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PLOS Sustainability and Transformation

OPINION

Fifty shades of sustainability? A new five-dimensional framework for assessing sustainability of wild species use

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Abstract

A novel framework for assessing the sustainability of wild species use is presented to address weaknesses in current formulations and support global and national policies relating to sustainable use. The novelty of the framework is its addition of animal health and welfare and human health to the conventional ecological, social, and economic dimensions of sustainability. The five-dimensional sustainability assessment framework (5DSAF) consists of 42 principles, which have been derived from an analysis and synthesis of existing international, national, sectoral and species-specific guidelines and standards. It can be applied by use of an Excel-based tool that allows scores to be allocated to each principle with results graphically displayed in the form of a radar chart. The 5DSAF has been successfully piloted as a self-assessment tool at industry and enterprise level and has the potential to evolve into a universal standard that government, private sector, and civil society actors could use to assess the sustainability, legality, and safety of all value chains for wild species and products.

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The need to rethink sustainability in the context of wild species use

Sustainable use of wild species is central to sustainable development. Sustainable use is one of the three objectives of the Convention on Biological Diversity (CBD) alongside conservation and equitable benefit sharing. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) also highlights the important, but often unrecognised, contribution that sustainable use of wild species makes to achieving the Sustainable Development Goals [1]. Concerns have, however, been raised regarding both the weakness of regulatory frameworks associated with wild species use [2] and the human and animal health and welfare implications of some forms of use [3,4]. The Kunming-Montreal Global Biodiversity Framework (GBF), adopted in 2022, reflects these concerns with Target 5 noting that use of wild species should not just be sustainable but also safe and legal.

While the legality of wild species use may be relatively straightforward to determine in most cases, sustainability and safety are more difficult to assess. We suggest that these issues should not be separated but should be treated together as a more holistic concept of sustainable use. To date, sustainability has been most commonly described as having three dimensions—social, economic, and environmental/ecological—often depicted as three nested or overlapping circles or pillars [5]. The concept of "One Health" gained increasing traction following the COVID-19 outbreak, highlighting the links between animal, human, and ecosystem health, and sustainable development more broadly [6]. We propose that this should be considered a core element of a new, expanded, conceptualisation of sustainable use, and we present a new framework that helps policy-makers and practitioners to apply this expanded concept. Our framework is novel in that it adds human health and animal health and welfare to the conventional three dimensions of economic, social, and ecological sustainability. It is policy-relevant in that it provides a potential tool for measuring progress towards the GBF Target 5 incorporating sustainability (as conventionally understood), safety (in terms of health risks), and legality into one framework.

The five-dimensional sustainability assessment framework

Our 5DSAF consists of 42 principles—seven for each of the five dimensions, and seven that cut across all dimensions (for example, compliance with relevant legislation)—as shown in Fig 1. These 42 principles were derived from a review of existing global, sectoral, and species-specific standards, principles, and guidelines. These included (but were not limited to): the Addis Ababa Principles and Guidelines for Sustainable Use of Biodiversity [7]; CITES Non-Detriment Findings [8]; UNCTAD BioTrade Principles and Criteria [9]; the FairWild Standard [10]; the Wildlife Friendly Standard [11]; World Health Organisation (WHO) guidance on reducing risk of pathogen transmission from animals to humans [12]; World Organisation for Animal Health (WOAH) guidance on animal welfare [13]. Some of these resources apply to only one dimension of sustainability (for example, CITES Non Detriment Findings, which are only concerned with ecological sustainability), while others are relevant to

