

The role of natural capital accounting for biodiversity conservation – revisited

Steven King^{1*}, Mark Eigenraam², Carl Obst², Michael Vardon³ and Daniel Juhn⁴

¹ UN Environment World Conservation Monitoring Centre (UNEP-WCMC)

²Institute for the Development of Environmental-Economic Accounting (IDEEA)

³Fenner School of Environment and Society, Australian National University

⁴ Conservation International

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Summary

Given the importance of biodiversity to many economic activities, and well-being more generally, it is recognized as an essential natural capital asset for sustainable development (UN, n.d.; CBD et al., n.d.). Both the Sustainable Development Goals (via Target 15.9) and Aichi Targets (via Target 2) identify natural capital accounting as a means of mainstreaming biodiversity into decision-making and development policies for better management of this resource. This is because well-designed natural capital accounts can provide a framework to integrate, synthesize and communicate information on the environment and the economy in the format decision-makers require in pursuit of sustainable use and conservation of biodiversity. This can cover a spectrum of applications, from informing on detailed spatial planning for natural capital and biodiversity management to generating the indicators to inform on progress towards policy targets. This includes achieving the SDGs and the Aichi Targets.

During the 2016 policy forum, Vardon et al. (2017) mapped the Aichi Targets to the System of Environmental-Economic Accounting (SEEA). This clearly identified that indicators informing many of the Aichi Targets may be generated via accounting described in either the SEEA Central Framework or SEEA Experimental Ecosystem Accounting (SEEA EEA). In this paper, we revisit and extend this work by mapping SDG 15 and Aichi Targets to the SEEA, with a focus on land, ecosystem extent and species (Table 2). We illustrate the potential of these natural capital accounts to support evidence based decision making for achieving management goals for biodiversity and ecosystems via a case study application for Uganda. To this end, we summarize an approach for the rapid development of SEEA based accounts designed to target key policy entry points for natural capital information (described in UNEP-WCMC and IDEEA 2017). We also illustrate the relevance of these accounts for informing on progress towards SDG 15, the Aichi Targets and wider SDGs in Table 2.

We hope that this short paper will support the use of natural capital accounting for biodiversity conservation generally and in pursuit of the SDGs. We believe it provides a useful, practical contribution to countries and agencies looking to begin work in this area.

1. Introduction

The Sustainable Development Goals (SDGs), recognize that biodiversity loss and ecosystem degradation are exacerbating the challenges humanity faces and that social and economic development is dependent on sustainable use of this natural capital asset (UN, n.d.). To this end SDG 15 calls for a halt to biodiversity loss and the integration of biodiversity into accounts via SDG Target 15.9.¹ This is because the value of biodiversity and the ecosystem services it supports are not reflected in market prices, often leading to biodiversity being neglected in traditional assessments of economic progress and development planning.

¹ By 2020 integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts. See: <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>

Natural capital accounting has been identified as a vehicle to accelerate mainstreaming of the value of biodiversity into decision-making and development policies in a systematic manner (Weber 2014; UNEP-WCMC and IEEP 2013). This is also clearly reflected in the Convention of Biological Diversity's strategic plan (2011 to 2020) for improving the status of biodiversity via Aichi Biodiversity Target 2.²

Given that biodiversity is central to many economic activities, it also features across many of the SDGs and their targets, (CBD et al., n.d.). These links between the SDGs and the Aichi Targets have been mapped by the CBD, FAO, World Bank, UN Environment and UNDP (CBD et al., n.d.) and are noted in the wider conservation literature (e.g., Brooks et al. 2015). Accordingly, the Aichi Targets and SDGs provide a set of aligned entry points that natural capital accounting can speak to across all stages of the policy cycle (i.e., problem identification, policy response, implementation, policy monitoring and evaluation).

However, accounting for biodiversity has remained challenging. This is due, in part, to complexities in measuring the multiple aspects of biodiversity and the contribution it provides. Nonetheless, in recent years a range of work on thematic accounting for biodiversity drawing on the System of Environmental Economic Accounting - Experimental Ecosystem Accounting (SEEA-EEA) (UN et al. 2014) and other frameworks has emerged. During the 2016 policy forum, Vardon et al. (2017) highlighted this work in a paper aiming to generate discussion about the potential uses of natural capital accounting for biodiversity conservation. This clearly identified that a many of the Aichi Targets may be addressed via accounting described in either the SEEA Central Framework or SEEA EEA.

