)	Led the National Biodiversity Assessment of 2011.[2] Involved in Ecosystem Accounting efforts.[24]
Planning/Science	
Council for Scientific and Industrial Research (CSIR)	Contracted in 2004 to establish procedural guidelines for the implementation of a long-term land-cover updating and change monitoring program for South Africa.[21] Involved in Ecosystem Accounting efforts.[24]
Statistics/Finance	
Statistics South Africa	Produces South Africa's natural resource accounts.[25] Staff members are part of the London Group on Environmental Accounting.[20] Involved in Ecosystem Accounting efforts.[24]
Treasury	Works with the UNDP BIOFIN program.[6]
Water	
Department of Water Affairs and Forestry (DWAF)	National monitoring programs (chemical or salinity monitoring program) for chemical water quality and water levels in dams.[7,25]
Department of Water and Sanitation	Involved in Ecosystem Accounting efforts.[24]
Wildlife/Biodiversity	
South African National Parks	Assisted with the National Biodiversity Assessment.[19]
Ezemvelo KZN Wildlife	Involved in Ecosystem Accounting efforts.[24]

Relevant Actors

Government

There are several government institutions that have extensive experience in fields relevant to this scoping effort (Table 24).

Civil Society

University of Cape Town (UCT): The university's MARAM program has provided data to the government for the compilation of the fishery accounts.[15]

World Wide Fund for Nature (WWF): Has undertaken economic valuation of marine protected areas in South Africa.[5]

Bilateral/Multilateral Institutions

FAO LADA Project: Conducted a land degradation assessment from 2006-2010 (using modeling and geospatial analysis) in South Africa.[26] Detailed reports about this project have been produced.[27]

GIZ: Has funded several environmental or governance projects in South Africa including green economy initiatives (employment for sustainable development in Africa)[28] and strengthening local governance and reform of the public sector.[13]

IUCN: The IUCN has undertaken several ecosystem valuation case studies in South Africa.[5]

SADC: Has funded regional programming on economic valuation including an economic analysis of rhino conservation within the SADC region.[29] SADC also aims to increase the statistical capacity of its member countries and undertakes REDD+ projects in the region.

TEEB: South Africa participated in a TEEB country study. The country study was implemented by the DEA and the Council for Scientific and Industrial Research (CSIR).[30] This country study was linked to the State of Play (baseline assessment of ecosystem services valuation studies in the country).[9]

UNDP BIOFIN Program: Launched globally in 2012, this program aims to address biodiversity finance challenges by increasing investment in the management of ecosystems and biodiversity.[6] This program is currently being implemented in cooperation with the Department of Environmental Affairs (DEA) and the Treasury.[6] The following four BIOFIN components are implemented in South Africa (implementation started in late 2014):[6]

Component 1: Review of Biodiversity Policies, Institutions, and Expenditures (ongoing)

Component 2: Defining the costs of implementing National Biodiversity Strategies and Action Plan

Component 3: Developing a Resource Mobilization Strategy for Biodiversity Finance (starting in 2015)

Component 4: Initiate implementation of the Resource Mobilization Strategy (starting in 2015)

The World Bank: The World Bank has funded many environmental programs in South Africa with sub-national and national impacts (e.g. Cape Peninsula Biodiversity Conservation Project; Arid

Lands Resource Management Project). The bank has also financed capacity building projects relevant to this project (e.g. Municipal Financial Management Technical Assistance Project, P076901).

Ecosystem valuation, natural capital accounting, and ecosystem accounting

South Africa has a long history of undertaking natural capital accounting initiatives. In the early 2000's, and funded by USAID, the Southern African Natural Resources Account (NRASA) project aimed to assist and enhance the in-country capacity for Botswana, Namibia, and South Africa to prepare and utilize Natural Resource Accounts in the decision-making process to achieve sustainable natural resource development.[31] During this time period, Statistics South Africa (Stats SA) compiled natural resource accounts for minerals and water (these were considered satellite accounts).[7] At the time it was noted that Stats SA aimed to compile a full set of water accounts with an update every five years though other documents noted that natural resource accounts more broadly would be updated every year.[7,32] Lessons learned from the development of pilot, sub-national water accounts included: 1) noting that not all necessary data were available; 2) data needed for accounts that meet UN SEEA guidelines are extensive; 3) staff members at DWAF and Stats SA who work with accounts should be fully trained to do so.[7] By 2005: 1) water and mineral accounts had been published as official statistics and were available on the Stats SA website; 2) land accounts (containing land-use and land-cover accounts for 1994/5) were available as a discussion document on the Stats SA website; 3) and water quality and energy use accounts had been developed as position documents.[20] Subsoil asset accounts were developed with the help of consultants.[20]

In 2011, a report on the National Biodiversity Assessment indicated that mapping and valuing ecosystem services was a research priority so that the value of biodiversity/ecosystems could be demonstrated and to enable the recognition of ecosystem services in market transactions, national accounting, and in the allocation of public sector resources.[33] However, this type of mapping and valuation of ecosystem services had not taken place yet.[33] This report noted that South Africa was one of five pilot countries for the Global Environmental Facility's (GEF) Project on Ecosystem Services (ProEcoServ).[33] ProEcoServ (2011 to 2014) aimed to develop innovative and practical approaches to mainstream the value of ecosystem services into national development programs.[33] CSIR was leading the South African component of ProEcoServ alongside the DEA and SANBI.[33] In the same year, South Africa committed to implementing the SEEA-framework through Stats SA, though environmental statistics had not been identified as a mainstream priority for the country. Gaps in the environmental accounting system remain.

In 2012, a document published by the Department of Environmental Affairs, building on the global study on The Economics of Ecosystems and Biodiversity (TEEB), served as a baseline valuation report on biodiversity and ecosystem services in South Africa.[9] This document presented the results of an extensive search of the peer-reviewed and gray literature. The purpose of the report was to provide a baseline upon

which future studies/valuation work could be conducted. A long-term goal of the report was to help mainstream the economic valuation of biodiversity and ecosystem services into national accounting.[9]

In 2014, a report to the CBD indicated that progress towards the integration of biodiversity values into national accounting was promising but not completed.[12] It was also noted that a partial economic valuation of South Africa's biodiversity has been completed and presented to key decision-makers and the public.[12] At the 2015 GDSA Roadshow it was noted that Mineral Accounts now presented both physical and monetary data and that there were reporting obligations for mineral, energy, fisheries, ecosystem services, water, and carbon accounts.[8]

South Africa began working on ecosystem accounting in mid-2013 and in mid-2014 joined six other pilot countries in a global project on Advancing SEEA Experimental Ecosystem Accounting (led by the UNSD in partnership with the UNEP and the CBD, funded by the Government of Norway). The lead institutions for this ecosystem accounting are Statistics South Africa and SANBI. In 2015, the South African National Biodiversity Institute (SANBI) gave a presentation regarding their new ecosystem accounting initiatives.[24] This presentation detailed some of the methods behind the calculation of ecosystem condition and extent in South Africa (for various terrestrial, wetlands, rivers, and marine ecosystem types).[24] It also illustrated how functional ecosystem units could be linked to ecosystem services (using grazing capacity, sediment retention, and carbon sequestration as examples).[24] At the 2015 GDSA Roadshow meeting it was noted that there were pilot ecosystem accounting initiatives underway in KZN for national river ecosystem and land accounts (using foundational science and data from NBA).[8] Hurdles faced by South Africa in ecosystem accounting include: limited data sharing between organizations; ownership concerns and weak incentives; insufficient financial and human resources (e.g. weak capacity for data collection); lack of data management skills; poor communication and unclear rational; and difficulties with quality assurance across scales.[8]

Finally, there are several other initiatives/policies which are beneficial to South Africa and its accounting efforts. First, South Africa is working with the UNDP BIOFIN program which aims to develop and implement a resource mobilization strategy for biodiversity finance.[6] Significant work has been carried out in South Africa to assess the value of ecosystem services.[6] For example, under the National Parks Act of 1976, South Africa has developed a system whereby private lands located next to national parks can be nominated as "contracted national parks". These areas continue to be privately owned and are allowed to develop eco-tourism enterprises while agreeing not to hunt or otherwise use resources from the land without prior authorization.[6] Second, South Africa is a member (and hosts the Technical Support Unit for the Africa Regional Assessment)[8] of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES). The members of IPBES are committed to building IPBES as the leading intergovernmental body for assessing the state of the planet's biodiversity, its ecosystem, and the essential services they provide to

society.[34] Third, South Africa has signed the communiqué for natural capital accounting (related to Rio+20).[35]

Past and current efforts relevant to this scoping are detailed, below.

Ecosystem Valuation

A 2012 document published by the Department of Environmental Affairs served as a baseline valuation report on biodiversity and ecosystem services in South Africa.[9] The document presented the results of an extensive search of the peer-reviewed and gray literature, which managed to locate 40 studies which have assessed ecosystem services values for/within South Africa.[9] In addition, the the report provides a detailed analysis of gaps in the literature regarding ecosystem valuation projects in South Africa.[9] Some examples of ecosystem valuation projects are summarized, below.

Regional efforts:

SADC: The SADC has undertaken several economic valuation studies within the SADC region, including an economic analysis of rhino conservation.[29]

Southern African Millennium Ecosystem Assessment (SAfMA): The SAfMA is linked to the Millennium Ecosystem Assessment, and aimed to assess the services provided by ecosystems in southern Africa and their impacts on the lives of the region's people.[36] One of the assessments undertaken by the SAfMA focused on the Gariep basin in South Africa. Additional assessments were conducted at a more local scale in the Great Fish River, the Richtersveld, and the Highveld.[36] The assessment was completed in 2004 and was not repeated.[37]

Ecosystem goods and services valuation for Benguela Current LME (BCLME): An economic valuation of the Benguela Current along the Angolan, Namibian, and South African coast.[38] The program undertook a partial cost-benefit analyses for formal sectors (did not look at informal sectors) and focused on direct use values or provisioning services.[38] Sectors examined, included: 1) biodiversity; 2) fisheries; 3) marine recreational activities; 4) mariculture; 5) oil and gas; 6) coastal marine mining; 7) desalination; and 8) ports.[38] The total economic value for fisheries across all three countries was estimated at USD$2.2 billion per year, USD$303 billion per year for oil and gas, USD$49.9 million per year for marine aquaculture, and USD$942 million per year for coastal marine mining.[38] Values could not be estimated for biodiversity, ports, and desalinization due to lack of data.[38] Other hurdles included limited time available for in-depth valuation.[38]

National efforts:

TEEB: South Africa participated in a TEEB country study (note: TEEB country studies are not always undertaken directly in partnership with the TEEB Secretariat). The country study was implemented by the DEA and the Council for Scientific and Industrial Research (CSIR).[30]

Sub-national efforts:

Economic valuation of marine protected areas along the Garden Route coast: WWF undertook an economic valuation of marine protected areas along the

Garden Route.[5] This was prompted by the question of whether or not to sport fishing should be allowed in South Africa's oldest MPA.[5]