	Sustainability dimensions and principles				
	Animal health & welfare	Human health	Ecological	Social	Economic
1	Captive or enclosed animals are provided with, or have access to, species-specific and appropriate nutrition, feed, and water which encourages natural behaviours and promotes health	People coming into contact with / working with wild species and their products (including in production facilities, markets, slaughterhouses etc) understand and practice good personal health and hygiene measures and biosecurity	There is a current formal / informal system (e.g., species or area management plan) in place which considers and governs the scale and rate of use of the target species in its harvest range taking into account its life history strategy and tailored to the local social and ecological context	The use (harvesting, processing, sale etc) of the species does not involve any harmful discrimination (e.g., gender-based, race-based or any other barriers) to effective participation and leadership	There is a formal/informal business plan in place which specifies the likely market for the product/output of the species use
2	The captive physical environment allows for species-specific comfortable resting places, free and normal movement, substrates and apparatus, thermal regulation, and adequate shelter	Facilities (incl. vehicles and equipment) handling wild species and/or their products (particularly food) have appropriate biosecurity, hygiene, food safety and sanitation measures in place to monitor, minimise and mitigate the risk of disease or hazards and cross-contamination / transmission	The species use is aligned with international national, regional, and/or local/customary plans for sustainable management, conservation, or restoration/regeneration of biodiversity	Local communities and indigenous people with legal or customary access and/or use rights are able to maintain control over the species use to the extent necessary to protect their rights, traditional knowledge and customary institutions and uses	There is an enabling environment (policy, legislation, incentives etc) supporting the species use and no external factors (e.g. pressure groups, conflict, political insecurity, global pandemics) undermining its financial viability
3.	The catching, maintaining, breeding, raising, transporting, handling (and where relevant, killing) of animals is carried out in a way that promotes physical and psychological welfare, minimising the risk of pain, injury, or disease	Activities involving any interactions with wild species and products are planned, organised and performed in a manner that enables health and safety risks to be identified and appropriate avoidance, minimisation and mitigation measures put in place	The species use does not adversely affect the conservation status of the target species in its harvest range. This includes population, structure and distribution and genetic diversity	Agreements with local communities and indigenous people are based on Free Prior and Informed Consent (FPIC), appropriate and adequate knowledge of customary tenure and access rights	There is a competitive market for the outputs/products of the species use
4.	Stocking densities and group composition of captive or enclosed animals ensure (most) normal behaviours, and positive species-specific social interactions	Condemned, decaying, contaminated or toxic plants, sick animals and mortalities do not enter human food chains. Sick animals are investigated and either quarantined for treatment or euthanized and disposed of according to strict health and safety protocols (e.g., no contact with body fluids)	The species use does not adversely affect the conservation or restoration/regeneration of non-target elements of biodiversity (e.g. non-target species, ecosystems, ecological processes, natural habitats, soil and water condition and quality)	Where the species use occurs on sacred sites or other lands and waters traditionally occupied or used by IPs and/or LCs, a protocol or code of conduct is in place to regulate the behaviour of personnel and visitors	The *type* of use of the species (e.g., hunting, tourism, ranching) and/or product (e.g., skins, resin, meat) is competitive with other available alternatives and does not sacrifice the persistence of the resource
5.	The catching, maintaining, breeding, raising, transporting, handling, and slaughtering of animals is carried out in a way that does not facilitate disease or parasite transmission	Trade chains are as short and simple as possible to reduce the number of interfaces at which there could be cross-contamination and transmission of hazards/pathogens and to facilitate traceability	The species use does not facilitate the introduction or spread of invasive or non-native species that have a detrimental conservation impact	Fair employment conditions, and labour rights, which maintain or enhance social and economic wellbeing, are provided for all workers including no use of any forced labour including child labour	The species use makes a positive contribution to local economic development and potentially also to sub-national or national economies (e.g., GDP contributions)
6.	Captive or enclosed animals with physical or psychological health issues are isolated (where appropriate) and treated/addressed promptly or killed humanely if treatment is not feasible or recovery is unlikely	An inspection and/or surveillance system is in place to detect signs of disease / pathogens in both animals and people working with the animals	Practices involved in the use of the species do not result in pollution and are efficient in terms of energy and water use and minimise waste generation	The use of the species does not result in the undermining or physical or economic displacement of local communities/segments within a community (e.g. traditional women harvesters displaced by commercial collectors)	Economic relations (prices, rates of pay, payment schedules etc) in the supply chain are understood and acceptable to those involved
7.	People working with animals have sufficient knowledge and understanding of animal behaviour and physiology to ensure good care practices and welfare standards are applied	People working with wild species and their products have appropriate safe and hygienic training, working environments, equipment, and practices	Practices, processes and facilities associated with the species use do not have a negative impact on areas important for biodiversity including e.g., High Conservation Value areas, Protected Areas, Key Biodiversity Areas, ICCAs, OECMs	The use of the species makes a positive contribution to the wellbeing of local communities in the area where the wild species is harvested	The revenue generated by the species use initiative allows for long-term viability and investment in the restoration and maintenance of the resource