In this short paper, we aim to contribute to this debate further by presenting a set of natural capital accounts, incorporating land, ecosystem extent and thematic species accounts. These accounts have been designed to provide information relevant to identified policy entry points in Uganda, including the attainment of the SDGs and Aichi Targets. The table of Aichi Targets and environmental and ecosystem accounts presented by Vardon et al. (2017) is also revisited in this context, to illustrate the potential of these types of accounts to inform on progress towards SDG 15 targets, the Aichi Targets and wider SDGs (Table 2).

2. Experimental ecosystem accounts for Uganda

Uganda ranks among the top ten most bio-diverse countries in the world (NEMA 2016). This natural richness generates a range of products and services that underpin livelihoods, including tourism, fisheries, forestry and agriculture. As such, biodiversity is widely recognized as an important part of the country's natural capital stock. However, in common with global trends, there are concerns about the rate at which Uganda is losing its biodiversity (i.e., its species and their habitats).¹ In response, Uganda has committed to addressing biodiversity loss and implementing the Aichi Targets via its Second National Biodiversity and Action Plan (NBSAP II) (NEMA 2016). Uganda's NBSAP II is also aligned to the SDGs, which are implemented via its National Development Plan (NDP II) (NPA 2015).

² By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems. See Aichi Biodiversity Targets <http://www.cbd.int/sp/targets/>

Therefore, biodiversity conservation is a key national policy goal for both the NBSAP (II) and NDP II.

As part of a joint project between UNEP-WCMC, the IDEEA Group, National Planning Authority, National Environmental Management Authority and Wildlife Conservation Society, a set of experimental ecosystem accounts, incorporating land, ecosystem extent and species accounts, were compiled for Uganda. Responding to stakeholder demands, these accounts were designed to yield spatially explicit information and key indicators relevant to the following policy entry points in Uganda:

1. To inform the ongoing debates surrounding the gazettement and de-gazettement of protected areas
2. To make the case for increased budget allocation and investment in biodiversity rich sectors for conservation and management
3. To establish the extent of ecosystem degradation and where declining biodiversity threatens the delivery of ecosystem services and implications on economic growth and human well-being
4. To increase awareness and appreciation of biodiversity as a natural capital asset amongst decision makers and the public
5. To assess national progress towards the objectives of Uganda's National Biodiversity Strategy Plan (NBSAP II) and National Development Plan (NDP II) and associated international commitments (i.e., the Aichi targets and SDGs)

In order to inform on the above demands, the information generated by the accounting process provided metrics on the rate and trends in habitat loss, progress towards protecting ecologically representative areas with high biodiversity importance, progress towards protecting the range and conservation status of threatened species and identifying areas where tourism and non-timber forest products (NTFP) possibilities can contribute to local economic development.

3. Summary of the Accounting Approach

The approach is based on integrating information on land cover with spatial data on ecosystems to develop a set of Experimental Ecosystem Accounts for Uganda (described in full in UNEP-WCMC and IEEP 2013). These accounts are compiled using the SEEA framework and provide information on the stocks of land and ecosystems. As highlighted in Vardon et al. (2017), these types of accounts can be compiled and updated using existing and remotely sensed data.

For Uganda, we use land cover maps produced by the National Forest Authority (NFA) for 1990, 2005, 2010 and 2015 (as described in Diisi 2009). Land Accounts have then been created for the extent of natural and non-natural land cover based on aggregations of relevant land cover classes. With these aggregated accounts in place, accounts of ecosystem extent have been compiled by intersecting areas of natural cover with a distribution of the original extent of vegetation in Uganda (as proposed by Langdale-Brown, Osmaston, and Wilson 1964). We extend the analytical power of these accounts by integrating expert knowledge on habitat preferences of selected species to evaluate the

implications of land cover change on them.³ We term these constructs ‘Species Accounts’, which fit within the SEEA-EEA framework as a thematic account for organizing information relevant to biodiversity (as described in UNEP-WCMC, 2016). These Species Accounts provide information on the extent of suitable habitat for three Non Timber Forest Product (NTFP) species (Gum Arabic, Shea butter nuts and *Prunus Africana*) and two flagship mammal species (Chimpanzees and Elephants) important for wildlife tourism. This sequential approach to calculating these natural capital accounts for Uganda is summarized in the Figure 1 below.

