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Boosting Biodiversity Conservation Through Sustainable Forest Resources Management

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Abstract

As far as biodiversity conservation is concerned, forests are seen as not only a critical habitat for biological diversity but also as a tool for their conservation through sustainable management of forest resources. Communities living around forested areas rely heavily on these forest resources for their livelihoods. Indeed, conflicts have at times arisen from the use and control of forests, between authorities and the communities. This paper argues that managing these forests sustainably and in collaboration with the communities is not only likely to benefit the citizenry more but also boost efforts towards conservation of biodiversity.

1. Introduction

This paper discusses the challenges, and explores some of the ways that communities can be effectively included in forest resources management through fostered Environmental Democracy for biodiversity conservation and human rights protection. Arguably, loss of biodiversity in general, and in tropical forests in particular, has been identified as a major concern for modern society the world over.[1] It has been argued that deforestation is a major contributor to global emissions and reducing emissions from deforestation and degradation is a potentially cost-effective method of limiting emissions which

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[1] Lele, S., Wilshusen, P., Brockington, D., Seidler, R. and Bawa, K., 'Beyond Exclusion: Alternative Approaches to Biodiversity Conservation in the Developing Tropics' (2010) 2 Current Opinion in Environmental Sustainability 94.

can also yield important benefits in terms of biodiversity, watershed management, and local livelihoods, indeed development more generally.[2]

The *2030 Agenda for Sustainable Development Goals*[3] under Goal 15 (SDG 15) recognises the importance of forests and obligates States to 'protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity'.[4] Among the targets associated with this Goal are that States should: by 2020, ensure 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; by 2030, ensure the conservation of mountain ecosystems, including their biodiversity, to enhance their capacity to provide benefits which are essential for sustainable development; take urgent and significant action to reduce degradation of natural habitat, halt the loss of biodiversity, and by 2020 protect and prevent the extinction of threatened species; ensure fair and equitable sharing of the benefits arising from the utilization of genetic resources, and promote appropriate access to genetic resources; by 2020, integrate ecosystems and biodiversity values into national and local planning, development processes and poverty reduction strategies, and accounts; mobilize and significantly increase from all sources financial resources to conserve and sustainably use biodiversity and ecosystems; and enhance global support to efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities.[5] Notably, these targets not only

[2] Masundire HM, 'Achieving Sustainable Development and Promoting Development Cooperation–Dialogues at the ECOSOC' (New York: United Nations, 2008),28.
[3] United Nations General Assembly, *Transforming our world: the 2030 Agenda for Sustainable Development*, Resolution adopted by the General Assembly on 25 September 2015 [without reference to a Main Committee (A/70/L.1)].
[4] UN General Assembly, *Transforming our world: the 2030 Agenda for Sustainable Development*, Goal 15.
[5] 'SDG 15: Protect, Restore and Promote Sustainable Use of Terrestrial Ecosystems, Sustainably Manage Forests, Combat Desertification, Halt and Reverse Land Degradation and Halt Biodiversity Loss – SDG Compass' <*https://sdgcompass.org/sdgs/sdg-15/*> accessed 13 August 2021.

recognise the link between forests and biodiversity conservation but also calls for empowerment of local communities through capacity building to enable them pursue sustainable livelihood opportunities. This arguably means ensuring that they fully participate in forests resources management in the spirit of Environmental Democracy.

2. Forest Resources and Biodiversity Conservation

Notably, forests are considered as critical habitats for biodiversity and are also essential for the provision of a wide range of ecosystem services that are important to human well-being.[6] Forest resources offer a range of benefits and opportunities for local and national economic development, improved livelihoods and provision of environmental goods and services such as watershed protection and carbon sequestration.[7] They contribute directly and indirectly to the national and local economies through revenue generation and wealth creation, and it is estimated that forestry contributes to 3.6% of Kenya's GDP, excluding charcoal and Direct Subsistence Uses.[8] Forests also support most productive and service sectors in the country, particularly agriculture, fisheries, livestock, energy, wildlife, water, tourism, trade and industry that contributes about 33% to 39 % of the country's GDP.[9] Biomass comprises about 80% of all energy used in the country, while they also provide a variety of goods, which support subsistence livelihoods of many communities.[10] Other services provided include erosion control, natural hazard and disease regulation. Forest adjacent communities benefit directly through subsistence utilization of the forests. Deforestation in Kenya is, however, estimated at 50,000 hectares annually, with a consequent yearly loss to the economy of over USD 19 million.[11]

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[6] Brockerhoff, E.G., Barbaro, L., Castagneyrol, B., Forrester, D.I., Gardiner, B., González-Olabarria, J.R., Lyver, P.O.B., Meurisse, N., Oxbrough, A., Taki, H. and Thompson, I.D., 'Forest Biodiversity, Ecosystem Functioning and the Provision of Ecosystem Services' (2017) 26 Biodiversity and Conservation 3005.
[7] Republic of Kenya, *Policy 2014*, Laws of Kenya.
[8] Ibid
[9] Ibid, para. 1.1.2.
[10] Ibid
[11] Ibid