Natural Capital Accounting

Regional efforts:

Southern African Natural Resource Account (NRASA) project: Funded by USAID in the early 2000's, this program aimed to assist and enhance the in-country capacity for Botswana, Namibia, and South Africa to prepare and utilize Natural Resource Accounts in the decision-making process to achieve sustainable natural resource development.[31]

National efforts:

Energy Use Account: In 2005, the government published a discussion document containing energy supply and use tables for 8 types of energy from 1995-2001.[20] The accounts were compiled in accordance with the SEEA (2003).[39] Supply and use accounts were created;[39] the methods used in these accounts are discussed extensively in government reports.[39] The 2015 GDSA Roadshow confirmed that the energy accounts continue to be a reporting requirement in South Africa.[8]

Fisheries Accounts: A 2012 report by Statistics South Africa presented national fishery accounts for South Africa for 1990-2010.[15] This report presented physical accounts for hake (*Merluccius paradoxus* and *M. capensis*) and west coast rock lobster (*Jasus lalandii*).[15] The industries surrounding these species constitute about 80% of the fishing industry in South Africa.[15] The report also presented resource rent accounts compiled for data sources; one compiled for hake and the other compiled for all fisheries.[15]

Mineral Accounts: The first mineral accounts were created as satellite accounts in the early 2000's by Statistics South Africa.[7] By 2012, Statistics South Africa had published a report containing mineral accounts for the entire country from 1980-2009; the focus of these accounts were gold, PGM, and coal.[4] The mineral accounts present the physical, monetary, and resource rent accounts and are aligned with the principles of the System of National Accounts (SNA) and follow the SEEA framework.[4] The methods for the development of these accounts is detailed extensively in government-authored reports.[4] Problems experienced in the creation of the first mineral accounts included: lack of data sources; presenting figures in nominal values (e.g. changing the currency to a more stable currency); following international guidelines; finding staff with relevant skills/knowledge/experience; educating users; and feeding the data into policy issues.[20]

Tourism Account: A 2014 report presented the final satellite tourism accounts from 2008 to 2010 as well as preliminary accounts for 2011 and 2012 (supply and use tables).[40] Although these accounts do not appear to focus exclusively on eco-tourism, they are included in this document due to the clear connection between environmental health and tourism in countries like South Africa. The accounts were prepared by Statistics South Africa. The accounts provide information on tourism's contribution to the South African economy both in terms of

expenditure and employment.[40] They found that tourism contributed to 3% of the GDP in 2012.[40] The methods used in these accounts are discussed extensively in government reports.[40]

Water Quality Accounts: In 2004, South Africa published a discussion document containing water quality accounts for the reference year 2000.[25] The purpose of the account was to determine the quality of water resources for their fitness-for-use for different water sectors (e.g. some water is not potable without treatment).[25] The water accounts were created for 19 water management areas in South Africa and followed the UN SEEA recommendations. The resulting report described the supply and use of water.[25] The larger goal was to link water quality with water flow.[25] However this was not possible due to data constraints.[25] The methods used in these accounts are discussed extensively in government reports.[25]

A 2010 report seemed to indicate that additional quality accounts had not been created.[3] The lack of regular updates with regard to the Water Accounts seemed to have been caused by the lack of consistent and appropriate data collected nationally.[3] However, the report suggested solutions to these lack of data by suggesting that Stats SA change its census questions and by linking Stats SA data with the Department of Water Affairs (DWA) data.[3]

Water Accounts: The first water accounts were created as satellite accounts in the early 2000's by Statistics South Africa with accounts first published in 2004.[7] These accounts were first calculated for one catchment area, and were later expanded to all of South Africa's 19 catchment areas.[7,16] These accounts were designed to be updated every five years.[7] The first accounts included physical supply, use, and asset accounts.[7,41] It was noted that these accounts could help with the National Water Act requirement of the establishment of a national water information system.[16] The methods used in the creation of these accounts are discussed extensively in government documentation.[7,16,41]

A 2010 report seemed to indicate that physical water accounts were not being updated and that additional quality and monetary accounts had not been created.[3] The lack of regular updates with regard to the Water Accounts may have been caused by the lack of consistent and appropriate data collected nationally.[3] However, the report suggested solutions to this lack of data by suggesting that Stats SA change its census questions and by linking Stats SA data with the Department of Water Affairs (DWA) data.[3]

Ecosystem Accounting

National efforts:

Land Accounts: The first land-use and land-cover accounts were created in 2004 as part of a government discussion document for the years 1994/5.[20,21] These accounts were occasionally described as ecosystem accounts and have been placed under the ecosystem accounting category of this document for this reason.[21] In South Africa, government discussion documents are published in order to solicit comments and/or suggestions from relevant stakeholders and users.[21] This initial document focused on the following aspects of the land-cover and land-use accounts: agricultural land, forestry,

urban areas, wetlands, grassland, barren rock, waterbodies, and other areas.[21] The accounts were developed keeping the 1993 SNA and SEEA 2003 guidelines in mind, though a flexibility was needed to adjust the accounts to the data which were available.

It was noted that, because changes in land-cover and land-use are observable only over a long time scale, land accounts like these should be compiled every four years or more (though it was explicitly stated that accounts would be updated pending data availability).[21] Plans were made to update the accounts once more data became available, though it is unclear whether that occurred or not.[21]

Ecosystem Accounting: South Africa began working on ecosystem accounting in mid-2013 and in mid-2014 joined six other pilot countries in a global project on Advancing SEEA Experimental Ecosystem Accounting (led by the UNSD in partnership with the UNEP and the CBD, funded by the Government of Norway). The lead institutions for this ecosystem accounting are Statistics South Africa and the South African National Biodiversity Institute (SANBI). In 2015, SANBI gave a presentation regarding their new ecosystem accounting initiatives.[24] This presentation detailed some of the methods behind the calculation of ecosystem condition and extent in South Africa (for various terrestrial, wetlands, rivers, and marine ecosystem types).[24] It also illustrated how functional ecosystem units could be linked to ecosystem services (using grazing capacity, sediment retention, and carbon sequestration as examples).[24] Work on this initiative is ongoing.

In a 2015 presentation at the GDSA Roadshow, it was noted that a Strategic Advisory Committee for Ecosystem Accounting had been established.[8] It was also indicated that training workshops had been conducted and that South Africa was undertaking awareness raising and capacity building surrounding natural capital accounting (e.g. engaging in the World Forum on the Natural Capital and the Natural Capital Protocol process).[8]

Priorities within the country

South Africa is keen on transitioning to a green economy and this is linked to several policies, strategies, and plan (e.g. 2030 National Development Plan; 2020 New Growth Path; National Strategy for Sustainable Development).[8] This ambition – as well as a broader ambition towards sustainable development – was stronger articulated and evidenced at the 2015 GDSA Roadshow meeting. As an example of their innovation: South Africa has had Business Plans for mining for over 80 years (this is considered exceptional).[5] It was clear during the GDSA meeting that there is a need for South Africa to undertake additional social and economic development in order to address challenges associated with poverty and unemployment.[14] However, this need for development is leading to high levels of pollution and waste generation.[14] It should be noted, though, that funding for environmental initiatives may be difficult to obtain. The South African government is the primary source of funding for many environmental programs, including their programs for biodiversity management; availability of funds from outside donors has been decreasing.[2] This results in constrained/limited resources available

to the sector (a sentiment echoed at the 2015 GDSA Roadshow meeting).[2]

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TANZANIA

The United Republic of Tanzania has achieved high growth rates in recent years due to is natural resource wealth and tourism.[1] Tanzania is part of the East African Community (EAC) and is one of the world's poorest countries in terms of per capita income. Tanzania's 2014 Gross Domestic Product (GDP) is estimated to have been USD$36.62 billion and the 2014 GDP per-capita (PPP) was USD$1,900.[1] Real GDP growth is approximately 7% per year.[1] In 2014, the largest contributors to Tanzania's GDP were agriculture (26.9%), industry (25.5%), and services (48%); 80% of the labor force is involved in agriculture while 20% is in industry and services.[1] Important agricultural products include coffee, sisal, tea, and cotton.[1] Approximately 49.6 million people live in Tanzania, 69% of the population lives in rural areas, and 67.9% of the population was below the poverty line in 2011.[1] Much of the rural population depend on the land for their livelihoods.[2]

Ecosystem extent and condition

Tanzania's area covers a total of 947,300 km^2 and the country has 1,424 kilometers of coastline.[1] This area includes Zanzibar, which is a semi-autonomous part of Tanzania. In 2011, land uses included: agricultural land (43.7%), forest (37.3%), and other uses (19%).[1] Tanzania's Kilimanjaro is the highest point in Africa and the country is bordered by three of the largest lakes on the continent: Lake Victoria, Lake Tanganyika, and Lake Nyasa.[1] Almost 80% of Tanzania is classified as semi-

Acronyms

CBD: Convention on Biological Diversity
CEEST: Center for Energy, Environment, Science, and Technology
DANIDA: Danish International Development Agency
DFID: Department of International Development (UK)
DMFA: Decision Makers' Forest Academy
EAC: East Africa Community
EdF Tanzania: Environment for Development Tanzania
EMA: Environmental Management Act
EWURA: Energy and Water Utilities Regulatory Authority
FAO: United Nations Food and Agriculture Organization
FINNADA: Finish Department for International Development
GEF: Global Environment Facility
GDP: Gross Domestic Product
GHG Emissions: Greenhouse gas emissions
GIZ/GTZ: Deutsche Gesellschaft für Internationale Zusammenarbeit
HBS: Household Budget Survey
ICT: Information and Communication Technology
IDA: International Development Association
IFAD: International Fund for Agricultural Development
KfW: German Development Bank
MEM: Ministry of Energy and Minerals
MKUKUTA: National Strategy for Growth and Reduction of Poverty
MNRT: Ministry of Natural Resources and Tourism
MoF: Ministry of Finance
NAFORMA: National Forest Resource Monitoring and Assessment Program
NBS: National Bureau of Statistics
NEAP: National Environmental Action Plan
NEMC: National Environment Management Council
NEP: National Environmental Policy
NORAD: North American Aerospace Defense Command
NTFPs: Non-Timber Forest Products
PEI: Tanzania Poverty Environment Initiative
PRS: Poverty Reduction Strategy
SIDA: Swedish International Development Cooperation
TANESCO: Tanzanian Electric Supply Company Limited
TFS: Tanzania Forest Service
UNCSD: United Nations Commission on Sustainable Development
UNDP: United Nations Development Program
UNEP: United Nations Environment Program
UNIDO: United Nations Industrial Development Organization
UONGOZI: Institute for African Leadership for Sustainable Development
USAID: United States Agency for International Development
VPO: Vice President's Office
WAVES: Wealth Accounting for Valuation of Ecosystem Services
WWF: World Wild Fund for Nature

arid; these areas contain grassland, dense thicket, woodland, gallery forests, and seasonally inundated grasslands.[2] Tanzania's important ecosystems include: wetlands, marine/coastal areas, highlands, and mountain ecosystems.[3] Tanzania is among the top 20 bio-diverse countries in the world[4] and 43.7% of the total land area in Tanzania is protected or conserved.[5]