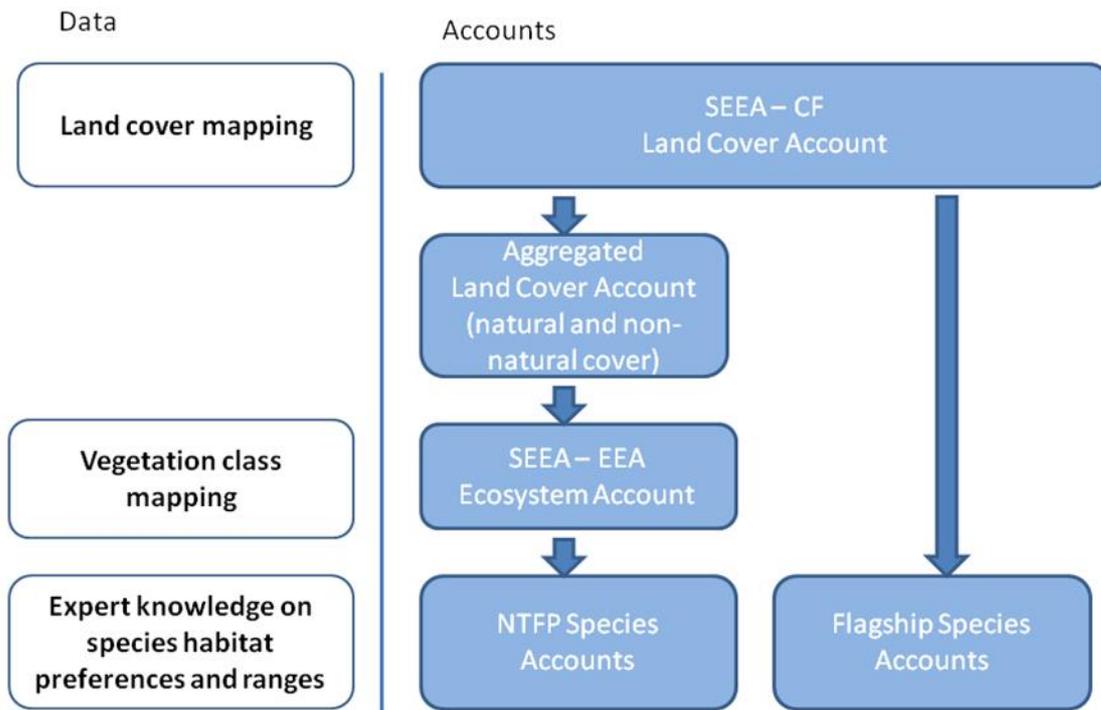


Figure 1: Stepwise approach to calculating natural capital accounts for Uganda

3. Results and their policy applications

By overlaying information on economic decisions regarding land-use and information on biodiversity, the accounts reveal a number of key findings that can inform on the key policy entry points identified in Uganda. Figure 2 provides such an example, showing the extent of suitable habitat that may support Shea Butter Nut harvesting in Uganda in 2015 (Closing Stock 2015), the extent included in the protected area estate (Protected Stock 2015) and the extent outside of the protected area estate (Unprotected Stock 2015). This information can assist decision makers in identifying where synergies in conservation and development may exist via opportunities for Shea Butter production that are not in conflict with protected areas. This type of information will be relevant to all the key policy entry points for biodiversity information identified for Uganda.

³ The approach draws on similar work undertaken by SANBI in South Africa (Driver et al. 2015) with respect to ecosystem accounting and existing work to associate natural ecosystems with species derived benefits in Uganda coordinated by Makerere University (Pomeroy et al. 2002).