While Kenya is endowed with a wide range of forest ecosystems ranging from montane rainforests, savannah woodlands; dry forests and coastal forests and mangroves, the current forest cover is estimated at 6.99% of the land area of the country, below the constitutional requirement of 10%.[12]

Forest resources conservation is provided for both in the international and national legal frameworks. The CBD Aichi Target 5 provides that "by 2020, the rate of loss of all natural habitats, including forests, should at least be halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced. Notably, the CBD Aichi Biodiversity Target 7 also provides that countries should ensure that "by 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity". The overall goal of Kenya's *Forest Policy 2014* was sustainable development, management, utilization and conservation of forest resources and equitable sharing of accrued benefits for the present and future generations of the people of Kenya. The *Draft National Forest Policy, 2020*, being a revised policy framework for forest conservation and sustainable management seeks to provide a framework for improved forest governance, resource allocation, partnerships and collaboration with the state and non-state actors and monitoring and evaluation to enable the sector contribute to the achievement of the country's growth and poverty alleviation goals within a sustainable environment.[13]

The *Forest Conservation and Management Act 2016*[14] was enacted to give effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socio-economic development of the country.[15]

[12] Ibid
[13] Republic of Kenya, *Draft Policy 2020*, May 2020, Laws of Kenya.
[14] No. 34 of 2016, Laws of Kenya.
[15] Preamble, No. 34 of 2016, Laws of Kenya.

The *National Spatial Plan 2015-2045* highlights some of the challenges facing forest ecosystems to include overwhelming pressure from competing land uses like agriculture, industry, human settlement and development of infrastructure; extraction of forest products, illegal logging, cutting trees for fuel wood and charcoal and grazing of livestock have also contributed to the degradation of forests. These competing land uses have adverse environmental effects on long-term sustainability of forest ecosystems. Under this Plan, the Government is mandated to: *prepare integrated forest resource management plans to promote sustainable use of forest resources; develop and implement national standards, principles and criteria of sustainable forest management; indigenous forests shall be identified and protected from logging and involve and empower communities in the management of forest ecosystems through controlled logging, agro-forestry, re-forestation and natural regeneration.*

The Constitution of Kenya 2010 also requires under Article 69(1) that the State should, *inter alia*,—(*a*) ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits; (*b*) work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya; (*d*) encourage public participation in the management, protection and conservation of the environment; (*e*) protect genetic resources and biological diversity; (*f*) establish systems of environmental impact assessment, environmental audit and monitoring of the environment.

The *Community Land Act*[16] provides that: for purposes of the sustainable conservation of land based natural resources within community land across counties, every respective registered community should abide by the relevant applicable laws, policies and standards on natural resources.[17] With respect to subsection (1), the communities should establish - measures to protect critical ecosystems and habitats; incentives for communities and individuals to invest in income generating natural resource conservation programmes; measures to facilitate the access, use and co-management of forests, water and other

[16] Community Land Act, No. 47 of 2016, Laws of Kenya.
[17] Ibid, sec. 20 (1).

resources by communities who have customary rights to these resources; procedures for the registration of natural resources in an appropriate register; and procedures for the involvement of communities and other stakeholders in the management and utilization of land-based natural resources.[18]

3. Challenges in Biodiversity Conservation and Forest Resources Management in Kenya

The management and conservation of forests is often associated with tension between powerful, centralised state authorities or the ruling elite and less powerful local communities. [19] Over the years, this state of affairs has led to decentralization of forest rights and tenure to local communities and indigenous groups in both developing and developed nations, giving greater local control of forest resources as a response to the failure of government agencies to exercise adequate stewardship over forests and to ensure that the values of all stakeholders are adequately protected.[20] While the law provides for community based approaches to forest management, there exists challenges at the local level, when local governance institutions are not downwardly accountable to the community and benefits are disproportionately captured by local elites.[21] As a result, tensions exist in some places between the development of locally accountable governance and traditional authorities, with Community-based natural resource management (CBNRM) interventions not being accompanied by the type of long-term investments in capacity-building required to ensure broader participation and the accountability of local leaders to their community.[22]

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[18] Ibid, se. 20 (2).
[19] Sayer, J., Elliott, C., Barrow, E., Gretzinger, S., Maginnis, S., McShane, T., & Shepherd, G., 'The Implications for Biodiversity Conservation of Decentralised Forest Resources Management Paper Prepared on Behalf of IUCN and WWF for the UNFF Inter-Sessional Workshop on Decentralisation Interlaken, Switzerland, May 2004'.
[20] Sayer J, Margules C and Boedhihartono AK, 'Will Biodiversity Be Conserved in Locally-Managed Forests?' (2017) 6 Land 6.
[21] Roe D, Nelson F and Sandbrook C, *Community Management of Natural Resources in Africa: Impacts, Experiences and Future Directions* (IIED 2009), ix.
[22] *Ibid*

