Approaches to Biodiversity Conservation: Embracing Global Resource Conservation Best Practices

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Abstract

This paper critically discusses the main approaches to biological diversity conservation, namely: in-situ and ex-situ conservation, highlighting their main features that countries can adopt as a way to enhance their conservation measures and move closer to achieving sustainable development goals. The author argues that countries should embrace the global best practices in resource conservation while paying attention to both climate change adaptation and biodiversity conservation.

1. Introduction

It has rightly been observed that while 'biodiversity can be greatly enhanced by human activities, it can also be adversely impacted by such activities due to unsustainable use or by more profound causes linked to our development models'.[1] This is despite the fact that biodiversity is considered to be very important for sustenance of all forms of life on earth.[2] Biodiversity is essential not only to the proper functioning of earth systems, it is also key to the delivery

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[1] 'Conserving Biodiversity for Life and Sustainable Development | United Nations Educational, Scientific and Cultural Organization' <*http://www.unesco.org/new/en/media-services/single-view/news/conserving_biodiversity_for_life_and_sustainable_development/*> accessed 29 July 2021; 'Threats to Biodiversity – Biodiversity Clearing House Mechanism' <*http://meas.nema.go.ke/cbdchm/major-threats/*> accessed 31 July 2021.

[2] Dmitrii Pavlov and Elena Bukvareva, 'Biodiversity and Life Support of Humankind' (2007) 77 Herald of the Russian Academy of Sciences 550.

of those ecosystem services that are crucial to human dignity and well-being including: the provision of potable water, food; soil fertility; maintenance of the 'genetic library of biodiversity' – an irreplaceable source of new innovations, pharmaceuticals and chemicals; and climate regulation – among others.[3] The concept of ecosystem services was inspired by the desire to give an economic assessment of these functions thus leading to the appearance of the concept of ecosystem services, that is, consideration with regard to their usefulness for humans.[4] Arguably, ecosystem services are divided into four categories namely: provisioning services refer to natural products that are directly used by humans for food, clothing, medicines, tools, or other uses; cultural services provide recreational opportunities, inspiration for art and music, and spiritual value; regulating services include pest control and carcass removal; and supporting services, such as pollination, seed dispersal, water purification, and nutrient cycling, provide processes essential for ecological communities and agricultural ecosystems.[5]

It is against this background that this paper discusses the global best practices and approaches to biodiversity conservation due to the important role of biodiversity in ensuring that the sustainable development agenda is achieved for the sake of current and future generations. The concept of sustainable development seeks to strike a balance between using ecosystem services to improve human lives and the need to ensure that the environment can comfortably replenish itself, that is, a balance between the ecocentric approaches to conservation against the anthropocentric approaches.[6]

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[3] 'Conserving Biodiversity for Life and Sustainable Development | United Nations Educational, Scientific and Cultural Organization' *<http://www.unesco.org/new/en/media-services/single-view/news/conserving_biodiversity_for_life_and_sustainable_development/>* accessed 29 July 2021.

[4] Dmitrii Pavlov and Elena Bukvareva, 'Biodiversity and Life Support of Humankind' (2007) 77 Herald of the Russian Academy of Sciences 550, 551.

[5] Wenny, D.G., Devault, T.L., Johnson, M.D., Kelly, D., Sekercioglu, C.H., Tomback, D.F. and Whelan, C.J., 'The Need to Quantify Ecosystem Services Provided by Birds' (2011) 128 The Auk 1.

[6] Louis J Kotzé and Duncan French, 'The Anthropocentric Ontology of International Environmental Law and the Sustainable Development Goals: Towards an Ecocentric

Some scholars identify three forms of biodiversity such as alpha (genetic diversity), beta (species richness) and gamma (ecological diversity) and the services that accrue from biodiversity include materialistic gains, ecological services (flood control, climate maintenance, and nutrient cycling), and non-materialistic benefits such as recreation.[7] This paper critically discusses some of the major approaches that have been adopted globally in conserving all the above mentioned forms of biodiversity. The paper also highlights the salient provisions of the 1992 Convention on Biological Diversity, the key international legal instrument on biological diversity conservation.