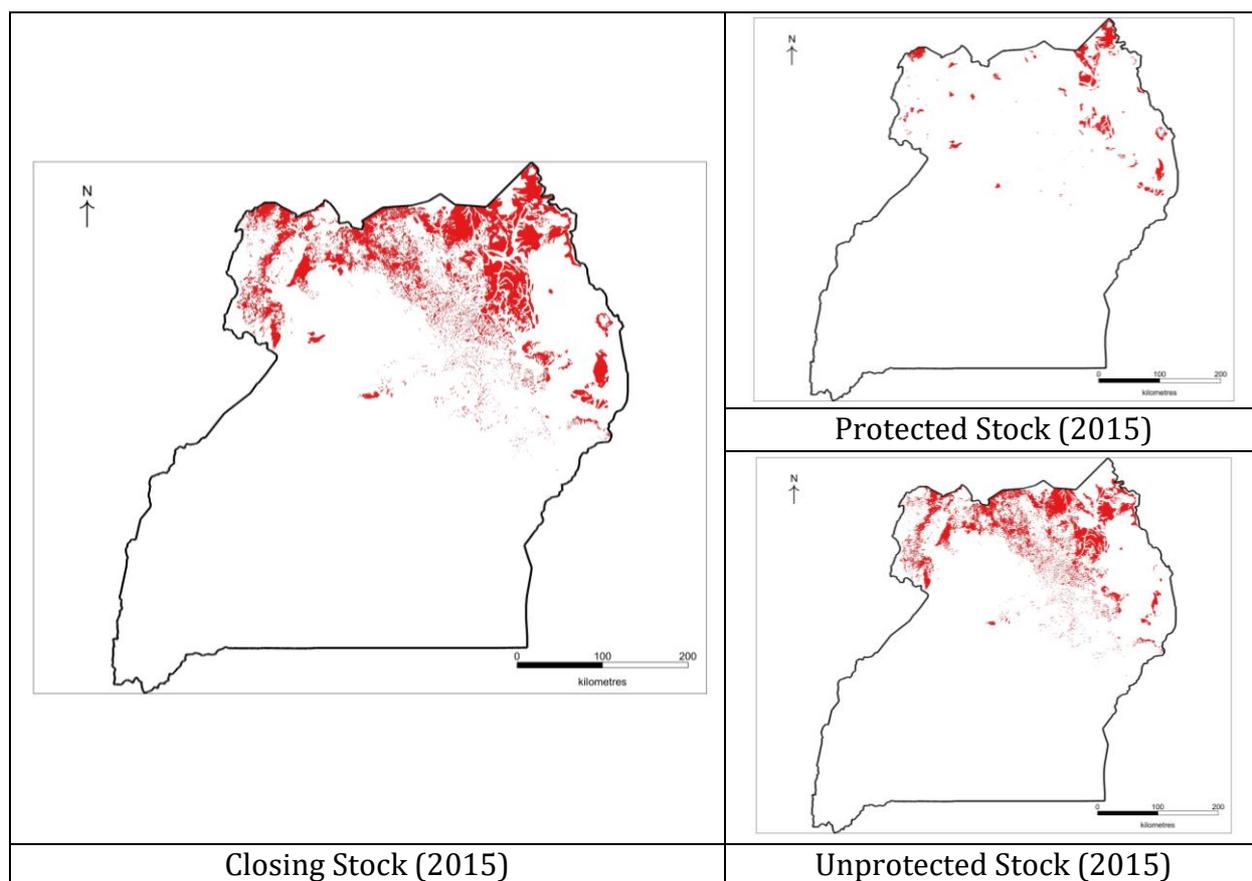


Figure 2: Example of Shea Butter Nut Tree information and Species Accounts for Uganda

Table 1 illustrates how the spatial information presented in Figure 2 can be presented as a Species Account.

Table 1: Example Shea Butter Nut Tree Account for Uganda (1990-2015)

	Extent (ha)
Opening Stock (1990)	2,706,485
<i>Net change</i>	<i>-605,561</i>
Closing Stock (2015)	2,100,924
Protected Stock (2015)	442,466
Unprotected Stock (2015)	1,658,458

In combination, the Land, Ecosystem Extent and Species Accounts for Uganda reveal a number of key policy finding that can inform on progress towards SDG 15 and Aichi Targets. These are summarized in Table 2. Drawing on the linkages between the Aichi Targets and the SDGs proposed by the CBD et al., (n.d.), the final column in Table 2 also illustrates the links between the Aichi Targets considered and these wider SDGs.⁴

⁴ It should be noted this final column is for indicative purposes to illustrate where, potentially, the types of natural capital accounts produced in Uganda could inform or monitor policy.

Table 2: Links between SDGs and Aichi Targets and Uganda natural capital accounts.