The loss of control rights over natural resources during the colonial period affected other resources including forests and water.[23] The focus of forests management in reserved forests was production and protection and included collection of revenues, supervisory permits and licences, protection against illegal entry and use, reforestation and afforestation, research and extension.[24] Further, outside reserved forests, the focus by the government authorities was regulation and control of forest resources utilisation through legislation without considering the interests of the local communities or the existing traditional management systems.[25]

Thus, the colonial government effectively transferred the management of forests from the local communities to the government through exclusionist and protectionist legal frameworks, a move that was inherited by the independent governments of Kenya.[26] It was only in the 1990s that there emerged a paradigm shift towards community-based forests management, although this was done with minimal commitment from the stakeholders.[27] Arguably, this has been with little success due to the bureaucracy involved in requiring communities to apply for complicated licenses and permits in order to participate in the same.

[23] Mogaka, H., 'Economic Aspects of Community Involvement in Sustainable Forest Management in Eastern and Southern Africa,' *Issue 8 of Forest and social perspectives in conservation*, IUCN, 2001, 74.

[24] Kigenyi, *et al*, 'Practice Before Policy: An Analysis of Policy and Institutional Changes Enabling Community Involvement in Forest Management in Eastern and Southern Africa,' *Issue 10 of Forest and social perspectives in conservation*, (IUCN, 2002), p. 9.

[25] *Ibid*

[26] For instance, in 1985 the Government of the day effected a total ban on the shamba system, which was participatory in nature in that it allowed communities to settle in forests and engage in farming as they took care of the forests. Following the ban, the communities were resettled outside the gazetted forest areas. This form of eviction has also been witnessed in such recent cases as the Endorois and the Ogiek cases.

[27] Emerton, L., 'Mount Kenya: The Economics of Community Conservation,' *Evaluating Eden Series*, Discussion Paper No.4, p. 6.

A closer examination of the *Forest Conservation and Management Act*, 2016[28] reveals this challenge. For instance, all indigenous forests and woodlands are to be managed on a sustainable basis for purposes of water, soil and biodiversity conservation; riverine and shoreline protection; cultural use and heritage; recreation and tourism; sustainable production of wood and non-wood products; carbon sequestration and other environmental services; education and research purposes; and as habitats for wildlife in terrestrial forests and fisheries in mangrove forests.[29] In this regard, the law requires the Kenya Forest Service to consult with the forest conservation committee for the area where the indigenous forest is situated in preparing a forest management plan.[30] Furthermore, the Forests Board is empowered to enter into a joint management agreement for the management of any state indigenous forest or part thereof with any person, institution, government agency or forest association.[31] While such arrangements can potentially promote co-management and are important in promoting environmental justice since communities get to participate in management of indigenous forests, there is little evidence of active involvement of these communities. If anything, these communities have been suffering eviction from the indigenous forests.[32]

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[28] *Forest Conservation and Management Act*, No. 34 of 2016, Laws of Kenya.

[29] Sec. 42 (1), *Forest Conservation and Management Act*, No. 34 of 2016; See also Article 60, Constitution of Kenya 2010.

[30] *Ibid*, S. 42(2).

[31] *Ibid*, S. 44(3).

[32] 'Kenya: Indigenous Peoples Targeted as Forced Evictions Continue despite Government Promises' <*https://www.amnesty.org/en/latest/news/2018/08/kenya-indigenous-peoples-targeted-as-forced-evictions-continue-despite-government-promises/*> accessed 7 July 2021; 'Kenya: Indigenous Ogiek Face Eviction from Their Ancestral Forest… Again' (*Mongabay Environmental News*, 8 October 2018) <*https://news.mongabay.com/2018/10/kenya-indigenous-ogiek-face-eviction-from-their-ancestral-forest-again/*> accessed 7 July 2021; 'Families Torn Apart: Forced Eviction of Indigenous People in Embobut Forest, Kenya - Kenya' (*ReliefWeb*) <*https://reliefweb.int/report/kenya/families-torn-apart-forced-eviction-indigenous-people-embobut-forest-kenya-0*> accessed 7 July 2021; 'Imminent Forced Eviction by Kenya Threatens Indigenous Communities' Human Rights and Ancestral Forests - Kenya' (*ReliefWeb*) <*https://reliefweb.int/report/kenya/imminent-forced-eviction-kenya-threatens-indigenous-communities-human-rights-and*> accessed 7 July 2021; 'Kenya Defies Its