2. Biodiversity: Definition and Scope

Notably, *Biodiversity*, a contraction of the phrase "biological diversity," can be traced to the first usage by Walter G. Rosen during a planning meeting for the 1986 National Forum on Biodiversity held in Washington, DC, while the first appearance of the word in the print literature likely occurred with the 1988 publication of the proceedings of the said conference.[8]

Rule of Law in the Anthropocene' (2018) 7 Global Journal of Comparative Law 5; 'Putting Ecosystems into the SDGs' (Water, Land and Ecosystems, 9 October 2015) <https://wle.cgiar.org/news/putting-ecosystems-sdgs> accessed 3 June 2021; Bullock, C. H. "Nature's values: From intrinsic to instrumental. A review of values and valuation methodologies in the context of ecosystem services and natural capital." National Economic and Social Council 10 (2017); 'Striking a Balance between Conservation and Development' (UNEP, 13 May 2019) <http://www.unep.org/news-and-stories/story/striking-balance-between-conservation-and-development> accessed 3 June 2021; McCartney, M., Finlayson, M., de Silva, S., Amerasinghe, P., & Smakhtin, V., 'Sustainable Development and Ecosystem Services' (2014); Rülke, J., Rieckmann, M., Nzau, J. M., & Teucher, M., 'How Ecocentrism and Anthropocentrism Influence Human–Environment Relationships in a Kenyan Biodiversity Hotspot' (2020) 12 Sustainability 8213.

[7]Tamanna Kumari, Pinky Deswal and Vineeta Shukla, 'Approaches to Biodiversity Conservation In India', February 2021 <https://www.researchgate.net/publication/349338888_APPROACHES_TO_BIODIVERSITY_CONSERVATION_IN_INDIA> accessed 11 July 2021.

[8] John Creech, 'Biodiversity Web Resources' <http://www.istl.org/12-fall/internet.html> accessed 29 July 2021; David L Hawksworth and Royal Society (Great Britain), Biodiversity: Measurement and Estimation (Springer Science & Business Media 1995).

The *1992 Convention on Biological Diversity*[9] defines 'biodiversity' to mean "the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems".[10]

The United Nations Educational, Scientific and Cultural Organization (UNESCO) on the other hand defines 'biodiversity' as the 'diversity of all living forms at different levels of complexity: genes, species, ecosystems and even landscapes and seascapes'.[11] Biological diversity or biodiversity has also been defined as 'the variety of the planet's living organisms and their interactions'.[12] The term is meant to encompass all of life's variation, expressed in genes, individuals, populations, species, communities and ecosystems.[13]

A broader definition of 'biodiversity' has been propounded as referring to three dimensions within which variability occurs: *genetic*, meaning the variation of genes within a species, sub-species or population; *population/species*, meaning the variation between living species and their component populations at different spatial scales (local, regional or global); and *community/ecosystem*, meaning the variation within ecological complexes of which species are a part.[14]

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[9] United Nations, Convention on Biological Diversity of 5 June 1992 (1760 U.N.T.S. 69).
[10] Article 2, Convention on Biological Diversity.
[11] United Nations Educational, Scientific and Cultural Organization, 'Conserving Biodiversity for Life and Sustainable Development | United Nations Educational, Scientific and Cultural Organization' <http://www.unesco.org/new/en/media-services/single-view/news/conserving_biodiversity_for_life_and_sustainable_development/> accessed 29 July 2021.
[12] Wes Sechrest and Thomas Brooks, 'Biodiversity – Threats' (2002).
[13] Ibid, 1; see also Matta, G., Bhadauriya, G., & Singh, V., "Biodiversity and Sustainable Development: A Review." Fecundity of fresh water prawn Macrobrachium Assamense Penensularae from Khoh River, India: 72.
[14] Roe, Dilys, "Linking biodiversity conservation and poverty alleviation: a state of knowledge review." CBD Technical Series 55 (2010), 13.

These definitions are relevant especially in the context of Sustainable Development debate as they reflect the important role that biological diversity can and indeed plays in meeting the essentials of realising Sustainable Development goals such as food security, alleviating poverty, among others.[15] The World Bank argues that while biodiversity provides many instrumental benefits, from food and fuel to recreation, even where biodiversity is not immediately instrumental, it represents global public goods that must be protected, if only for their potential value in the future.[16]

3. General Approaches to Biodiversity Conservation

There are mainly two approaches to biological diversity conservation, namely: in-situ and ex-situ conservation. There is also the Ecosystem Services Approaches for Biodiversity Conservation. Notably, over the past century a wide range of different conservation-oriented approaches have been enacted, from local and regional scale activities, such as protected area establishment, ex-situ conservation, recovery planning for species and ecosystems, specific threat management (e.g. disease, fire), and biodiversity off-sets, to global scale inter-governmental policy developments such as the *Convention on Biological Diversity* (CBD) and *the Convention on International Trade on Endangered Species* (CITES), all approaches based on multiple values of biodiversity, including those values not related to humans.[17] This section discusses these approaches within the context of the 1992 CBD.