Ecosystem services and natural resources

Tanzania's important natural resources include its fauna and flora, hydropower, tin, phosphorus, iron ore, coal, diamonds, gemstones, gold, natural gas, and nickel.[1] Hydroelectric plants provide 66.5% of electricity in the country.[1] Tourism – much of centers around the country's wildlife and mountain ecosystems – accounts for 6% of GDP; when direct and indirect benefits were combined, the sector contributed to 12.4% of GDP in 1999.[3] The average percentage (1995-2002) contributions of GDP by sectors directly dependent upon environment and natural resources were: agriculture (crops), 35.3%; tourism, 13%; agriculture (livestock), 4.7%; forestry and wildlife hunting, 3.3%; fishing, 2.5%; electricity (energy), 1.6%; mining, 1.4%; and water, 0.2%.[6] The total economic value of catchment forests in Tanzania is more than 17,250 USD/ha.[7] Tanzania's wetlands are vital for electricity production, groundwater recharge, flood control, water retention, and prevention of eutrophication in rivers and lakes.[5]

Threats to ecosystem services and natural resources

Tanzania's natural hazards include drought, flooding during rainy seasons, and some limited volcanic activity.[1] Environmental issues include soil degradation, deforestation, desertification, destruction of coral reefs, droughts affecting agriculture, illegal hunting/trade of wildlife (e.g. ivory).[1] Ecosystem degradation occurs due to unsustainable use/overexploitation, littering, illegal artisanal mining, wildfires, infrastructure development, and agricultural expansion. Degradation is exacerbated by population growth/demographic changes, inadequate management capacity and institutional coordination, low participation of key stakeholders in management, and low levels of awareness of the importance of some ecosystems (e.g. wetlands).[4,5] Tanzania has already started experiencing climate variability and climate change.[8] Average temperatures are expected to increase 1.9 to 3.6 degrees Celsius and weather-related events such as drought and floods are expected to increase in severity, duration, and frequency.[8]

Policy

Tanzania's constitution was last amended in 2012 though a new Constituent Assembly (formed in early 2014) recently passed a new draft of the constitution, which may take effect in 2015.[1] Tanzania, has 30 administrative regions.[1]

Tanzania is party to several international environment agreements (Appendix A). At the national level, natural resource management in Tanzania is governed by policy, strategy, and legal frameworks.[9] In most cases, policies and legal frameworks are specific to a particular type of resource but also take into account the cross

cutting characteristics of natural resources.[9] Tanzania has made an effort to mainstream the environment into national development planning; notably through the National Strategy for Growth and Reduction of Poverty (MKUKUTA) program (see, below).[10] Detailed, recent, reviews of land policy,[9] watershed policy and legal frameworks,[9] forest management and land reserves,[9] water resources management,[9] poverty and environment indicators,[4] and national sector policies relevant to forestry[11] exist. A detailed review of environmental policies from 1990-2004 also exists.[6]

In addition to many of the policies below, Zanzibar also has several policies relevant to this scoping effort, such as the: National Environmental Policy (1992); Zanzibar Development Vision 2010 (operationalized through the Zanzibar Strategy for Growth and Reduction of Poverty); and Zanzibar Energy Policy of 2009 (regulates the energy sector).[12]

National policies/programs:

Environmental Management Act (EMA, 2004): Provides the legal and institutional framework for sustainable management of the environment,[9] prevention and control of pollution, environmental quality standards, and public participation in environmental issues.[3] The Act also provides a foundation for Environmental Impact Assessments, which are required for projects that could impact the environment (e.g. extraction of resources from water catchment areas or game reserves; development of new urban areas; dam construction).[13] An overview of the Act and its implications exists.[3]

National Adaptation Program of Action (NAPA): Informed by aspirations of the National Development Vision 2025.[12] Encompasses the sustainably of the stock of natural resources.[13]

National Development Vision 2025: Launched in 1999, the Development Vision 2025 has three objectives: 1) to achieve quality and good life for all; 2) good governance and rule of law; and 3) building a strong and resilient economy that can effectively withstand global competition.[12,14] The formal implementation tool of this vision is the Five Years Development Plans (the current five year plan is in place from 2011/12 to 2015/16).[4,12] The Presidential Delivery Bureau oversees the Five Years Development Plans through a mechanism known as Big Results Now.

National Environmental Action Plan (NEAP): Prepared in 1994 and updated in 2012, this action plan is part of the government's efforts to mainstream environmental efforts.[12] The Vice President's Office (2012) prepared the newest NEAP (2013-2018), which provided updated information on the country's natural resources and devised strategic interventions for climate change, genetically modified organisms, biofuels, invasive species, and electronic waste.[12]

National Environmental Policy (NEP): This policy came into law in 1997 to mainstream the environment into decision-making in Tanzania.[9] The policy aims to: 1) ensure sustainability, security, and equitable use of resources; 2) prevent and control degradation of land, water, vegetation, and air; 3) conserve and enhance Tanzania's natural and manmade heritage; 4) improve the

condition and productivity of degraded areas; 5) raise awareness of the linkages between environment and development; and 6) promote international cooperation on the environmental agenda.[9] In addition, the policy identifies six key environmental challenges that need urgent national action/intervention: 1) land degradation; 2) lack of accessible, good water; 3) environmental pollution; 4) loss of wildlife habitats and biodiversity; 5) deterioration of aquatic systems; and 6) deforestation. This policy is currently being reviewed.[13]

National Strategy for Growth and Reduction of Poverty (MKUKUTA): This program began implementation in 2005 over two phases (Phase 1: 2005-2010;[3] Phase 2: 2010-2015)[2] and was created under the Tanzania Poverty Environment Initiative.[15] This program fully incorporates environmental and natural resource management issues/targets into its strategies.[16] The aims of the program are to stimulate growth and reduce poverty; its framework has three clusters: 1) growth and reduction of income poverty; 2) quality of life and social wellbeing; 3) and governance and accountability.[3] MKUKUTA's monitoring system recognizes the integration of poverty-environment indicators in measuring progress to achieving poverty reduction and environmental management targets.[16] The program has 118 national development targets, 16 of which are related to the environment.[10] The implementation of the program is linked directly to the national budget process (Medium Term Expenditure Reviews; Public Expenditure Reviews) and the strategy has helped increase budgetary allocations to the environment sector.[10]

National REDD+ Strategy (2013) and other REDD+ preparedness: At the national level, REDD+ is managed and coordinated by the Division of the Environment of the Vice President's Office (VPO); the National REDD+ Task Force was established by the VPO and the Ministry of Natural Resources and Tourism (MNRT) to lead the process of developing a National REDD+ Strategy.[17] In 2009, Tanzania embarked on the road towards REDD by formulating a national framework to guide the development of a REDD+ Strategy. Tanzania is supported by the UN-REDD program (USD$4.3 million) and the Royal Norwegian Government (USD$80 million) to prepare for REDD+ implementation. The UN-REDD Program is a collaborative partnership between the United Nations Food and Agriculture Organization (FAO), the United Nations Development Program (UNDP) and the United Nations Environment Program (UNEP) and seeks to assist Tanzania to prepare and implement a national REDD+ strategy. Activities so far include the development of 9 pilot projects; capacity building and technical support for developing a national Monitoring, Reporting and Verification system; and the piloting of a national trust fund.[17]

Tanzania Poverty Environment Initiative (PEI): Initiated in 2003 (in partnership with UNEP-UNDP), this program focuses on developing the capabilities of key national institutions in designing pro-poor economic growth interventions and sustainable development.[18] This initiative has assisted in the development of poverty environment indicators under the global PEI initiative.[16] One of the outputs of this program has been the National Strategy for Growth and

Reduction of Poverty (MKUKUTA).[16] This program is assisted by the UNDP-UNDEP Poverty and Environment Initiative (see Actors section) and is led by the President's Office Planning Commission.[18]

Data Availability and Monitoring

Over the past few decades, multiple reports have indicated that data availability (including completeness, uniformity, and accuracy) and monitoring programs in Tanzania are limited and that assistance is needed for better environmental-economic monitoring in the country.[13] First, in 2004, there was limited access and availability of data on environmental revenues and expenditures, as well as inadequate capacity for environmental management.[6] Second, in a 2011 report, it was noted that a lack of accurate data were still a major hurdle facing the MKUKUTA II initiative.[19] The report indicated that the economic value of environment and natural resources needed to be better captured in order to guide resource allocation for economic growth and poverty reduction; environmental accounting and auditing were key areas where capacity was lacking.[19] Third, in 2012, a Vital Signs workshop in Tanzania confirmed that: 1) data collection and data holding are dispersed across multiple institutions who collect and have custody of information for different purposes; 2) it is often difficult to access the government's raw data; 3) data products, especially maps, can be difficult to downscale to disaggregated levels; and 4) a harmonized approach to data collection is needed in Tanzania.[20] Fourth, in 2014, and in reference to the MKUKUTA II, it was noted that budgetary constraints limited the amount of sub-national data that could be collected for the environmental indicators.[4] It was also noted that monitoring efforts to conserve the environment are limited since many of the poverty-environment indicators are biased in favor of using the environment (as opposed to conserving or managing it).[4]

There are, however, several large initiatives that may fill the data gap. First, under the President's Office, the Planning Commission has established a monitoring bureau for the Big Results Now program (Energy, Agriculture, Transport, Industry, Water, and Education).[13] Big Results Now is supported by TEEB Tanzania and is an implementation mechanism related to the Five Year Development Plans.[4] This initiative places a strong focus on results, with accountability and performance management at the core of implementation.[21] The objective of the initiative is to ensure government plans and programs are implemented on time with a focus on citizens' needs.[21] Second, the Program on Systematic Observations focuses on assessing the capacity of the Tanzania Meteorological Agency (TMA) to participate in systematic climate data observations and station networks.[12] Third, the Vital Signs project is a promising step forward in the collection of national level data related to agriculture.

Tanzania has recognized that open data is critical for improving participation and monitoring of government activities.[21] In May 2013, Tanzania conducted an Open Data Readiness Assessment (with the support of the World Bank) and identified an action plan aimed at addressing seven dimensions of Open Data; the assessment found that Tanzania is

lagging behind other East African countries in open, online data provision. The World Bank is aiming to start a new project to support the establishment of open data in order to increase access of service delivery information (education, water, and health).[21] The project also aims to improve budget credibility and execution through better cash management, public investment management, and procurement.[21]

A few national data collection programs are listed, below, and examples of data resources are listed in Table 25.

Table 25: Data availability from different sources. This is not a comprehensive list and is simply illustrative of the kinds of data that may be available.