The *Draft National Forest Policy 2020* acknowledges that 'while the Forests Act No. 7 of 2005 and the Forest Conservation and Management Act 2016 provide for PFM (a model where the authority managing forest land invites local people to participate in some activities with responsibilities outlined in participatory agreements and participatory forest management plans (PFMPs)), the implementation of PFMPs through management agreements between KFS and CFAs has been limited due to inadequate funding, where the PFM process needs to be strengthened, improved upon, and adequately financed'. In addition, the Policy document states that 'participation should extend to community engagement in the management and utilization of national gazetted forests through community forestry. Other issues that need to be addressed are: sustainable access, user rights and benefit sharing; enhancing the livelihoods of communities; adoption and mainstreaming of innovative climate change adaptation and mitigation models in forest resource management strategies; and identification of best practices on grievance and redress mechanisms between communities and forest management institutions'.[33]

It has been argued that many, if not all of the planet's environmental problems and certainly its entire social and economic problems, have cultural activity and decisions – people and human actions – at their roots.[34] As such, solutions

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Own Courts: Torching Homes and Forcefully Evicting the Sengwer from Their Ancestral Lands, Threatening Their Cultural Survival | Forest Peoples Programme' <*http://www.forestpeoples.org/topics/legal-human-rights/news/2014/01/kenya-defies-its-own-courts-torching-homes-and-forcefully-evi*> accessed 7 July 2021; 'Kenya's Sengwer People Demand Recognition of "Ancestral Land" | Voice of America - English' <*https://www.voanews.com/africa/kenyas-sengwer-people-demand-recognition-ancestral-land*> accessed 7 July 2021; Jacqueline M Klopp and Job Kipkosgei Sang, 'Maps, Power, and the Destruction of the Mau Forest in Kenya' (2011) 12 Georgetown Journal of International Affairs 125; 'Kenya Forest Service - Kenya Forest Service' <*http://www.kenyaforestservice.org/index.php?option=com_content&view=article&catid=223&id=149&Itemid=98*> accessed 7 July 2021.

[33] Republic of Kenya, Draft National Forest Policy 2020, para. 2.2.2.

[34] Dessein, J. et al (ed), 'Culture in, for and as Sustainable Development: Conclusions from the COST Action IS1007 Investigating Cultural Sustainability,' (University of

are likely to be also culturally-based, and the existing models of sustainable development forged from economic or environmental concern are unlikely to be successful without cultural considerations.[35] Culture in this context, has been defined as: the general process of intellectual, spiritual or aesthetic development; culture as a particular way of life, whether of people, period or group; and culture as works and intellectual artistic activity.[36]

Notably, the generation, adaptation and use of indigenous knowledge are greatly influenced by the culture.[37] It has rightly been observed that despite the indigenous populations having suffered from invasion and oppression, and oftentimes they have seen their knowledge eclipsed by western knowledge, imposed on them through western institutions, indigenous populations have managed to survive for centuries adapting in many different ways to adverse climate conditions and managing to create sustainable livelihood systems.[38] Indeed, their diverse forms of knowledge, deeply rooted in their relationships with the environment as well as in cultural cohesion, have allowed many of these communities to maintain a sustainable use and management of natural resources, to protect their environment and to enhance their resilience; their ability to observe, adapt and mitigate has helped many indigenous communities face new and complex circumstances that have often severely impacted their way of living and their territories.[39] It is, therefore, worth including indigenous knowledge and culture in any plans, programmes and policies aimed at realisation of sustainable development agenda.

Jyväskylä, Finland, 2015), p. 14. Available at *http://www.culturalsustainability.eu/conclusions.pdf* [Accessed on 7 July 2021].

[35] Ibid, p.14.

[36] Ibid, p. 21.

[37] SGJN Senanayake, 'Indigenous Knowledge as a Key to Sustainable Development' (2006) 2 Journal of Agricultural Sciences–Sri Lanka.

[38] Giorgia Magni, 'Indigenous Knowledge and Implications for the Sustainable Development Agenda.' (2017) 52 European Journal of Education 437, p.3 < *https://unesdoc.unesco.org/ark:/48223/pf0000245623*> Accessed 7 July 2021.

[39] Ibid; See also Anders Breidlid, 'Culture, Indigenous Knowledge Systems and Sustainable Development: A Critical View of Education in an African Context' (2009) 29 International Journal of Educational Development 140.