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[15] Måns Nilsson, 'Biodiversity's Contributions to Sustainable Development' [2019] Nature Sustainability <https://www.sei.org/publications/biodiversity-contributions-sustainable-development/> accessed 3 June 2021; Gagan Matta, Gaurav Bhadauriya and Vikas Singh, 'Biodiversity and Sustainable Development: A Review' Fecundity of fresh water prawn Macrobrachium Assamense Penensularae from Khoh River, India 72.

[16] Sobrevila, Claudia; Hickey, Valerie, The Role of Biodiversity and Ecosystems in Sustainable Development. 2010 Environment Strategy Analytical Background Papers; World Bank, Washington, DC. © World Bank, 2010. https://openknowledge.worldbank.org/handle/10986/27584 License: CC BY 3.0 IGO< accessed 29 July 2021.

[17] Ingram JC, Redford KH and Watson JEM, 'Applying Ecosystem Services Approaches for Biodiversity Conservation: Benefits and Challenges' [2012]

3.1. In-situ Biodiversity Conservation

In situ conservation is defined as the on-site conservation of genetic resources in natural populations of plants or animal species such as forest genetic resources, in natural populations of tree and animal species.[18] The *Convention on Biological Diversity* 1992 defines it to mean 'the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties'.[19] Notably, Article 8 of the Convention on Biological Diversity (CBD) specifies in-situ conservation as the primary conservation strategy, and states that ex-situ measures should play a supportive role to reach conservation targets.[20] Article 8 of CBD provides that in order to promote in-situ conservation, each Contracting Party should, as far as possible and as appropriate: (a) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity; (b) Develop, where necessary, guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity; (c) Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use; (d) Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings; (e) Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas; (f) Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through the development and implementation of

S.A.P.I.EN.S. Surveys and Perspectives Integrating Environment and Society <https://journals.openedition.org/sapiens/1459> accessed 12 September 2021.

[18] Ajayi SS, 'Chapter 9 - Principles for the Management of Protected Areas' in SS Ajayi (ed), Wildlife Conservation in Africa (Academic Press 2019) <https://www.sciencedirect.com/science/article/pii/B9780128169629000090> accessed 12 September 2021.

[19] Article 2, Convention on Biological Diversity (CBD) 1992.

[20] 'In-Situ Conservation Definition| Biodiversity A-Z' <https://biodiversitya-z.org/content/in-situ-conservation> accessed 12 September 2021.

plans or other management strategies; (g) Establish or maintain means to regulate, manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biological diversity, taking also into account the risks to human health; (h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species; (i) Endeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components; (j) Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices; (k) Develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations; (l) Where a significant adverse effect on biological diversity has been determined pursuant to Article 7, regulate or manage the relevant processes and categories of activities; and (m) Cooperate in providing financial and other support for in-situ conservation outlined in subparagraphs (a) to (l) above, particularly to developing countries.

In-situ initiatives beyond protected areas may thus include: habitat restoration, recovery or rehabilitation; strategies for the sustainable use and management of biological resources; recovery programmes for nationally or sub-nationally threatened or endangered wild species; on-farm agricultural biodiversity conservation targeted at traditional crop varieties and crop wild relatives; genetic reserve conservation, that is, monitoring of genetic diversity in natural wild populations within a delineated area (known as genetic sanctuaries or gene management zones); control of threats to biodiversity such as invasive alien species, living modified organisms or over exploitation; preservation and maintenance of traditional knowledge and practices; and implementation of

the regulatory, legislation, management or other frameworks needed to deliver the protection of species or habitats.[21]

Some commentators have observed that while agriculture and protected areas are sometimes seen as opposite ends of a spectrum, in fact, they can play important complementary roles, especially when the protected areas are managed in ways explicitly designed to support agricultural development.[22] Notably, in situ conservation of wild relatives and forest tree resources focuses on responding to the drivers and pressures that threaten the natural populations so as to maintain the genetic diversity and geographic range of species, thereby maximizing their potential to respond to natural or human-made environmental change.[23]

3.2. Ex-situ Conservation

Ex situ conservation is defined as the relocation of endangered or rare species from their natural habitats to protected areas equipped for their protection and preservation, as an essential alternative strategy when in situ conservation is inadequate.[24] The *Convention on Biological Diversity* 1992 defines *"ex-situ conservation"* to mean the conservation of components of biological diversity outside their natural habitats.[25] Ex-situ conservation involves maintenance and breeding of endangered plants and animals under partially or wholly controlled conditions in specific areas including zoo, gardens, nurseries, etc. That is, the conservation of selected plants and animals in selected areas