	Cross-cutting principles
1	Wild species use operations and practices are compliant with applicable local, regional, national, and international legal regulations
2	Wild species use operations and practices take note of, and apply, existing authoritative best practice guidance where relevant
3	Wild species use operations and practices are subject to regular monitoring (of disease/health, species population, social context and of the impacts of any processes involved in the use) to facilitate adaptive management
4	Wild species use operations and practices adopt a precautionary approach ensuring risks are anticipated, assessed and addressed in ways as to mitigate or minimise adverse conservation and social consequences
5	Wild species use operations and practices are well-governed and based on robust institutions, demonstrating clearly defined roles and responsibilities, accountability and transparency
6	Wild species supply chains are traceable from the point of off-take and systems in place for monitoring
7	People working with wild species are provided with sufficient training and awareness to ensure compliance with relevant best practices and regulations

Fig 1. The 42 principles of the 5DSAF.

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multiple dimensions (for example, the FairWild standard, which includes principles relevant to both ecological and social dimensions).

Applying the framework

The 5DSAF has been designed to be applied to all wild species and to a wide variety of uses at different scales—from individual enterprises, ranches, or farms to an entire trade sector. Not all of the principles are applicable to all species and all uses (for example, the animal health and welfare dimension of the framework is clearly not relevant to use of plants and fungi), and this is taken into account when using the framework to assess a particular species use.

To conduct a sustainability assessment, an Excel-based tool guides the user through the framework assigning a score between 0 and 3 for each relevant principle [14]. The scores are based on four indicators which reflecting a progressively increasing level of alignment of the initiative being assessed with the principle. The indicators were developed based on expert opinion of the relevant disciplinary experts within the team. The scores indicate the following: 0 = no evidence of alignment with the principle (bad practice); 1 = evidence of some alignment with the principle (emerging good practice); 2 = evidence for good overall alignment (good practice); 3 = evidence that the provisions of the principle are met or even exceeded (exemplary practice).

Once all the relevant principles in each dimension have been scored, the tool presents the results graphically in the form of a radar chart that shows how the enterprise/initiative is performing against each dimension. The Excel tool also provides space for users to record a narrative summary of specific actions needed to improve performance against each principle. Thus, the framework is a useful tool for developing an action plan for continuous improvement.

Looking ahead

The 5DSAF has been piloted in Tanzania (the newly legalised game meat industry); Zimbabwe (crocodile farming and crocodile trophy hunting); Indonesia (reptile skin trade), and South Africa (game ranching) [15]. The pilots provide proof of concept that the 5DSAF is: (a) useful as a management tool at an enterprise level; (b) meaningful for evaluating entire industry sectors; and (c) straightforward to apply. The sustainability of wild species use is complex to measure. Adding safety and legality into the mix exacerbates the complexity. The dearth of widely applicable indicators for Target 5 is testament to this. Over time, we envision that the 5DSAF could fill this much-needed indicator gap and progress from a self-assessment tool to a standard that government, private sector, and civil society actors use to assess the sustainability, legality, and safety of all value chains for wild species and products.

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