Economically, forests provide timber which is an important source of revenue and a major foreign exchange earner. Forests also serve as habitats and a source of livelihoods for indigenous peoples and forest dwellers.[40] The *Africa Forest Law Enforcement and Governance (AFLEG) Ministerial Declaration of 2003*[41] recognized the role of forests in its preamble noting that Africa's forest eco-systems are essential for the livelihoods of the African people; especially the poor and that forests play important social, economic and environmental functions.[42]

Environmental injustice continues to manifest itself in modern times through conflicts such as those in Lamu County and in the pastoral counties, largely attributable to environmental injustices inflicted over the years.[43] The conflicts also rise as a result of some sections of the society habouring feelings that land and other land-based resources were taken away from local communities, creating a feeling of disinheritance. In other areas, there are conflicts over access to resources such as forests among forest communities for livelihood, while in others conflicts emerge due to competition over scarce natural resources and competing land uses.[44]

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[40] UNFF Memorandum <*www.iucnael.org/en/.../doc.../849-unit-3-forest-game-backgrounder.html*> Accessed on 15 August 2021; See also UNEP, *Global Environment Outlook 5: Environment for the future we want*, (UNEP, 2012), pp.145-154.

[41] Africa Forest Law Enforcement and Governance (AFLEG), Ministerial Conference 13-16 October, 2003; Ministerial Declaration, Yaoundé, Cameroon, October 16, 2003.

[42] Sec. 2, *Forest Conservation and Management Act*, No. 34 of 2016, Laws of Kenya.

[43] "They Just Want to Silence Us" (*Human Rights Watch*, 17 December 2018) <*https://www.hrw.org/report/2018/12/17/they-just-want-silence-us/abuses-against-environmental-activists-kenyas-coast*> accessed 9 July 2021; Rachel Berger, 'Conflict over Natural Resources among Pastoralists in Northern Kenya: A Look at Recent Initiatives in Conflict Resolution' (2003) 15 Journal of International Development 245.

[44] 'FAO Working Paper 1' <*http://www.fao.org/3/X2102E/X2102E01.htm*> accessed 9 July 2021; Urmilla Bob and Salomé Bronkhorst, 'Environmental Conflicts: Key Issues and Management Implications' (2010) 10 African Journal on Conflict Resolution.

4. Sustainable Management of Forests for Biodiversity Conservation

The environment and forest sector is the foundation upon which the performance of the key primary sectors of the economy is anchored including, manufacturing, energy, health and agriculture.[45] It was estimated that by 2010 the national forest cover stood at 4.18 million Ha, representing 6.99% of the total land area while the gazzetted public forests managed by Kenya Forest Service covered 2.59 million Ha.[46] In 2015, the forest cover was estimated at 7.2% based on the national projection from the 2010 forest cover data.[47] This is below the recommended minimum global standard of 10% thus necessitating Kenya's goal of increasing and maintaining the national tree cover to at least 10% by 2022.[48] Most of the forestland in Kenya has been attributed to change of and use over the years thus shrinking the country's forest cover to below the international accepted standards.[49] This is despite the fact that forests are considered important for the provision of vital ecosystem services to communities living around them, contributing immensely to their

[45] Republic of Kenya, *Draft National Strategy for Achieving and Maintaining Over 10% Tree Cover By 2022, May 2019*< http://www.environment.go.ke/wp-content/uploads/2019/08/revised-Draft-Strategy-for-10-Tree-Cover-23-5-19-FINAL.pdf> *accessed 31 July 2021*, para. 1.1.

[46] *Ibid*

[47] *Ibid*

[48] https://www.the-star.co.ke/authors/gilbertkoech, 'Why State Wants You to Plant Trees on 10% of Your Land' (*The Star*) <https://www.the-star.co.ke/news/2021-03-14-why-state-wants-you-to-plant-trees-on-10-of-your-land/> accessed 3 June 2021; Anyango Otieno and Jeckoniah Otieno, 'Sh48b Needed to Raise Forest Cover to 10 per Cent' (*The Standard*)
<https://www.standardmedia.co.ke/kenya/article/2001394403/sh48b-needed-to-raise-forest-cover-to-10-per-cent> accessed 3 June 2021.

[49] Donald Kipruto Kimutai and Teiji Watanabe, 'Forest-Cover Change and Participatory Forest Management of the Lembus Forest, Kenya' (2016) 3 Environments 20; Sylvester Ngome Chisika and Chunho Yeom, 'Enhancing Ecologically Sustainable Management of Deadwood in Kenya's Natural Forests' (2021) 2021 International Journal of Forestry Research e6647618; Jebiwott, A., Ogendi, G. M., Makindi, S. M., & Esilaba, M. O., 'Forest Cover Change and Ecosystem Services of Katimok Forest Reserve, Baringo County, Kenya'.

livelihoods.[50] Natural forests also provide many ecosystem services needed for biodiversity conservation and sustainable management.[51]

Sustainable forest management is impossible without the conservation of biological diversity in forest ecosystems. In addition to the establishment and functioning of protected areas (PA) and a network of protective forests to maintain biodiversity, it is necessary to ensure the existence and species dispersal in the territories actively involved in forest management.[52]