[21] Ibid.
[22] 'The Role of Protected Areas for Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture - Jeffrey A. McNeely' <https://www.bioversityinternational.org/fileadmin/bioversity/publications/Web_version/62/ch07.htm> accessed 12 September 2021.
[23] Bellon, M.R., Dulloo, E., Sardos, J., Thormann, I. and Burdon, J.J., 'In Situ Conservation—Harnessing Natural and Human-Derived Evolutionary Forces to Ensure Future Crop Adaptation' (2017) 10 Evolutionary Applications 965.
[24] Ajayi SS, 'Chapter 9 - Principles for the Management of Protected Areas' in SS Ajayi (ed), Wildlife Conservation in Africa (Academic Press 2019) <https://www.sciencedirect.com/science/article/pii/B9780128169629000090> accessed 12 September 2021.
[25] Article 2, Convention on Biological Diversity (CBD) 1992.

outside their natural habitat is known as ex-situ conservation.[26] Article 9 of CBD provides for *ex-situ* conservation and states that: each Contracting Party should, as far as possible and as appropriate, and predominantly for the purpose of complementing in-situ measures: (a) Adopt measures for the ex-situ conservation of components of biological diversity, preferably in the country of origin of such components; (b) Establish and maintain facilities for ex-situ conservation of and research on plants, animals and micro- organisms, preferably in the country of origin of genetic resources; (c) Adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions; (d) Regulate and manage collection of biological resources from natural habitats for ex-situ conservation purposes so as not to threaten ecosystems and in-situ populations of species, except where special temporary ex-situ measures are required under subparagraph (c) above; and (e) Cooperate in providing financial and other support for ex-situ conservation outlined in subparagraphs (a) to (d) above and in the establishment and maintenance of ex- situ conservation facilities in developing countries.

It has been observed that during recent years, dramatic progress has been made with the development of new conservation techniques for non-orthodox and vegetatively propagated species, and the current ex situ conservation concepts should be modified accordingly to accommodate these technological advances.[27] However, it is suggested that considering the fact that the requirements for optimal conservation vary from species to species, as well as the available infrastructural and human resources, it is important to consider all these aspects as well as the wider socio-economic conditions under which

[26] Jaisankar I, Velmurugan A and Sivaperuman C, 'Chapter 19 - Biodiversity Conservation: Issues and Strategies for the Tropical Islands' in Chandrakasan Sivaperuman and others (eds), Biodiversity and Climate Change Adaptation in Tropical Islands (Academic Press 2018) <https://www.sciencedirect.com/science/article/pii/B9780128130643000193> accessed 12 September 2021.

[27] Engelmann F and Engels JMM, 'Technologies and Strategies for Ex Situ Conservation' [2002] Managing plant genetic diversity 89, 99.

a given conservation effort takes place when deciding how to optimize these parameters into the conservation strategy.[28]

3.3. Ecosystem Services Approaches for Biodiversity Conservation

Notably, ecosystem services as a concept and framework for understanding the way in which nature benefits people has led to a suite of approaches that are increasingly being used to support sustainable management of biodiversity and ecosystems.[29] While the ecosystem approach is a well-established strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way, the Ecosystem Services Approach (ESA) takes this strategy one step further, and through the inclusion of ecosystem services ensures that the complex relationships between nature and humans are more clearly understood and explicitly included.[30] Ecosystem-based management, with a primary focus on ecosystem services, is seen as a viable approach as it can also help broaden constituencies and influence decision-making to support conservation, as an integrated approach to natural resource management that considers the entire ecosystem, including humans, and has the goal of "maintaining an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need".[31]

An Ecosystem Services Approach (ESA) has been associated with four common characteristics: (1) ecosystem services are valued on the basis of their benefits to humans; (2) ecosystem services are underpinned by ecosystem processes and this relationship is made explicit; (3) the approach requires

[28] Ibid, 100.
[29] Ingram, J.C., Redford, K.H. and Watson, J.E., 'Applying Ecosystem Services Approaches for Biodiversity Conservation: Benefits and Challenges' [2012] SAPI EN. S. Surveys and Perspectives Integrating Environment and Society.
[30] Beaumont NJ, Mongruel R and Hooper T, 'Practical Application of the Ecosystem Service Approach (ESA): Lessons Learned and Recommendations for the Future' (2017) 13 International Journal of Biodiversity Science, Ecosystem Services & Management 68.
[31] Ingram, J.C., Redford, K.H. and Watson, J.E., 'Applying Ecosystem Services Approaches for Biodiversity Conservation: Benefits and Challenges' [2012] SAPI EN. S. Surveys and Perspectives Integrating Environment and Society, 4.

interdisciplinary collaboration and stakeholder engagement at multiple scales; and (4) the outcomes of the approach can be incorporated into environmental policy and management decisions.[32]