Type of Data	Data Source
Biodiversity	
Wildlife revenue (hunting)	MNRT[6]
Fisheries	
Fisheries revenue	MNRT[6]
Forests	
Timber and NTFP revenue	MNRT[6]
National Forest Inventory	
Monetary value of benefits received from managed forests	TFS, NBS, MoF[4]
Land cover	
Land sector revenue (land registration)	Division of Lands[6]
Agricultural revenue	Ministry of Agriculture and Food Security[6]
Land cover	Africover
Natural Resources	
Forest inventory	TFS
Socio-economic/Administrative	
Poverty Monitoring System	Framework in place to monitor PRS[12]
Tanzania Social Economic Database	Unknown author[4]
Household income derived from natural resources	HBS surveys[4]
Tourism	
Revenue from national parks	MNRT[6]
Tanzania Tourism Sector Survey	NBS[24]
Water/Hydrology	
Water Point Mapping (WPM)	Information on levels of access to rural water supply (World Bank).[12]
Meteorological data	Tanzania Meteorological Agency[12]
Data on water use	Basin Water Offices (the second tier management of water resources, under the national level, which is the Ministry of Water).
Hydrological model	TANESCO[25]

National government data sources:

State of the Environment Reports: These reports provide an overview of challenges associated with environmental management in the country; last produced in 2009.[12] The 2013 State of the Environment is currently in press.[13]

National Report on the Status of Land Degradation: Contains information about the extent and conditions of different ecosystems as well as the stocks of different ecosystem services.[13]

National Forest Resource Monitoring and Assessment Program (NAFORMA): NAFORMA has collected significant social and biophysical data at the district level, funded by the Government of Finland and the FAO (country-wide dataset).[17] One of five pilot projects around the world established to help REDD+ countries develop a national baseline and reference scenario.[22]

Vital Signs: Vital Signs Tanzania is part of a global monitoring system launched with funding from the Bill and Melinda Gates Foundation and led by Conservation International in partnership with the Earth Institute.[23] Vital Signs Tanzania provides near real-time data and diagnostic tools to leaders in Tanzania to help inform agricultural decisions and monitor their outcomes.[23] The program is implemented by the Tanzania Forest Conservation Group in partnership with the National Bureau of Statistics.[23]

Statistical capacity

The National Accounts Department of the National Bureau of Statistics is responsible for reporting economic statistics in the country.[26] The framework used is largely based on the 1993 System of National Accounts.[26] The International Monetary Fund has a comprehensive review of the methods used by Tanzania in the development of their national accounts.[26]

In regards to statistical capacity, the World Bank and several other partners are currently funding a program for the development of a national statistics system in Tanzania (Project: P107722).[27] The project was started in 2011 and has an estimated closing date of 2016; the objective of the project is to "develop a national statistical system that effectively and efficiently delivers reliable and timely statistics in accordance with international standards and best practice."[27] The project consists of five components addressing issues such as the legal, institutional and organizational framework for statistics in Tanzania, training and skills development, development of statistical infrastructure, data development and dissemination and investments in ICT equipment and new office space for the National Bureau of Statistics and the Office of the Chief Government Statistician of Zanzibar.[27] In a mid-term review, it was noted that the project has achieved significant improvements particularly within statistical infrastructure development and data production and dissemination. Accomplishments of the project include: implementation of the planned surveys, archiving and documenting micro-data sets in the National Data Archive, parliament discussions of a draft statistics bill to reform the legal framework for statistics in Tanzania, and development of a quality assurance framework for official statistics.[27] Another important accomplishment is the impending completion of the revision of the Tanzanian system of national accounts, which includes updating the base year from 2001 to 2007 and transitioning to the latest version of the industrial classification. The revised national accounts' aggregates and time-series were scheduled to be released by the end of September 2014.[27]

The National Bureau of Statistics and the Ministry of Finance have both worked in the past with the UNDP-UNEP PEI program on sub-national economic valuation programs.[9] There

are fragmented and weak accounting systems and limited logistical resources in environmental monitoring and expenditures.[6]

Tanzania is a member of the South African Development Community (SADC), which is currently implementing its Regional Indicative Strategic Development Plan (RISDP).[28] The RISDP has four intervention areas: 1) development of legal framework in Statistics; 2) harmonization of statistics in the SADC region; 3) provision of relevant statistics for regional integration; and 4) statistical capacity building development in SADC.[28] As part of this work, SADC coordinates, enhances, and promotes national statistical systems in member states. As such, SADC has undertaken several projects with its member countries to expand their capacity in this regard.[28]

Relevant Actors

Government

In 2004, a review of the capacity of different environmental government agencies was undertaken as part of a larger study on environmental revenues.[6] This report, which examined the Vice President's Office's Department of Environment and the National Environment Management Council, found that there was an imbalance in the available capacity and the demand for services from those departments.[6] It was noted that the Vice President's Office and the National Environment Management Council served as focal points for other ministries seeking environmental assistance and advice.[6]

Table 26: Government ministries/agencies that appeared to have had roles in the past related to ecosystem valuation and natural capital accounting.

Ministry	Notes
Agriculture	
Ministry of Agriculture, Food, and Cooperatives	Has undertaken studies to establish strategies for addressing the negative effects of climate change on food insecure areas.[12]
Ministry of Agriculture and Food Security	Participated in UNDP-UNEP PEI workshops related to ecosystem valuation.[29]
Environment/Natural Resources	
National Environment Management Council (NEMC)	Conducted a study of GHG emissions in 2013 for Oil and Natural Gas Operations.[12] Has worked with the UNDP-UNEP PEI program sub-nationally on economic valuation programs.[9] Has produced reports on relevant topics including the institutional capacity needs and entry points for mainstreaming climate change adaptation into development planning in Tanzania.[30] Has organized workshops on Integrated Ecosystem Assessments.[3]
Ministry of Natural Resources and Tourism (MNRT)	Implements the Management of Natural Resources Program (co-funded by the Governments of Norway and Tanzania); program undertakes community based natural resource management as well as strategic program implementation to respond to changing policy and legal environments.[12] Has worked with the UNDP-UNEP PEI program sub-

	national on economic valuation programs.[9] Participated in UNDP-UNEP PEI workshops related to ecosystem valuation.[29]
Ministry of Energy and Minerals (MEM)	Currently exploring renewable energy sources as part of green economy initiatives.[13]
Finance/Statistics	
Ministry of Finance (MoF)	Has worked with the UNDP-UNEP PEI program sub-nationally on economic valuation programs.[8]
National Bureau of Statistics (NBS)	Has worked with the UNDP-UNEP PEI program sub-nationally on economic valuation programs.[8]
Forests	
Tanzania Forest Service (TFS)	Undertakes inventories of forests and other natural resources.
Planning/Government	
Agency of Cooperation and Research in Development	Was funded by the Raoul Wallenberg Institute to build multi-stakeholder collaboration to promote transparency in the mining industry.[12]
Vice President's Office (VPO)	The Vice-President's Office (through the Environment Division and the Poverty Reduction Division) has played a key role in mainstreaming the incorporation of the environment into the development planning process in Tanzania.[10] Has worked with the UNDP-UNEP PEI program sub-national on economic valuation programs.[9] Participated in UNDP-UNEP PEI workshops related to ecosystem valuation.[29] Division of Environment and Poverty Eradication participated in an invitation-only workshop on Integrated Ecosystem Assessments in 2006.[3]
Planning Commission	Under the President's Office, the Planning Commission has established a monitoring bureau for the Big Results Now program (Energy, Agriculture, Transport, Industry, Water, and Education).[13]
Science	
Center for Energy, Environment, Science, and Technology (CEEST)	Established in 1992. Develops the expertise and facilities necessary for research and coordination of climate change work. Has undertaken a number of climate change studies.[12]
Water	
Energy and Water Utilities Regulatory Authority (EWURA)	
Ministry of Water	Promotes institutional and legal reforms of multi-sectoral water management and development needs.[12]

Civil Society

To promote national dialogue among stakeholders, there are Annual Poverty Policy Weeks.[12] It should also be noted that there are several stakeholders located in Zanzibar not listed here (e.g. the Zanzibar Business Council).[12]

African College of Wildlife Management Mweka (ACWM): Participated in an invitation-only workshop on Integrated Ecosystem Assessments in 2006.[3]

University of Dar es Salaam: The Department of Statistics has conducted a Natural Resource Accounting study.[12] In its Department of Economics, the university houses the Environment for Development Tanzania (EfD Tanzania) initiative (part of an international initiative funded by the Swedish International Development Cooperation Agency) that works with the Environmental Economics Unit at the University of Gothenburg (Sweden). The goals of EfD Tanzania are to, "support poverty alleviation and sustainable development through increased use of environmental economics capacity in policy making processes." The programs objectives include: 1) increasing the number of trained environmental economics; 2) strengthening the capacity of environmental economics; 3) increasing awareness among policy makers; 4) organizing workshops; and 5) distributing publications and policy briefs on this issue.[31] The Economic Research Bureau and Geography Department of the university participated in UNDP-UNEP PEI workshops related to ecosystem valuation.[29] The university participated in an invitation-only workshop organized by the government on Integrated Ecosystem Assessments in 2006.[3] The Environment for Development program at the university is an implementing partner for the UNDP-UNEP PEI program.[32]

Sokoine University of Agriculture: Conducted a study on GHG emissions in 2013 with the National Environment Management Council.[12] Participated in UNDP-UNEP PEI workshops related to ecosystem valuation.[29] Participated in an invitation-only workshop organized by the government on Integrated Ecosystem Assessments in 2006.[3]

Decision Makers' Forest Academy (DMFA): Hosted by the UONGOZI Institute, this academy brings together high-level leaders from government, private sector, and civil society to discuss and experience the critical issues facing the forestry industry in Tanzania.[12]

Institute for African Leadership for Sustainable Development (UONGOZI Institute): Has a green growth platform and hosts the Decision Makers' Forest Academy (DMFA).[12]

World Wild Fund for Nature (WWF): Participated in an invitation-only workshop organized by the government on Integrated Ecosystem Assessments in 2006.[3]

TEEB Tanzania: Tanzania is one of five countries that is participating in a three-year project, funded by the European Commission, to undertake a country study that responds to their policy needs. A TEEB country study identifies the ecosystem services that are vital to meeting the country's policy priorities and makes recommendations on how these services can be integrated into

policies.[33] TEEB Tanzania compares alternative scenarios to support the Big Results Now policy to reform agricultural production. Each of the three sections of the Rufiji River Basin (mountain highlands, midlands, and the delta) are going to be assessed in an integrated manner.[33]

Bilateral/Multilateral Institutions

In 2004, most environmental management projects at the national level were donor supported. For example, in 2003/4, donor support to environmental programs amounted to Tsh 83.5 billion.[6] In 2004, the Ministry of Finance listed the following agencies has having funded environmental management programs in Tanzania: European Union, DANIDA, FAO, France, FINNADA, GEF, IDA, Ireland, Japan, IFAD, NORAD, SIDA, Switzerland, UNDP, USAID, UNEP, and Germany/GTZ/KfW.[6]

DFID: Funded a study on the Economic Impacts of Climate Change in Tanzania.[34]