Sustainable forest management practices that reduce the depletion of carbon stock and enhance forest resiliency (e.g., through reduced impact logging and longer harvesting cycles) could benefit biodiversity if they are applied in forests that have unsustainable harvest rates but would negatively impact forest biodiversity if applied in intact old-growth forests.[53]

4.1. Addressing Poverty as a Causation Factor in Deforestation

Kenya's Draft Forest Policy 2020 acknowledges that while forestlands provide an important resource base for rural people's livelihoods, rapidly increasing populations, poverty, demand for fuel wood and grazing have put pressure on land forcing large segments of the rural poor to resort to poor land use practices.[54] Arguably, there are better chances of maintaining biodiversity if local benefits are maximized and local costs are minimized through carefully negotiated allocation of forest land to different purposes and by optimising the balance between all the goods and services derived from forests, especially

[50] Jebiwott, A., Ogendi, G. M., Makindi, S. M., & Esilaba, M. O., 'Forest Cover Change and Ecosystem Services of Katimok Forest Reserve, Baringo County, Kenya'.
[51] Sylvester Ngome Chisika and Chunho Yeom, 'Enhancing Ecologically Sustainable Management of Deadwood in Kenya's Natural Forests' (2021) 2021 International Journal of Forestry Research, 1.
[52] 'Biodiversity Conservation in Forest Management' (*WWF Russia*) *<https://wwf.ru/en/what-we-do/forests/biodiversity-conservation-in-forest-management/>* accessed 13 September 2021.
[53] Harvey CA, Dickson B and Kormos C, 'Opportunities for Achieving Biodiversity Conservation through REDD' (2010) 3 Conservation Letters 53.
[54] Republic of Kenya, *Draft Forest Policy 2020*, para. 1.2.4.

where poor people live in proximity to forests rich in biodiversity.[55] It is suggested that policies that address links between ecological services and poverty can affect a lot of forest and many people.[56] Indeed, SDG 1 also acknowledge that one of the steps towards achieving sustainability will be eradicating abject poverty among the global citizenry. Some studies posit that policy options for reducing poverty can be sustainably effective in reducing deforestation and can be used in place of policies that, *inter alia,* restrict forest use excessively in order to reconcile forest conservation with social welfare.[57]

It is perhaps against this background that at COP 26, in an attempt to address poverty through diversified livelihood sources, world leaders acknowledged that meeting our land use, climate, biodiversity and sustainable development goals, both globally and nationally, will require transformative further action in the interconnected areas of sustainable production and consumption; infrastructure development; trade; finance and investment; and support for smallholders, Indigenous Peoples, and local communities, who depend on forests for their livelihoods and have a key role in their stewardship.[58]

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[55] Szaro, R.C., Sayer, J.A., Sheil, D., Snook, L., Gillison, A., Applegate, G., Poulsen, J. and Nasi, R., 'Biodiversity Conservation in Production Forests' [1999] Center for International Forestry Research, Jakarta, Indonesia and International Union for Forestry Research Organizations, Vienna, Austria. 61pp, 2. Available at: http://www. cifor. cgiar. org/publications/pdf_files/others/biodiversity. pdf

[56] Kerr, S., Pfaff, A., Cavatassi, R., Davis, B., Lipper, L., Sanchez, A. and Timmins, J., *Effects of Poverty on Deforestation: Distinguishing behaviour from location*. No. 854-2016-56193. 2004, 2.

[57] Miyamoto M, 'Poverty Reduction Saves Forests Sustainably: Lessons for Deforestation Policies' (2020) 127 World Development 104746; see also Fagariba CJ, Song S and Soule SKG, 'Livelihood Economic Activities Causing Deforestation in Northern Ghana: Evidence of Sissala West District' (2018) 8 Open Journal of Ecology 57.

Some authors, however, contend this causality link between deforestation and poverty- Geist, H. and Lambin, E.,
"Is poverty the cause of tropical deforestation?" *The International Forestry Review* 5, no. 1 (2003): 64-67.

[58] 'Glasgow Leaders' Declaration on Forests and Land Use' (*UN Climate Change Conference (COP26) at the SEC – Glasgow 2021*, 2 November 2021) <https://ukcop26.org/glasgow-leaders-declaration-on-forests-and-land-use/> accessed 12 November 2021.

Efforts towards addressing deforestation thus involve poverty eradication as both a means and an end.