At COP 26 in Glasgow, Scotland, Climate change experts from United Nations University (UNU) and World Food Programme (WFP) encouraged countries to embrace better integration of nature-based solutions in adaptation planning.[33] Arguably, these nature-based solutions can have the twin benefits of climate adaptation and biodiversity conservation.[34]

At COP 26, embracing nature-based solutions was seen as a way to not only take care of the environment but also ensuring that the ecosystem in turn takes care of human basic needs, and participants thus resolved to explore solutions that cover both the climate and biodiversity crises.[35] A Draft Decision published from COP 26 emphasised "the critical importance of nature-based solutions and ecosystem-based approaches, including protecting and restoring forests, to reducing emissions, enhancing removals and protecting biodiversity".[36]

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[32] Beaumont NJ, Mongruel R and Hooper T, 'Practical Application of the Ecosystem Service Approach (ESA): Lessons Learned and Recommendations for the Future' (2017) 13 International Journal of Biodiversity Science, Ecosystem Services & Management 68.

[33] 'COP26: Nature-Based Solutions Win in Science and on the Ground - World' (ReliefWeb) <https://reliefweb.int/report/world/cop26-nature-based-solutions-win-science-and-ground> accessed 24 November 2021.

[34] Key, I., Smith, A., Turner, B., Chausson, A., Girardin, C., MacGillivray, M. and Seddon, N., "Can Nature-Based Solutions Deliver a Win-Win for Biodiversity and Climate Change Adaptation?" (2021).

[35] United Nations, 'COP26 Day 7: Sticking Points and Nature-Based Solutions' (United Nations) <https://www.un.org/en/climatechange/cop26-day-7-sticking-points-and-nature-based-solutions> accessed 24 November 2021.

[36] '"Nature-Based Solutions" Prove Divisive at Glasgow Climate Talks' (Climate Home News, 11 November 2021) <https://www.climatechangenews.com/2021/11/11/nature-based-solutions-prove-divisive-glasgow-climate-talks/> accessed 24 November 2021; See also United Nations, Draft CMA decision proposed by the President, Draft Text on 1/CMA.3, Version 10/11/2021 05:51.

The new opportunities that ecosystem services approaches provide for biodiversity conservation include: the development of broader constituencies for conservation and expanded possibilities to influence decision-making; opportunities to add or create new value to protected areas; and the opportunities to manage ecosystems sustainably outside of protected areas.[37]

The main concern, however, despite the increasing adoption of ecosystem services as a framework and suite of tools by the conservation community, regard the application and efficacy of these approaches for conserving all of the components of biodiversity that the conservation community is charged with protecting. This is because at their core, ecosystem services approaches prioritize those processes that contribute to human wellbeing; very different from a biodiversity conservation approach, which is concerned with identifying conservation management actions to promote the persistence of all biodiversity, including species or ecosystems that do not have an identified value for humans.[38] Thus, it is suggested that when utilising ecosystem services approaches for conservation, planners and managers must be realistic and recognise that these approaches are not all-encompassing and there are going to be gap species, ecosystems, and ecological processes whose conservation will require tools tailored to address those issues.[39]

[37]Ingram, J.C., Redford, K.H. and Watson, J.E., 'Applying Ecosystem Services Approaches for Biodiversity Conservation: Benefits and Challenges' [2012] SAPI EN. S. Surveys and Perspectives Integrating Environment and Society, 3.

[38] Ingram, J.C., Redford, K.H. and Watson, J.E., 'Applying Ecosystem Services Approaches for Biodiversity Conservation: Benefits and Challenges' [2012] SAPI EN. S. Surveys and Perspectives Integrating Environment and Society, 5; Reyers B and others, 'Finding Common Ground for Biodiversity and Ecosystem Services' (2012) 62 BioScience 503.

[39] Ingram, J.C., Redford, K.H. and Watson, J.E., 'Applying Ecosystem Services Approaches for Biodiversity Conservation: Benefits and Challenges' [2012] SAPI EN. S. Surveys and Perspectives Integrating Environment and Society.

4. Overview of the Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is the first global agreement to cover all aspects of biological diversity: the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding,[40] and the same was signed at the Earth Summit in Rio de Janeiro, Brazil, in 1992 and entered into force on 29 December 1993.[41]

The main principle that guides the application of CBD is that 'States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.[42]

The CBD calls for cooperation among Contracting States in conservation and sustainable use of biological diversity.[43] As for individual States, the CBD requires them to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which should reflect, *inter alia*, the measures set out in this Convention relevant to the Contracting Party concerned; and integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.[44]

[40] Article 1, Convention on Biological Diversity.
[41] Biosafety Unit, 'Welcome to the CBD Secretariat' (8 April 2013) <https://www.cbd.int/secretariat/> accessed 29 July 2021.
[42] Article 3, Convention on Biological Diversity.
[43] Ibid, Article 5.
[44] Article 6, Convention on Biological Diversity.