GEF: Funded a climate GHG emissions study.[12]

GIZ: Has funded several projects in Tanzania including a green economy initiative[7] and a climate GHG emissions study (under its former name of the Deutsche Gesellschaft fur Technische Zussamenarbeit, GTZ).[12] GIZ is currently funding (2013-2016) a project on sustainable management of natural resources in Tanzania.[35]

UNCSD (UN Commission on Sustainable Development): Provides support for sustainable development.[12]

UNEP: Funded a climate GHG emissions study and the National Cleaner Production Centre.[12]

UNDP-UNEP Poverty-Environment Initiative (PEI): This program, initiated in 2003, develops the capacity of key national institutions in designing and implementing pro-poor economic growth interventions and sustainable development.[12,32]

The UN-PEI program has undertaken several ecosystem valuation projects. First, the PEI completed training of key sectors (wetlands, tourism) on economic evaluation on natural resources carried out[32] and economic Valuation of Ihefy Wetlands in 2011.[9] Second, the PEI completed an Integrated Ecosystem Assessment pilot, as part of the Millennium Ecosystem Assessment in 2007.[29] Finally, the PEI organized Workshops on Integrated Ecosystem Assessments where information was shared regarding ecosystem characteristics, functioning, and values.[3]

UNIDO: Funded the National Cleaner Production Centre.[12]

The World Bank: The World Bank (and other donors) are funding the Water Sector Support Project (2006-2025) related to the Big Results Now initiative.[12] The World Bank has also funded several environment-related projects in the past (e.g. the Lake Victoria Management Project; Forest Conservation and Management Project and the Eastern Arc Forest Conservation and Development Project). One of the unintended outcomes from one of their projects was the creation of sub-national information (Lower Kinhansi area) on the valuation of water.[25]

Ecosystem valuation, natural capital accounting, and ecosystem accounting

Over the past decade, several program documents have provided information on Tanzania's capacity to undertake economic valuation of natural resources. In 2001, the National Biodiversity Strategy and Action Plan (related to the Convention of Biological Diversity or CBD), noted that there was inadequate economic valuation of biodiversity resources.[36] In a 2004 Public Expenditure Review of Environment, senior managers in the Vice President's Office and the National Environmental Management Committee noted that capacity building was needed in the valuation of environmental resources, so that Tanzania could have experts who would ensure that environmental resources are not undervalued and that market-based approaches are used for environmental protection.[6] This capacity building was listed as one of six environmental issues of priority and an issue that was included in the strategic plans of both organizations. In the same report, the President's Office of Planning and Privatization confirmed that the Tanzanian accounting standards did not capture the specific contributions of some environmental sectors to GDP for tourism, wildlife, and forests.[6] Two years later, in 2006, during a government workshop on integrated ecosystem assessments, one of the main issues noted by participants was that environmental valuation and accounting needed to be used to influence policy, with environmental assessments used as a management tool.[3] Participants further stated that there was a need to "integrate depreciation of natural capital into macro-economic indicators and (that)…national environmental accounting committees should be established."[3]

Despite several years of apparent appreciation for ecosystem valuation, a 2008 document detailing the results of a Millennium Ecosystem Assessment pilot (which contained many of the same basic analyses and data requirements as an Ecosystem Accounting project), the National Environment Management Council again indicated that assessments were only being done at a sub-national scale and that the technical and financial resources did not exist for a national-level assessment.[29] However, in the document, it was expressed that the government wished to collect and harmonize basic data at the national level so that it could be used in policy-making. The document also stated that these types of assessments would contribute to the implementation of the following policies: EMA, National Environmental Policy, the MKUKUTA, and the Tanzania Development Vision 2025.[29] A report on the institutional capacity for mainstreaming climate change adaptation into development planning at the national level, indicated that financial, technical, human, and other resources were inadequate to ensure effective adaptation.[30] Finally, in 2013, the World Bank noted that the economic benefits of some ecosystems, such as marine fisheries and coastal natural resources, are still undervalued in Tanzania.[37] The World Bank also noted that undertaking some of these analyses is constrained by the lack of consistent baseline data and related meaningful socio-economic studies.[37]

Most recently, a 2014 report on the implementation of the CBD indicated that biodiversity had not yet been incorporated into national

accounting systems and that there was limited capacity for research and generation of accurate information and data needed to value biodiversity.[7] In the same year, a report on the MKUKUTA II and poverty-environmental indicators noted that an environmental valuation indicator would be difficult to operationalize. Specifically, in order to understand the percentage monetary value of benefits received from participatory forests and wildlife management regimes, it was suggested that a sub-national case study be used (e.g. a critical environmental hotspot). It was suggested that this case study would identify the monetary value of benefits acquired from the communities participating in wildlife management regimes in Tanzania (and that the ministry responsible for forest resources, wildlife, and fisheries would take lead in identifying the hotspot areas for this case study).[4]

There are a few signs of progress in environmental valuation. First, Tanzania is a signatory of the Natural Capital Accounting Communiqué (related to the Rio +20 in 2012) and also supports WAVES but is not a core implementation country.[12] Natural capital accounting is still a challenge in Tanzania and increased technical capacity is needed, though it is recognized as being important for the country.[13] Second, a national climate financing framework is being developed to facilitate tracking of climate change finances; there are also proposals for other types of natural resources financing (such as for forests).[13] Third, there has been some work on reviewing the literature on the economic value of pastoralism[38] and there have been many sub-national ecosystem assessments, including: assessment of forest conditions in the Eastern Arc Mountains; ecosystem services provided by Mount Kilimanjaro; and ecological functions of the Jozani Chwaka Bay National Park mangrove ecosystem.[3] Finally, Tanzania is a member of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES); IPBES members are committed to building IPBES as the leading intergovernmental body for assessing the state of the planet's biodiversity, its ecosystem, and the essential services they provide to society.[39]

Past and current efforts relevant to this scoping are detailed, below.

Ecosystem Valuation

Regional (multi-country) efforts:

Southern African Millennium Ecosystem Assessment (SAfMA):[3] This assessment was one of 33 sub-global assessments conducted using the Millennium Ecosystem Assessment framework. It aimed to assess the services provided by ecosystems in southern Africa and their impacts on the lives of people. The SAfMA was undertaken at three spatial scales: regional assessment, basin assessment, and local assessment. The regional assessment covered Africa south of the Equator. The basin assessment included the Gariep and Zambezi basins. The local assessments included Gauteng, Great Fish River, Lesotho Highlands, Richtersveld, and Gorongosa-Marromey. The SAfMA studied three ecosystem services: food, water, and biodiversity. The assessment steps included: 1) identifying and categorizing ecosystems and ecosystem services, 2) identifying links between ecosystem services and human well-being, and 3) identifying direct and

indirect drivers of change, and selecting indicators.[3]

National efforts:

Economics of Climate Change in Tanzania: Study funded by DFID and undertaken by the Stockholm Environment Institute (in Oxford) working with local partners (study published in 2010).[34] The analysis involved: 1) future emissions profile for Tanzania and key opportunities for investment in low carbon technologies or options across different sectors; 2) consideration of carbon finance and co-benefits with other policies; 3) opportunities and barriers for financing and assessing low carbon funds; and 4) the linkages between low carbon investments and climate resilience.[34] The study recommended various strategies for Tanzania in regards to climate change including: improving estimates of cost of climate change, building capacity, a more sustainable and lower carbon pathway, and revisions of national policy and vision documents.[34]

Inventory of Greenhouse Gases (GHGs): Developed in 2003/4, this program addressed energy, agriculture, industrial processes, waste management, forestry, and land use.[12]

Land Valuation: There was a land valuation initiative undertaken several years ago with the assistance of academic researchers from Europe.[13]

National REDD+ Programs: A national REDD program has been initiated following the Draft National Strategy for Reduced Emissions from Deforestation and Forest Degradation (REDD+) in 2011 (see REDD+ program summary, above).[12]

Sub-national efforts:

Compensation for environmental services program/Payments for Ecosystem Services (PES): Some examples of PES programs, include:

Tarangire Elephant Project: Organized by the World Conservation Society, the project is working with local communities and tour operators to protect the main dispersal area of the northern subpopulation of elephants.[40]

Equitable payments for watershed services project in Mount Uluguru: Organized by the Dar es Salaam Water Supply Company, Coca Cola, CARE International, WWF, and several other donors. Project aims to extend the RUPES (Rewards for Upland Providers of Ecosystem Service) approach; involves upland communities in the Kibungo sub-catchment being rewarded for land management interventions that reduce the sedimentation of the River Ruvuu.[29]

Eastern Arc Mountains: As a result of the NatCap program (see below), a partnership between WWF and CARE was built in order to set up the political machinery to compensate suppliers of watershed services via payments from downstream consumers.[41]

Natural Capital Project (NatCap): Starting in 2007 (lasting 5 years), this project aimed to improve knowledge of the Eastern Arc Mountains regional ecosystem services.[12] The program used the InVEST program to model the current and project stocks, flows, and values of ecological services.[42] With the

help of the InVEST program, the initiative resulted in the development of the following models: hydrological services, timber services and value, nature-based tourism services, governance of resources, carbon-related services, NTFPs, conservation cost and benefits, and biodiversity priorities and existence values.[42] The program found that the area's forests sustain rivers that supply water and hydroelectric power to over 3 million people, contain extensive natural reserves for carbon storage, and provide building materials, food, and cash income for mountain communities.[42]

Southern Agriculture Growth Corridor of Tanzania: A green growth program that uses REDD+ to help finance transitions to low-emissions energy systems.[12]

TEEB Case Study, Traditional forest restoration in the Shinyanga Region (Central Tanzania): In 1986, a government program called HASHI was started to create and restore forests in the region. This initiative examined whether forest-based ecosystem services (fuel, fruit, timber, honey, medicines, fodder, water catchment, erosion reduction, cultural meaning) could be used as a reason to prioritize reforestation programs. The economic value of restoration was calculated as USD$14 per month per person.[43]

TEEB Tanzania: Tanzania is one of five countries that is participating in a three-year project, funded by the European Commission, to undertake a country study that responds to their policy needs. A TEEB country study identifies the ecosystem services that are vital to meeting the country's policy priorities and makes recommendations on how these services can be integrated into policies.[33] TEEB Tanzania compares alternative scenarios to support the Big Results Now policy to reform agricultural production. Each of the three sections of the Rufiji River Basin (mountain highlands, midlands, and the delta) will be assessed in an integrated manner.[33]

UNDP-UNEP Poverty-Environment Initiative (PEI): This program aims to, among other things, ensure that economic valuation of key natural services is conducted in Tanzania.[32] The program is led by the Vice President's Office (Division of Environment) and implementing partners include the Ministry of Finance (Poverty Eradication Division), National Environmental Management Council, National Bureau of Statistics, the Prime Minister's Office/Regional Administration and Local Government, Ministry of Livestock and Fisheries, and the University of Dar es Salaam.[32]

Notable aspects of this program, include:

Economic Valuation of Ihefu Wetland:[9] Carried out in 2007-2010 and assessed the economic value of wetlands to community welfare and livelihoods; the study used a partial valuation approach due to data limitations. The study found that the direct value of the study is with regard to hydropower production was the generation of 14.8 HEP to the national grid.[9]

Pilot study in the Livingstone Mountain Ranges: Study undertaken starting in 2007 using the following indicators: level of environmental risk, services provided by the ecosystems, economic

importance, levels of community dependency, biodiversity value, linkages with other ecosystems, management status, size and age of the ecosystems, and location of the ecosystem.[29]

Value of land resources in the Tabora Region (Central Western Tanzania):[44] In 2013, the values of land resources of the Tabora region and its main ecosystem services were assessed. The analyses focused on nine ecosystem types and quantified their extent, their provisioning services (total of USD$1.45 billion per year), their water regulation services (USD$908 million per year), their tourism/cultural/aesthetic value (USD$91 million per year), and their carbon sequestration services (USD$12.79 billion per year).[7] The study recommended that although woodlands were shown to have the highest economic value in terms of biodiversity and carbon stock, values from other land use types need to be sustained as they play significant impacts on the community livelihoods.[44] The valuation was undertaken by the University of Dar es Salaam with help from the Stockholm Environmental Institute, via the Vice President's Office.[44]

Natural Capital Accounting

National efforts:

Tourism Satellite Accounts: The development of these accounts started in 1999 (with accounts launched in 2000) by the Ministry of Natural Resources and Tourism. However it was quickly noted that the Ministry could not implement the account alone due to inadequate manpower and because tourism impacts various sectors of the economy.[45] As such, the development of the accounts now involves: the Ministry of Natural Resources and Tourism, the Central Bank of Tanzania, the National Bureau of Statistics, the Immigration Department, and the Zanzibar Commission for Tourism.[37] The project resulted in new data collection efforts (e.g. the Tanzania Tourism Sector Survey; International Visitors Exit Survey).[24] Problems associated with the development of the account included limited funding and a lack of cooperation from tourism establishments/government institutions though the 2008 Tourism Act was signed to address these issues.[45]

Sub-national efforts:

Natural Resource Accounting Study (Forests): The Department of Statistics at the University of Dar es Salaam worked with the National Bureau of Statistics to conduct a Natural Resource Accounting study on the contribution of natural forests income in a pilot district in 2002.[12,46] The research study focused on the Urambo district because undertaking a national study would have required a larger amount of resources.[46] This work was undertaken with the help of the Centre for Environmental Economics and Policy in Africa (CEEPA) which works to enhance the capacity of African researchers to conduct environmental economics and policy inqury.[46] Research carried out with grants from the Resource Accounting Network of Eastern and Southern Africa (RANESA, a non-profit that supported environmental economics and policy).[46]

The purpose of the study was the valuation of non-marketed forest resources and proposing means for generation of modified national accounts

that would cover the full value of forest resource production (and consumption).[46] Land cover for the study area was studied for three time points from 1975 to 1997.[46] Secondary (government data) and primary data (household interviews) were used.[46] Hurdles faced by the program included data collection and the quality of the data once they were obtained; it was noted that this could probably be addressed by changes in government policy.[46] The total value of natural forest products consumed per household was estimated at USD$2098 though 32% of the value was for products used in tobacco curing.[46] The policies recommended by the project aimed to ensure regular delivery of data from government departments, which would facilitate natural resource accounting and regular updates.[46]

Ecosystem Accounting

Sub-national efforts:

Zanzibar Marine Accounts: Zanzibar developed marine ecosystem services accounts for the 2007 calendar year; this effort was described as Ecosystem Accounting (as opposed to Natural Capital Accounting).[47] The coastal management accounts were developed by the Earth Institute (Columbia University), the Institute of Marine Sciences (University of Dar es Salaam), and funded by the Pew Foundation from 2006-2009.[48] The accounts were based on the ecosystem accounting approach of the UN and the European Environment Agency. Physical accounts for land use/major component of the ecosystem (such as coral reefs and mangrove forests) and economic accounts were developed.[48] Detailed methods for the development of these accounts are available.[48] It is not clear whether this account was maintained and updated following its initial development.

The results of the coastal management accounts illustrated that local communities benefited most from budget and small-scale tourism.[47] In addition, the study estimated that marine ecosystem services contribute 30% of GDP; the contribution to GDP was also calculated for various other marine ecosystem services (including tourism related to coastal areas).[48]

Priorities within the country

Tanzania is a country that has achieved high Real GDP growth rates, but still faces high levels of poverty, and is attempting to pair economic growth with sustainable development. It must achieve these goals within the reality of the government's governance landscape (Appendix B) and in a region where population growth rates and unsustainable use of resources are having large impacts on the environment. Nevertheless, the government has signaled its understanding of the importance of the environment in sustainable development goals through its participation in the UNDP-UNEP PEI program and by protecting large areas of the country (43.7% of land is protected or conserved). Tanzania is considered one of the countries to have successfully mainstreamed poverty-environment linkages at the planning stage, with emphasis natural resource intensive sectors (land, agriculture, fisheries, water, and forests).[4]

More broadly, Tanzania has indicated its priorities in the environment in several of its policy documents. First, the National

Environment Action Plan and the National Environmental Policy are part of the government's efforts to mainstream the environment into government planning. These emphasize the importance of mitigating land degradation, ensuring access to water and increasing the quality of aquatic systems, decreasing environmental pollution, and decreasing loss of wildlife and forests. Second, the MKUKUTA fully incorporates environmental and natural resource management issues and targets into its strategies; its aims are to stimulate growth and reduce poverty in a way that is sustainable.

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UGANDA

The Republic of Uganda has experienced sustained economic growth following reforms in 1990.[1] Uganda is part of the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA). Real Gross Domestic Product (GDP) growth is approximately 3.5-6% per year.[1] Uganda's 2014 GDP is estimated to have been $26.09 billion and the 2014 per-capita income was $1,800.[1] In 2014, largest contributors to Uganda's GDP were agriculture (21.9%), industry (26.7%), and services (51.3%); 82% of the labor force is involved in agriculture while 5% is in industry and 13% is in services.[1] Important agricultural products include coffee, tea, cotton, and tobacco.[1] Approximately 35.9 million people live in Uganda, 84.2% of the population lives in rural areas, and 19.7% of the population was below the poverty line in 2013.[1] Most (85%) of the population is highly dependent on natural resources for their livelihoods.[2]

Ecosystem extent and condition

Uganda's area covers a total of 241,038 km^2.[1] In 2011, land uses included: agricultural land (71.2%), forest (14.5%), and other uses (14.3%).[1] Uganda has a large diversity of terrestrial and aquatic habitats including: high altitude montane forest, rivers and lakes, woodlands, grasslands, bush lands, and agricultural areas.[3]

Acronyms

BIOFIN: Biodiversity Finance Initiative
CBD: Convention on Biological Diversity
CHM: Clearing House Mechanism
COMESA: Common Market for Eastern and Southern Africa
EAC: East African Community
ESE: Ecosystem Services Economics Unit (within UNEP)
GDSA: Gaborone Declaration for Sustainability in Africa
GEF: Global Environment Facility
GDP: Gross Domestic Product
GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit
ICRAF: International Centre for Research in Agroforestry
IMF: International Monetary Fund
IPBES: Intergovernmental Platform on Biodiversity and Ecosystem Services
MFPED: Ministry of Finance, Planning, and Economic Development
NAPA: National Adaptation Program of Action
NBSAP: National Biodiversity Strategies and Action Plan
NCA: Natural Capital Accounting
NDP: National Development Plan
NEMA: National Environment Management Authority
NPA: National Planning Authority
PEAP: Poverty Eradication Action Plan
PEI: Poverty Environment Initiative
REDD+: Reducing Emissions from Deforestation and Forest Degradation
SEEA: System of Environmental-Economic Accounting
SNA: System of National Accounts
TEAM: Tropical Ecosystem Assessment and Monitoring
TSA: Tourism Satellite Account
UNDP: United Nations Development Program
UNEP: United Nations Environment Program
WAVES: Wealth Accounting and Valuation of Ecosystem Services

Ecosystem services and natural resources

Uganda has substantial natural resources, including fertile soils, regular rainfall, copper, cobalt, hydropower, limestone, salt, gold, and oil.[1]

Hydroelectric plants provide 59.9% of electricity in the country.[1] Uganda ranks among the top ten most biodiverse countries globally.[3] Forest ecosystems are important for food, medicine, wood for construction, fuel wood (firewood and charcoal provide 96% of energy for cooking in Uganda) and animal biodiversity.[4] Wetlands provide income opportunities to the rural poor and provide ~5 million people in Uganda with water.[4] Fisheries resources are among the most significant endowments of Uganda with nearly 5.3 million people directly involved in fishing, fish processing, and trading.[4] In terms of tourism, the number of tourist arrivals increased 34% from 2010 to 2011, with the number of tourists visiting protected areas increasing by 9.4% during the same time period.[4]

Threats to ecosystem services and natural resources

Environmental issues include the draining of wetlands for agricultural use, deforestation, overgrazing, soil erosion, and poaching.[1] Of increasing concern is persistent degradation and the loss of critical ecosystems, some of which are of international significance; degradation is, in part, due to population growth and associated socioeconomic activities including urbanization, industrialization, agricultural expansion, and trade.[5] Of note, fisheries – which are very important, economically, to Uganda – have been negatively impacted by over-fishing with volume of fish exports declining since 2005.[4]

Deforestation and degradation are negatively impacting Uganda's ecosystems. In Uganda, the annual contribution of ecosystem services is estimated to have decreased from USD$5,097 million in 2005 to USD$4,405 million in 2010.[4] This decline is mainly due to deforestation.[4] A study on the extent and impact of land degradation has been published.[6]

Uganda will be impacted by climate change. The National Adaptation Program of Action (NAPA) has already noted an average temperature increase of 0.28°C per decade between 1960 and 2010.[4] Forestry, water, wildlife, and agriculture sectors will be particularly impacted.[4]

Policy

Uganda's constitution was last amended in 2005.[1] Uganda has 111 districts in addition to its capital city.[1]

Uganda is party to several international environment agreements (Appendix A). Recent reviews of policy relevant to biodiversity conservation (related to the CBD), wildlife, and wetlands have been published.[4,7,8] Policies relevant to this scoping are detailed, below.

National policies/programs:

Uganda Poverty Environment Initiative (PEI): A set of poverty-environment indicators covering land use, water and sanitation, use of forest resources, fish resources, environment and health, housing, and vulnerability to disasters have been developed.[9] As a result of this initiative, policy briefs on the value of water and other assets have been developed and learning trips have been undertaken between Uganda and Rwanda.[10,11] The PEI initiative was undertaken in two phases: phase I from 2005-2007 and phase II from 2007-2011.