4.2. Role of Technology and Innovation in Combating Deforestation

Technological and social innovation has an important role in delivering a low-carbon growth through: short-term cost-effective emissions reductions using known technologies (for example, in energy generation and transmission), land use change (for example, in reduced deforestation), and energy efficiency; and in the medium – to longer-term, through delivering next-generation low-carbon technologies, especially for the power, transport, industry, and building sectors.[59] However, it must be noted that due to the development differences between countries, there would be different policy frameworks for different technologies at different stages of development.[60]

Social innovation refers to the reconfiguration of social practices and new institutions such as networks, partnerships, collaborations and governance arrangements—in response to societal challenges and opportunities, and it is seen as crucial for addressing challenges as it has the potential to deliver tangible and positive benefits for rural communities.[61] Arguably, its potential lies in offering 'new ways of framing, knowing, doing and organising and transforming the way researchers, development agents and rural stakeholders usually work together, and it represents a shift in the perspective and approach to development that provides opportunities for better inclusion of stakeholders' voices, values and vision in matters that concern them and for valuing their experience.[62]

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[59] Masundire HM, 'Achieving Sustainable Development and Promoting Development Cooperation–Dialogues at the ECOSOC' (New York: United Nations, 2008),28.
[60] *Ibid*, 28.
[61] Barlagne, C., Bézard, M., Drillet, E., Larade, A., Diman, J.L., Alexandre, G., Vinglassalon, A. and Nijnik, M., 'Stakeholders' Engagement Platform to Identify Sustainable Pathways for the Development of Multi-Functional Agroforestry in Guadeloupe, French West Indies' [2021] Agroforestry Systems <https://doi.org/10.1007/s10457-021-00663-1> accessed 15 September 2021.
[62] Ibid

Some of these innovations, it is hoped, will help in predicting changes in future land use and the effects of climate-related deforestation and this will in turn help governments and environment-oriented organizations to use the readily available vast data to hopefully make better policies to protect the forests.[63] Indeed, Kenya's *Draft National Forests Policy 2020* acknowledges that 'the forest sector suffers from low productivity of tree crops, low conversion efficiency and weak value addition schemes, as a result of climate change, small genetic base of crops, emerging pests and diseases, delayed investments in silvicultural technology[64], low investments in technology development, and poor investment in forest-based industry. As such, it states that research and development is needed to refocus basic forestry disciplines to pertinent issues such as productivity, low cost silvicultural technologies, health, crop diversification, processing, value addition, intellectual property rights and indigenous knowledge.[65]

The United Nations climate negotiations on Reducing Emissions From Deforestation And Degradation (REDD), a kind of payments for environmental services (PES)[66], provide a rare opportunity for conservation of tropical forests and biodiversity.[67] It has been observed that since Reducing emissions from deforestation and forest degradation (REDD+) policies, projects, and interventions focus on forests, they simultaneously affect socioeconomic and ecological outcomes at local, subnational, national,

[63] 'Technology to Tackle Deforestation' (*AZoCleantech.com*, 29 November 2013) <https://www.azocleantech.com/article.aspx?ArticleID=470> accessed 15 September 2021.

[64] Developing silvicultural systems for sustainable forestry involves assembling the components of a silvicultural prescription such that the prescription will successfully maintain a range of ecosystem attributes (values). Those components include a suite of harvesting, regeneration, and tending methods. 'Developing Silvicultural Systems for Sustainable Forestry in Canada' <*http://www.fao.org/3/XII/0596-B1.htm*> accessed 15 September 2021.

[65] Republic of Kenya, *Draft National Forest Policy 2020*, para. 2.2.10.

[66] Pagiola S and Bosquet B, 'Estimating the Costs of REDD at the Country Level'.

[67] Harvey CA, Dickson B and Kormos C, 'Opportunities for Achieving Biodiversity Conservation through REDD' (2010) 3 Conservation Letters 53.

regional, and global levels.[68] Reducing emissions from deforestation and forest degradation in developing countries (REDD) is based on the following basic idea: reward individuals, communities, projects and governments that reduce greenhouse gas (GHG) emissions from forests.[69]

There is a need for countries to continue exploring such projects as part of innovative responses to deforestation and climate change.[70] At the 26th UN Climate Change Conference of the Parties (COP26) in Glasgow, Scotland, held in November 2021, the *Glasgow Declaration on Forests and Land Use* was announced to the world, and was signed by 100 countries representing 85% of the globe's forested land, pledging to end or reduce deforestation by 2030.[71] Overall, the sustainable management and conservation of the world's forests received a significant boost at COP26 with financial pledges, technical progress and a declaration by World Leaders and other stakeholders on 'Forests and Land Use'.[72] Through the Declaration, the Participants emphasised the critical and interdependent roles of forests of all types, biodiversity and sustainable land use in enabling the world to meet its sustainable development goals; to help achieve a balance between anthropogenic greenhouse gas emissions and removal by sinks; to adapt to

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[68] Duchelle, A.E., De Sassi, C., Jagger, P., Cromberg, M., Larson, A.M., Sunderlin, W.D., Atmadja, S.S., Resosudarmo, I.A.P. and Pratama, C.D., 'Balancing Carrots and Sticks in REDD+ Implications for Social Safeguards' (2017) 22 Ecology and Society; Duchelle AE and others, 'What Is REDD+ Achieving on the Ground?' (2018) 32 Current Opinion in Environmental Sustainability 134; Arun Agrawal, Daniel Nepstad, and Ashwini Chhatre, 'Reducing Emissions from Deforestation and Forest Degradation', Annu. Rev. Environ. Resour. 2011. 36:373–96, at 373.