As for sustainable use of components of biological diversity, CBD requires Contracting States to, as far as possible and as appropriate: integrate consideration of the conservation and sustainable use of biological resources into national decision-making; adopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity; protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements; support local populations to develop and implement remedial action in degraded areas where biological diversity has been reduced; and encourage cooperation between its governmental authorities and its private sector in developing methods for sustainable use of biological resources.[45]

CBD also requires each Contracting Party to, as far as possible and as appropriate, adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity.[46]

In order to build capacity through research and training, CBD requires all the Contracting Parties, taking into account the special needs of developing countries, to: establish and maintain programmes for scientific and technical education and training in measures for the identification, conservation and sustainable use of biological diversity and its components and provide support for such education and training for the specific needs of developing countries; promote and encourage research which contributes to the conservation and sustainable use of biological diversity, particularly in developing countries, inter alia, in accordance with decisions of the Conference of the Parties taken in consequence of recommendations of the Subsidiary Body on Scientific, Technical and Technological Advice: and in keeping with the provisions of Articles 16, 13 and 20, promote and cooperate in the use of scientific advances in biological diversity research in developing

[45] Ibid, Article 10.
[46] Ibid, Article 11.

methods for conservation and sustainable use of biological resources.[47] In addition to this, the Contracting Parties should: promote and encourage understanding of the importance of, and the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes; and cooperate, as appropriate, with other States and international organizations in developing educational and public awareness programmes, with respect to conservation and sustainable use of biological diversity.[48] In order to reduce or eliminate adverse impacts on biodiversity, CBD requires States to invest in impact assessment measures and/or procedures. [49]

Notably, Kenya is a signatory to the Convention on Biological Diversity, and thus obligated to consider as well as adopt the Aichi Targets in its national plans and programs on biological diversity conservation.[50] It is noteworthy that development and agricultural activities are likely to adversely affect biodiversity conservation measures. As a result, the government should continually establish efficient systems of Strategic Environmental Assessment (SEA), Environmental Impact Assessment (EIA), Strategic Environmental and Social Assessment (SESA) and Environmental Audit and Monitoring of the environment and Environmental Security Assessment (ESA) and ensure that the same are periodically reviewed to ensure that they remain effective. There is a need to ensure that these EIA processes are not only carried out as a formality but are also reflective of what is on the ground and there should also be a follow up mechanism to ensure that the companies engage the

[47] Ibid, Article 12.
[48] Article 13, Convention on Biological Diversity.
[49] Article 14, Convention on Biological Diversity.
[50] Biosafety Unit, 'Main Details' <https://www.cbd.int/countries/profile/?country=ke> accessed 3 June 2021; 'Convention on Biological Diversity | Treaties Database' <http://kenyalaw.org/treaties/treaties/87/Convention-on-Biological-Diversity> accessed 3 June 2021; 'Ministry of Environment and Forestry » Blog Archive » Statement By Kenya On Strategic Plan For Biodiversity 2011-2020' <http://www.environment.go.ke/?p=3091> accessed 3 June 2021.

communities throughout and that they continually carry out their duties as per the law and the assessment reports.[51]

These impact assessment activities should also include Biodiversity Impact Assessment (BIA). BIA, a subset of EIA, has been defined as an evaluation exercise which involves identifying, measuring, quantifying, valuing and internalizing the unintended impacts (on biodiversity) of development interventions.[52] Arguably, EIA processes should entail BIA, and specifically, ecological impact assessment to the extent that ecological diversity is one aspect of biodiversity, in order to determine how and to what extent, development interventions and projects are affecting biodiversity — composition, structure and function.[53] While neither the Constitution of Kenya 2010 nor EMCA expressly mentions BIA, the same can be adopted in line with the provisions of Article 69 of the Constitution as well as sections 57A, 58, 62, and 112 on conservation of environmental resources, including biodiversity.