SDG 15 Targets	Relevant Aichi Target	Relevant accounts	Relevant indicators and uses	Aichi Target Links to other SDGs (CBD et al., n.d.)
SDG Target 15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	Aichi Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	Land Cover Accounts Ecosystem Extent Accounts Species Accounts	The flagship and NTFP species, ecosystem extent and land accounts provide information on the sustainable use of terrestrial ecosystems that can inform on the maintaining a sufficient stock of ecosystem assets that can provide long-term benefits for all.	SDG 1; SDG 3; SDG 5; SDG 6; SDG 7; SDG 8; SDG 9; SDG 11; SDG 13; and, SDG 14;
	Aichi Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	Ecosystem Extent Accounts Species Accounts	The flagship species and ecosystem extent accounts can reveal progress towards protecting an ecologically representative set of areas with high biodiversity importance in Uganda. They flagship and NTFP species accounts can also assist in identifying opportunities for conservation and socio-economic development, via activities such as sustainable harvesting and wildlife watching tourism	SDG 6; SDG 11; and, SDG 14.
SDG Target 15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	Aichi Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	Ecosystem Extent Accounts Species Accounts	The species and ecosystem extent accounts provide information on the sustainable use of terrestrial ecosystems that can be used to monitor habitat loss (including forests) and provide the spatial data for analyzing fragmentation.	SDG 7; SDG 13; and, SDG 14
SDG Target 15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species				
SDG Target 15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development	Aichi Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	<i>Prunus Africana</i> Species Accounts	This species is associated with medium to high altitude forest. As such the Species Accounts can inform on progress towards protecting the range of this species in mountainous areas.	SDG 7; SDG 13; and, SDG 14

SDG Target 15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species	Aichi Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	Species Accounts	The flagship species, Shea butter tree nut and <i>Prunus Africana</i> accounts can inform progress towards protecting the range and conservation status of these threatened species. There is also likely to be a number of other threatened species whose status would be improved via an umbrella effect.	SDG 14
15.6 Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed	Aichi Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	Species Accounts	The <i>Prunus Africana</i> and NTFP species accounts can help monitor trends in the maintaining the genetically diversity of these species based on distributions of different communities in different sub-regions and associated access rights.	SDG 2; SDG 3.
SDG Target 15.9: By 2020 integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts	Aichi Target 2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	Ecosystem Extent Accounts Species Accounts	The ecosystem extent and species accounts provide the first step in integrating biodiversity values into the national accounting system. Further integration can be achieved by making links to economic statistics related to tourism and provisioning ecosystem services.	SDG 1; SDG 8; SDG 9; SDG 11; SDG 13; SDG 14; and, SDG 17
Important for achieving SDG 15 generally (CBD et al., n.d.)	Aichi Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	Land Cover Accounts Ecosystem Extent Accounts	In combination, the land cover and ecosystem extent accounts can identify areas that have been degraded and are characterized by high ecosystem diversity potential. This can inform selection of areas for restoration and improving biodiversity and resilience.	SDG 6; SDG 7; SDG 9; SDG 10; SDG 11; SDG 13; and, SDG 14.

4. Conclusions

Overall, the rich spatial data and spatial infrastructure underpinning the accounts is demonstrated to be very flexible and further analysis of the data is possible. This can be extended to a more holistic and integrated land use planning that better considers biodiversity and the impacts of management on biodiversity and the ecosystem services it provides. Such an integrated planning approach would be a significant improvement from traditional land planning regimes and could help to build the bridge that is often missing between them and economic and development planners. This clearly addresses to the key policy-entry points identified for information on biodiversity in Uganda. This is also fundamental to achieving the SDGs, which, by design, require that the environmental, economic and social dimensions of sustainable development are addressed in a holistic manner. In these regards, the accounts compiled for Uganda deliver a spatial evidence base for:

- Informing expansion of the protected areas estate to secure threatened species and tourism development opportunities
- Targeting investments for the development of sustainable harvesting programs for non-timber forest species (NTFP) and tourism development
- Highlighting the benefits of biodiversity by linking the accounts to spatial statistics on the economy (e.g., tourism expenditure and NTFP yields)
- Evaluating the trade-offs between biodiversity benefits and different development options
- Tracking the degree of habitat conversion and degradation associated with different economic sectors and potential implications on NTFP harvests and the tourism sector
- Reporting on progress towards achieving the SDG 15 and the Aichi Targets.

From a practical perspective, the rapid development of the accounts using existing data also allows insights to be quickly disseminated. This will assist in retaining the support of key users of the accounts and foster ownership through elicited feedback. This staged approach is also likely to prove more efficient, as investments to fill data gaps and compile additional natural capital accounts can then be targeted to policy and user priorities, and can also be used as a motivation for investment in local data and skill development.

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