Poverty Eradication Action Plan (PEAP): The Poverty Eradication Action

Plan was first developed in 1997 and has been revised multiple times since. The plan was used as a mechanism to move towards sustainable development; the environment has been mainstreamed into this plan.[5] This framework aimed to address key poverty challenges; it was replaced by the five-year National Development Plan.[13] A copy of the PEAP is available.[14]

National Development Plan (NDP, 2010/11-2014/15): The vision of the NDP was "a transformed Ugandan society from a peasant to a modern and prosperous country within 30 years" with themes of the NDP including growth, employment, and socio-economic transformation and prosperity.[15]

National Adaptation Program of Action (NAPA): The NAPA is Uganda's climate change action plan. The NAPA has been piloted in three ecosystems in order to strengthen communities' resilience to adverse impacts of climate change and also to strengthen biodiversity and ecosystem resilience as well.[4]

National Vision 2040: The National Vision 2040 was launched in 2013 and is being implemented through 5-year National Development Plans (NDP).[4] Vision 2040 has articulated several national targets for environmental conservation and ecosystem management; these are described in detail in the most recent report written by the government for the CBD.[4] The environment (specifically, biodiversity) has been mainstreamed into both the Vision 2040 and the NDP.[4]

REDD+ Strategy: A national REDD+ strategy has been finalized. Its main emphasis is on forestry conservation and restoration of both public and private lands.[4]

Data Availability and Monitoring

Data are not always available in Uganda and monitoring systems are not always in place. In 2006, it was noted that resources (technical, financial, and data resources) were low.[5] Specifically, information gaps existed that included inventories of ecosystem goods across different ecosystems.[5] Later, in 2009, a report by the UNDP-UNEP PEI provided insights into how the environment could be better mainstreamed into development programs.[16] One of the recommendations of that report was that national capacity for environmental statistics needed to be strengthened in the following ways: 1) the national statistical system should be reviewed to include environmental indicators/questions; and 2) a comprehensive set of baseline studies on poverty-environment needed to be undertaken to obtain data on indicators, guide the selection of key performance indicators, and set targets against which to monitor progress.[16] It was noted that existing statistical surveys conducted by the Uganda Bureau of Statistics (e.g. National Demographic and Health Survey, Household Living Conditions Survey, Core Welfare Indicator Questionnaire) did not adequately cover environmental data/questions.[16]

In the 2010 National Development Plan, one of the strategies proposed was to strengthen tourism and wildlife information systems, including the development of a tourism satellite account (TSA). This process would involve the development of a tourism management information system, the

development of the TSA, multiple data collection activities (including strengthening of animal wildlife databases), and enhancement of in-country tourism attractions.[15]

A 2014 report to the CBD noted that fisheries data are inadequate, though the government has proposed the establishment of a database/information system on fish stocks.[4]

Examples of data resources are listed in Table 27.

National government data sources:

National Clearing House Mechanism (CHM): The Clearing House Mechanism was launched in 2012 and aims to share information on biodiversity nationally and globally.[4]

Table 27: Data availability from different sources. This is not a comprehensive list and is just illustrative of the kinds of data that may be available.

Type of Data	Data Source
Land cover	
Land cover	Africover
Water/Hydrology	
Water use	Directorate of Water Development[12]

Statistical capacity

The Uganda Bureau of Statistics (UBOS) produces and disseminates accounts. The 1993 System of National Accounts (SNA) reporting methodology for accounts is used.[17] The International Monetary Fund (IMF) has a comprehensive review of the methods used by Uganda in the development of their national accounts.[17] The IMF notes that UBOS staff working on the national accounts occasionally face shortages in consumables (e.g. printing paper) and that funds for the improvement of the national accounts are low.[17]

In 1999 the World Bank funded a program with outcomes that included, among other things: 1) improved financial management including more timely preparation and auditing of government accounts; and 2) improved quality and timeliness in macroeconomic and poverty data.[18] Those aspects of the project were considered to have been completed in a satisfactory manner. Complete information about the program can be found in World Bank documentation.[18]

In 2002, however, a World Bank document indicated that the quality of accounting in Uganda had fallen behind other African countries due to a lack of support from the government for the profession including the lack of a local professional qualification.[19] As a result, the World Bank moved to increase the quality of the accounting profession in Uganda and provide general capacity building for government infrastructure.[19]

Relevant Actors

Government

There are several government institutions that have experience in fields relevant to this scoping effort (Table 28).

Table 28: Government ministries/agencies that appeared to have had roles in the past related to ecosystem valuation and natural capital accounting.

Ministry	Notes
Environment	
National Environment Management Authority (NEMA)	Was a partner on the UNDP-UNEP PEI initiative; [2] has attended international workshops related to the UNDP-UNEP PEI.[5] Is one of the national counterparts for the UNDP BIOFIN program.[20] Is the national focal point for the CBD.[4] Identified as being a key agency in the promotion of natural resource accounting in a CBD document.[21]
Finance	
Ministry of Finance, Planning, and Economic Development (MFPED)	Was a partner on the UNDP-UNEP PEI initiative.[2] Has attended international workshops related to the UNDP-UNEP PEI.[5] Is one of the national counterparts for the UNDP BIOFIN program.[20] Identified as being a key agency in the promotion of natural resource accounting in a CBD document.[21]
Planning	
National Planning Authority (NPA)	Partnered with the Ecosystem Services Economics (ESE) Unit of UNEP is undertaking the "Capacity building in national planning for food security" project in Uganda which appears to have incorporated ecosystem valuation.[22] NPA's role is to ensure that the findings of the project feed into national planning processes.[22]
Statistics	
Uganda Bureau of Statistics	Undertakes various statistical surveys at a national level.[16]

Civil Society

Makerere University Institute of Environment and Natural Resources: The institute offers multiple post-graduate degrees in environmental impact assessments, environmental information management, and related issues.[23] Some of their courses touch on the economics of natural resource use.[23]

Fauna and Flora International: Undertook a study on cultural values in Lake Mburo and the Rwenzori Mountains national parks in 2009.[7]

International Centre for Research in Agroforestry (ICRAF): Partnering with the Ecosystem Services Economics (ESE) Unit of UNEP is undertaking the "Capacity building in national planning for food security" project in Uganda which appears to have incorporated ecosystem valuation.[22] ICRAF provides data collection services to the project.[22]

Bilateral/Multilateral Institutions

Global Environment Facility (GEF): Provides financial support to the government to undertake its NBSAP and meet the requirements of the CBD.[4]

GIZ: Has funded several environmental or governance projects in Uganda including: green economy initiatives (employment for sustainable development in Africa)[24] and renewable energy and energy efficiency programs.

United Nations Environment

Programme (UNEP): The Ecosystem Services Economics (ESE) Unit of UNEP is undertaking the "Capacity building in national planning for food security" project in Uganda (Hoima District in Western Uganda); the project appears to have incorporated ecosystem valuation into its outcomes.[3] The project aims to quantify the relationship between food production and key inputs affecting ecosystems.[25] The trade-offs between food production and the state of ecosystems and their services will also be analyzed through economic valuation of food services with relevance to food production and ecosystem management.[22] This project works with the National Planning Authority (NPA) and the International Centre for Research in Agroforestry (ICRAF).[22] UNEP also provides financial support to the government to undertake its NBSAP and meet the requirements of the CBD.[4]

United Nations Development Programme (UNDP) BIOFIN Program: The BIOFIN program aims to address biodiversity finance challenges by increasing investment in the management of ecosystems and biodiversity.[20] In Uganda, the national counterparts for this program are the National Environmental Management Authority (NEMA) and the Ministry of Finance, Planning, and Economic Development.[20] The following four BIOFIN components are being implemented in Uganda:[20]

Component 1: Review of Biodiversity Policies, Institutions, and Expenditures (ongoing)

Component 2: Defining the costs of implementing National Biodiversity Strategies and Action Plan

Component 3: Developing a Resource Mobilization Strategy for Biodiversity Finance (starting in 2015)

Component 4: Initiate implementation of the Resource Mobilization Strategy (starting in 2015)

UNDP-UNEP Poverty-Environment Initiative (PEI): The PEI project was active Uganda in two phases (Phase I, 2005-2007; Phase II, 2007-2011) and aimed to mainstream the environment into the Poverty Eradication Action Plan as well as the National Development Plan.[2]

The World Bank: The World Bank has funded several environmental programs in Uganda with sub-national and national impacts (e.g. Institutional Capacity Building for Protected Areas Management and Sustainable Use Project;[26] Carbon Finance Project[27]).

Ecosystem valuation, natural capital accounting, and ecosystem accounting

The government of Uganda appears to be developing (or has developed) natural capital accounts; first attempts at sub-national environmental accounting took place as early as 1992.[31] Generally speaking, there has been a long history of awareness of, and interest in, environmental accounting. First, a 2002 report for the CBD clearly noted that natural resource accounting was a goal of the Ugandan government.[21] Specifically, the report noted that there would need to be lobbying for the inclusion of natural resource accounting in national budgets, though it is not clear whether this actually occurred or not.[21]

Later, a 2006 report indicated that Uganda was undertaking initiatives related to environmental accounting and the creation of markets for ecosystem services, though further details on these programs were not provided.[5] This report noted that challenges facing ecosystem management in Uganda included linking ecosystem concerns to policy making (especially budgetary allocations) and resource gaps (information, technical, and financial gaps).[5] In 2009, a government document noted that there was still very limited knowledge on the importance of wildlife to economic development.[7] Specifically, the report indicated that most information available concerned the contribution of wildlife to tourism and not to its ecosystem services.[7] A second report published in the same year indicated that it was difficult to get sustainable funding to conserve areas because it was difficult to reflect environmental and natural resources in the national accounts.[8] In 2009, the full economic value of some ecosystems (wetlands) were not adequately understood or appreciated.[8] This had not changed by 2013, when the profile for Uganda's national accounting systems on the IMF website noted that environment accounts had not been included in GDP compilation.[17]

More recently, in the 2010 National Development Plan, one of the strategies proposed was to strengthen the tourism and wildlife information systems. This would include the development of a tourism satellite account (TSA) for which several activities were proposed: 1) development of a tourism management information system, 2) the development of the TSA itself, 3) multiple data collection activities, 4) strengthening of animal wildlife databases, and 5) enhancement of in-country tourism attractions.[15]

In 2014, a report for the CBD clearly articulated the benefits of environmental valuation for Uganda and how valuation would enable the construction of natural resource accounts.[4] Nevertheless, this report also noted that statistical value of protected areas had not been captured in national accounting though several ecosystem valuation studies had been completed.[4] The report recommended the development of capacity in natural resource accounting methodology to generate data that can be used for these initiatives.[4] NCA was not included as an economic instrument being used in Uganda to promote environmental sustainability in an undated policy brief prepared by the UNDP-UNEP PEI program (though several other economic instruments were noted).[13]