Internationally, the inclusion of BIA in EIA activities is also supported by Article 14 of the *Convention on Biological Diversity* which states that: each Contracting Party, as far as possible and as appropriate, shall: (a) Introduce appropriate procedures requiring environmental impact assessment of its

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[51] 'Chapter 3: EIA Process' <http://www.fao.org/3/V8350E/v8350e06.htm> accessed 24 July 2021; '1.7 Overview of the Stages of the EIA Process' <https://www.soas.ac.uk/cedep-demos/000_P507_EA_K3736-Demo/unit1/page_14.htm> accessed 24 July 2021; 'Our Role in Securing Public Participation in the Kenyan Legislative and Policy Reform Process' (Natural Justice, 23 July 2020) <https://naturaljustice.org/our-role-in-securing-public-participation-in-the-kenyan-legislative-and-policy-reform-process/> accessed 24 July 2021; 'Accountability, Transparency, Participation, and Inclusion: A New Development Consensus? - Carnegie Endowment for International Peace' <https://carnegieendowment.org/2014/10/20/accountability-transparency-participation-and-inclusion-new-development-consensus-pub-56968> accessed 24 July 2021.

[52] Wale E and Yalew A, 'On Biodiversity Impact Assessment: The Rationale, Conceptual Challenges and Implications for Future EIA' (2010) 28 Impact Assessment and Project Appraisal 3, 3.

[53] Ibid, 3.

proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures; (b) Introduce appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account; (c) Promote, on the basis of reciprocity, notification, exchange of information and consultation on activities under their jurisdiction or control which are likely to significantly affect adversely the biological diversity of other States or areas beyond the limits of national jurisdiction, by encouraging the conclusion of bilateral, regional or multilateral arrangements, as appropriate; (d) In the case of imminent or grave danger or damage, originating under its jurisdiction or control, to biological diversity within the area under jurisdiction of other States or in areas beyond the limits of national jurisdiction, notify immediately the potentially affected States of such danger or damage, as well as initiate action to prevent or minimize such danger or damage; and (e) Promote national arrangements for emergency responses to activities or events, whether caused naturally or otherwise, which present a grave and imminent danger to biological diversity and encourage international cooperation to supplement such national efforts and, where appropriate and agreed by the States or regional economic integration organizations concerned, to establish joint contingency plans.[54] The Conference of the Parties is to examine, on the basis of studies to be carried out, the issue of liability and redress, including restoration and compensation, for damage to biological diversity, except where such liability is a purely internal matter.[55]

It is, therefore, worth pointing out that Article 14 does not impose a direct obligation that is enforceable by other states to conduct EIAs before undertaking activities that pose risks to biological diversity.[56] This is also

[54] Article 14(1), Convention on biological Diversity; see also generally, Craik N, 'Biodiversity-Inclusive Impact Assessment', Elgar Encyclopedia of Environmental Law (Edward Elgar Publishing Limited 2017).
[55] Convention on biological Diversity, Article 14 (2).
[56] Craik N, 'Biodiversity-Inclusive Impact Assessment', Elgar Encyclopedia of Environmental Law (Edward Elgar Publishing Limited 2017), 2.

captured in *COP 8 Decision VIII/28, Impact Assessment: Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment* which 'emphasizes that the voluntary guidelines on biodiversity-inclusive environmental impact assessment are intended to serve as guidance for Parties and other Governments, subject to their national legislation, and for regional authorities or international agencies, as appropriate, in the development and implementation of their impact assessment instruments and procedures'.[57]

It has been acknowledged that natural habitat loss and fragmentation, as a result of development projects, are major causes of biodiversity erosion, and while Environmental impact assessment (EIA) is the most commonly used site-specific planning tool that takes into account the effects of development projects on biodiversity by integrating potential impacts into the mitigation hierarchy of avoidance, reduction, and offset measures, the extent to which EIA fully address the identification of impacts and conservation stakes associated with biodiversity loss has been criticized as inadequate.[58]

The *COP 8 Decision VIII/28, Impact Assessment: Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment* provides, *inter alia*, that the Conference of the Parties to the Convention on Biological Diversity:- notes that the Akwé: Kon Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessments regarding Developments Proposed to Take Place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or used by Indigenous and Local Communities (decision VII/16 F, annex) should be used in conjunction with the voluntary guidelines on biodiversity-inclusive environmental impact assessment contained in the annex below and the draft guidance on biodiversity-inclusive strategic environmental assessment contained in annex

[57] Unit B, 'Impact assessment: Voluntary guidelines on biodiversity-inclusive impact assessment' <*https://www.cbd.int/decision/cop/?id=11042*> accessed 10 September 2021.

[58] Bigard C, Pioch S and Thompson JD, 'The Inclusion of Biodiversity in Environmental Impact Assessment: Policy-Related Progress Limited by Gaps and Semantic Confusion' (2017) 200 Journal of environmental management 35, 35.

II to the note by the Executive Secretary on voluntary guidelines on biodiversity-inclusive impact assessment.[59]

The *Voluntary Guidelines On Biodiversity-Inclusive Environmental Impact Assessment* identifies some biodiversity issues at different stages of environmental impact assessment.[60] The guidelines identify different stages in this process: *Screening*- used to determine which proposals should be subject to EIA, to exclude those unlikely to have harmful environmental impacts and to indicate the level of assessment required. Screening criteria have to include biodiversity measures, or else there is a risk that proposals with potentially significant impacts on biodiversity will be screened out; *Scoping*: used to define the focus of the impact assessment study and to identify key issues, which should be studied in more detail. It is used to derive terms of reference (sometimes referred to as guidelines) for the EIA study and to set out the proposed approach and methodology.

Scoping also enables the competent authority (or EIA professionals in countries where scoping is voluntary) to: (a) Guide study teams on significant issues and alternatives to be assessed, clarify how they should be examined (methods of prediction and analysis, depth of analysis), and according to which guidelines and criteria; (b) Provide an opportunity for stakeholders to have their interests taken into account in the EIA; and (c) Ensure that the resulting Environmental Impact Statement is useful to the decision maker and is understandable to the public[61]; *Assessment and evaluation of impacts, and development of alternatives*; *Reporting: the environmental impact statement (EIS)*; *Review of the environmental impact statement*; *Decision-making;* and, *Monitoring, compliance, enforcement and environmental auditing*.[62]
COP 8 Decision suggests that, taking into account the three objectives of the Convention, fundamental questions which need to be answered in an EIA

[59] Unit B, 'Impact assessment: Voluntary guidelines on biodiversity-inclusive impact assessment' <https://www.cbd.int/decision/cop/?id=11042> accessed 10 September 2021.
[60] Ibid.
[61] Ibid.
[62] Ibid.

study include: (a) *Would the intended activity affect the biophysical environment directly or indirectly in such a manner or cause such biological changes that it will increase risks of extinction of genotypes, cultivars, varieties, populations of species, or the chance of loss of habitats or ecosystems*? (b) *Would the intended activity surpass the maximum sustainable yield, the carrying capacity of a habitat/ecosystem or the maximum allowable disturbance level of a resource, population, or ecosystem, taking into account the full spectrum of values of that resource, population or ecosystem*? And, (c) *Would the intended activity result in changes to the access to, and/or rights over biological resources*?[63]

It may be important for stakeholders in environmental law in Kenya to review the requirements and process of EIA in biodiversity rich areas to include BIA as envisaged under Article 69(1) of the Constitution of Kenya. Notably, effective impact assessments and management plans largely rely on a solid foundation of: a) Information on biodiversity (e.g., taxonomic descriptions of species, conservation status assessments of species, conservation status assessments of ecosystems, distribution maps of species and habitats at a scale that is appropriate for project planning, understanding of sensitivity to stressors); b) Understanding of direct, indirect, and where feasible, cumulative impacts (i.e., placing the project in the context of land/resource use trends to ascertain how it contributes to landscape-scale impacts); c) Identification of priorities for biodiversity conservation (e.g., existing and planned protected areas, National Biodiversity Strategies and Action Plans); and d) Demonstrated methods to manage impacts.[64]

Arguably, if development projects are to take into consideration biodiversity conservation, then it is the high time that stakeholders consider inclusion of BIA in EIA and ESIA activities in the country. Fostering Environmental Democracy in these processes will also be important as the impact assessment

[63] Ibid.
[64] Hardner, J., Gullison, R.E., Anstee, S. and Meyer, M., 'Good Practices for Biodiversity Inclusive Impact Assessment and Management Planning' [2015] Prepared for the Multilateral Financing Institutions Biodiversity Working Group, 4.

is not purely technical and it is good practice to consult project stakeholders in all steps of the process, especially in the identification of potential impacts at the outset of the assessment.[65] This is especially important because local stakeholders may have a greater appreciation than external technical experts of the biodiversity values in the area and their sensitivity to impacts.[66]

5. Conclusion

The fundamental difference between the two main conservation strategies are: ex situ conservation involves the sampling, transfer, and storage of target taxa from the target area, whereas in situ conservation involves the designation, management, and monitoring of target taxa where they are encountered.[67] It is suggested that each ecosystem should be managed depending on its biodiversity composition and the choice of the management approach should also be informed by the same. If Kenya and the rest of the African countries are to achieve sustainable development goals through effective biodiversity conservation, they must not only embrace the global best practices in biodiversity conservation but must ensure that the same are entrenched and implemented through their domestic laws on environmental conservation.

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[65] Ibid, 7.
[66] Ibid, 6.
[67] Maxted N, 'In Situ, Ex Situ Conservation' in Simon A Levin (ed), Encyclopedia of Biodiversity (Second Edition) (Academic Press 2013) <https://www.sciencedirect.com/science/article/pii/B9780123847195000496> accessed 12 September 2021.

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