An undated presentation given by staff members of NEMA and UBOS outlined biodiversity and ecosystem accounting initiatives in Uganda.[32] This presentation indicated that the National Environment Management Policy (NEMP, 1994) appeared to include environmental accounting as an objective.[32] The presentation further detailed that the NEMP 1994 proposed a number of activities, including: 1) increased capacity in the Ministry of Finance and Economic Planning to prepare satellite environmental accounts as part of national accounting procedures; and 2) initiation of a pilot project on the development of national indicators and the application of environmental accounting in Uganda, within the framework of the United Nations guidelines on national environmental accounting.[32] This presentation touched on a series of

studies already undertaken in Uganda (total economic valuation of the forest sector; millennium ecosystem assessments; payments for ecosystem services programs).[32] However, it was specifically noted that, "no (ecosystem) models (had been) developed on SEEA-EEA."[32] Nevertheless, the government agencies indicated that they were beginning to develop a national framework for ecosystem accounting and were thinking about key policy questions (conceptual issues, stakeholder mapping, capacity issues versus institutional mandates).[32] The government is also identifying potential linkages and synergies between SEEA-EES and on-going policy and planning initiatives (NDP revision process; NEMP revision process; National Statistical Strategy; Post 2015 development agenda). The government plans to develop land accounts, water accounts, fisheries, and oil and gas accounts.[32]

In 2013, government representatives gave another presentation updating on the progress of their ecosystem accounting initiatives.[31] This presentation indicated that Uganda's Environmental and Natural Resources Sector Working Group commissioned a study on the feasibility of integrating sustainability concerns into the Ugandan National Accounting System.[31] This study recommended immediate, medium, and long-term actions.[31] The immediate actions were those that could be undertaken based on the existing data with minor adjustments.[31] The medium and long term actions required more extensive revision, research, and collection of additional data.[31] It was noted that a key lesson learned was that institutional commitment is critical for the institutionalization of accounting procedures and outputs.[31] When this presentation was given, several capacity gaps were identified (in environmental economics, ecosystem assessments, and ecosystem accounting) and the presenters also noted that there was a limited appreciation of economic sustainability issues by key decision makers, as well as limited collaboration between relevant government entities.[31] It was noted that there needed to be institutional commitment, collaboration, and partnership between the environmental/natural resource sector, the Uganda Bureau of Statistics, the National Planning Authority, the Economic Policy Research Centre, the private sector, and the Ministry of Finance.[31]

Uganda is a member of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES); the members of IPBES are committed to building IPBES as the leading intergovernmental body for assessing the state of the planet's biodiversity, its ecosystem, and the essential services they provide to society.[28]

Some studies have been undertaken to assign economic value to pastoralism.[29]

Ecosystem Valuation

National efforts:

Economic value of Uganda's forest resources: This study revealed that the forest sub-sector contributes 8.7% to Uganda's GDP based on national accounts figures for 2010.[4] It was recommended that similar studies be undertaken for wetlands, soils, land, and fisheries. The study also recommended development of capacity in natural

resource accounting methodology to generate data that can be used for these types of initiatives.[4]

Sub-national efforts:

The government has summarized the results of various sub-national valuation studies for both wildlife and wetlands in several reports.[7,8]

UNEP: The Ecosystem Services Economics (ESE) Unit of UNEP is undertaking the "Capacity building in national planning for food security" project in Uganda (Hoima District in Western Uganda) which appears to have incorporate ecosystem valuation.[25] This project aims to identify the trade-offs by quantifying the relationship between food production and key inputs affecting ecosystems.[25] The trade-offs between food production and the state of ecosystems and their services will also be analyzed through economic valuation of food services with relevance to food production and ecosystem management.[22] This project works with the National Planning Authority (NPA) and the International Centre for Research in Agroforestry (ICRAF).[22] It is not clear whether this project has made progress beyond the planning stage.

Integrated Ecosystem Assessment Pilot Study (Lake Kyoga Catchment Area, report published in 2008): This assessment was undertaken as part of the Millennium Ecosystem Assessment and the UNDP-UNEP PEI to provide information on the linkages between ecosystem changes, ecosystem services, and human well-being.[30] The study examined four major ecosystems and their services: freshwater ecosystems, forest ecosystems, agricultural areas, and grasslands.[30]

Economic valuation of the Murchison Falls Conservation Area and the Budongo Central Reserve: A valuation of these two protected areas found that both conserve biodiversity and contribute ecosystem services in: non-timber products (mainly wood, USD$1.92 million), non-wood forest products (USD$2.17 million), medicinal and pharmaceutical products (USD$0.88 million), soil erosion control (USD$52.8 million), carbon sequestration (USD$1.5 million), watershed protection and catchment services (USD$10.6 million), research and education (USD$0.02 million), and aesthetic services (USD$56.92 million).[4]

Natural Capital Accounting

National efforts:

Fisheries Accounts: In a joint presentation (undated) given by representatives from NEMA and UBOS, it was indicated that Uganda was going to develop fisheries accounts.[32] A second presentation indicated that a partnership had been created with the Centre for Environmental Economics and Policy (CEEPA) at the University of Pretoria in South Africa to develop fisheries accounts.[31] This presentation indicated that fisheries accounts had been produced but had not been used by the government.[31]

Forest Accounts: A government presentation indicated that a partnership had been created between the government and the Centre for Environmental Economics and Policy (CEEPA) at the University of Pretoria in South Africa to develop forest

accounts.[31] The presentation indicated that these accounts had not been created yet.[31]

Land Accounts: In a joint presentation (undated) given by representatives from NEMA and UBOS, it was indicated that Uganda was going to develop land accounts.[32]

Oil and Gas Accounts: In a joint presentation (undated) given by representatives from NEMA and UBOS, it was indicated that Uganda was going to develop oil and gas accounts.[32]

Water Accounts: In a joint presentation (undated) given by representatives from NEMA and UBOS, it was indicated that Uganda was going to develop water accounts.[32] A report published in 2013 by Economic Research Southern Africa presented the results of the first development of water resource accounts for the Ugandan economy; it appears that these accounts were developed as part of a PhD thesis and it is not clear whether the accounts were developed in collaboration with the government (or are being utilized by the government).[33] These water resource accounts were developed using data from various departments in the Ministry of Water and Environment, the National Water and Sewerage Corporation, and the FOA-AQUASTAT Database.[33] The accounts were developed following the SEEA-Water framework.[33]

Ecosystem Accounting

National efforts:

Ecosystem Accounts: In a joint presentation (undated) given by representatives from NEMA and UBOS, it was indicated that Uganda was developing a national framework for ecosystem accounting.[32] An undated presentation given by Wageningen University indicated that a new project on wetland ecosystem services would be beginning in Uganda.[34]

Priorities within the country

Uganda's aims to be a middle-income country by 2017, and upper middle-income country by 2032, and a first world country within the next fifty years.[4] This desire is articulated in the Uganda Poverty Eradication Action Plan, the National Vision 2040, and in the National Development Plan. Uganda has perhaps one of the lowest poverty rates of the signatory Gaborone Declaration countries, though a large proportion of the population continue to reside in rural areas and is dependent on natural resources. In addition, Uganda aims to become one of the top five tourist destinations in Africa and among the top 10 long-haul tourist destinations in the world.[4] Given that Uganda's tourism revolves primarily around biodiversity, this is an important entry point for resource mobilization for the conservation and management of biodiversity.[4] However, a financing gap for biodiversity conservation investments in Uganda is estimated at $455 million/year.[4] A lack of funding for environmental initiatives and mainstreaming of the environment into government programs has been noted in other government documents as well.[16]

Uganda does appear to be trying to incorporate ecosystem accounting into their policy framework; the National Environment Management Policy (1994) appears to include an objective for environmental accounting.[32] In an undated presentation given by

government officials, the following two policy priorities were listed: 1) integration of environmental economics and accounting into the national development planning process; and 2) structuring accounting and financial management systems to facilitate analyses of environmental benefits/achievements and costs.[32] During the 2015 GDSA Roadshow, representatives of the government indicated that there was a clear need for capacity building in NCA.[35]

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Appendix A

Table 29: Environmental international agreements which countries are party to. Source: CIA Factbook 2015

	Botswana	Kenya	Madagascar	Namibia	Rwanda	Tanzania	Uganda
Antarctic-Environmental Protocol							
Antarctic-Marine Living Resources				X			
Antarctic Seals							
Antarctic Treaty							
Biodiversity	X	X	X	X	X	X	X
Climate change	X	X	X	X	X	X	X
Climate change –Kyoto protocol	X	X	X	X	X	X	X
Desertification	X	X	X	X	X	X	X
Endangered species	X	X	X	X	X	X	X
Environmental modification							
Hazardous wastes	X	X	X	X	X	X	X
Law of the sea	X	X	X	X		X	X
Marine dumping		X					
Marine life conservation		X	X				X
Ozone layer protection	X	X	X	X	X	X	X
Ship pollution		X	X				
Tropical Timber 83							
Tropical Timber 94							
Wetlands	X	X	X	X	X	X	X
Whaling		X					

(Appendix A continued)

	Liberia	Mozambique	Gabon	Ghana	South Africa
Antarctic-Environmental Protocol					X
Antarctic-Marine Living Resources					X
Antarctic Seals					X
Antarctic Treaty					X
Biodiversity	X	X	X	X	X
Climate change	X	X	X	X	X
Climate change –Kyoto protocol	X	X	X	X	X
Desertification	X	X	X	X	X
Endangered species	X	X	X	X	X
Environmental modification				X	
Hazardous wastes	X	X	X	X	X
Law of the sea	X	X	X	X	X
Marine dumping			X		X
Marine life conservation					X
Ozone layer protection	X	X	X	X	X
Ship pollution	X	X	X	X	X
Tropical Timber 83	X		X	X	
Tropical Timber 94	X		X	X	
Wetlands	X	X	X	X	X
Whaling			X		X

Appendix B

Table 30: Various governance indicators and scores by country. Green boxes indicate the country with the best scores for each index.

Indicator	Botswana	Kenya	Madagascar	Namibia	Rwanda	Tanzania	Uganda	Liberia	Mozambique	Gabon	Ghana	South Africa
Global Peace Index[1]	36	132	66	48	137	59	110	84	82	68	61	122
Human Development Index[2]	109	147	155	127	151	159	164	175	178	112	138	118
Corruption Perceptions Index[3]	63	25	28	49	49	31	26	37	31	37	48	44
The Management Index	9	68	109	27	67	58	38	25	53	ND	15	31
The Open Budget Index	45	46	-	34	90	51	18	56	50	ND	44	2
The Status Index	18	59	103	30	87	73	46	71	70	ND	23	28

[1] Rank out of 162 countries in 2014. Source: Institute for Economics and Peace (2014). Global Peace Index 2014
[2] Rank out of 187 countries in 2014. Source: United Nations Human Development Report (2014)
[3] Scale from 0-100 (0 = high corrupt; 100 = not very corrupt). Source: www.transparency.org
[4] Rank out of 129 countries in 2014. Source: http://www.bti-project.org/index/management-index/
[5] Rank out from 1 to 98 in 2012 (1 being the best). Source: http://survey.internationalbudget.org/#timeline
[6] Rank out of 129 countries in 2014. Source: http://www.bti-project.org/index/status-index/