[69] Verbist, B., Vangoidsenhoven, M., Dewulf, R. and Muys, B., 'Reducing Emissions from Deforestation and Degradation (REDD)' [2011] KLIMOS, Leuven, Belgium 1.

[70] Cf. Duchelle AE and others, 'Balancing Carrots and Sticks in REDD+ Implications for Social Safeguards' (2017) 22 Ecology and Society.

[71] 'COP26 Glasgow Declaration: Salvation or Threat to Earth's Forests?' (*Mongabay Environmental News*, 3 November 2021) <*https://news.mongabay.com/2021/11/cop26-glasgow-declaration-salvation-or-threat-to-earths-forests/*> accessed 11 November 2021.

[72] 'COP26: Pivotal Progress Made on Sustainable Forest Management and Conservation | UNFCCC' <*https://unfccc.int/news/cop26-pivotal-progress-made-on-sustainable-forest-management-and-conservation*> accessed 11 November 2021.

climate change; and to maintain other ecosystem services.[73] It is hoped that the countries in question will uphold their commitments in combating deforestation for climate change mitigation and biodiversity conservation.

4.3. Promoting Agroforestry for Biodiversity Conservation

As already pointed out, Environmental Democracy is an important tool in promoting participatory management of resources, including forests. As a result, it has been suggested that social innovation is critical in shaping human-forest relationships and how farmers and scientists engage with each other to design sustainability transitions, where it has been observed that if countries are to address synergies between rural livelihoods, biodiversity conservation and the capacity of the natural environment to provide ecosystem services, the role of local communities is central.[74] Agroforestry is a participatory approach that can be used in enhancing the participation of communities in sustainable management of forest resources for biodiversity conservation.[75]

With declining biodiversity affecting food security, agricultural sustainability and environmental quality, agroforestry has been hailed as a possible partial solution for biodiversity conservation and improvement.[76] Agroforestry systems try to balance various needs: 1) to produce trees for timber and other commercial purposes; 2) to produce a diverse, adequate supply of nutritious foods both to meet global demand and to satisfy the needs of the producers themselves; and 3) to ensure the protection of the natural environment so that

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[73] Preamble< 'Glasgow Leaders' Declaration on Forests and Land Use' (*UN Climate Change Conference (COP26) at the SEC – Glasgow 2021*, 2 November 2021) <*https://ukcop26.org/glasgow-leaders-declaration-on-forests-and-land-use/*> accessed 11 November 2021.

[74] Barlagne, C., Bézard, M., Drillet, E., Larade, A., Diman, J.L., Alexandre, G., Vinglassalon, A. and Nijnik, M., 'Stakeholders' Engagement Platform to Identify Sustainable Pathways for the Development of Multi-Functional Agroforestry in Guadeloupe, French West Indies' [2021] Agroforestry Systems <https://doi.org/10.1007/s10457-021-00663-1> accessed 15 September 2021.

[75] P Udawatta R, Rankoth L and Jose S, 'Agroforestry and Biodiversity' (2019) 11 Sustainability 2879.

[76] Ibid

it continues to provide resources and environmental services to meet the needs of the present generations and those to come.[77]

Often, farmers see themselves as being part of the socio-ecological system and as custodians of the natural environment.[78] Agroforestry is a form of integrated land management that combines agriculture and forestry on a same unit of land and aims to 'create environmental, economic, and social benefits'.[79] Arguably, agroforestry contributes directly to SDGs) 1 (no poverty), 2 (zero hunger), 3 (good health and wellbeing), 6 (clean water and sanitation), 7 (affordable and clean energy), 8 (decent work and economic growth), 11 (sustainable cities and communities), 12 (responsible consumption and production), 13 (climate action), and 15 (life on land) and indirectly through implementation approaches to Goals 4 (quality education), 5 (gender equality), 9 (industry, innovation and infrastructure),10 (reduced inequalities), 14 (life below water), 16 (peace, justice and strong institutions) and 17 (partnerships for the goals).[80]

If well designed and implemented, agroforestry systems can arguably provide the following: their role in rural development as they can improve food sovereignty and contribute to provision of energy for the smallholders; and their environmental functions: contribution to biodiversity conservation, to increased connectivity of fragmented landscapes, and adaptation and mitigation of climate change.[81]

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[77] 'What Is Agroforestry?' (*World Agroforestry | Transforming Lives and Landscapes with Trees*) <https://www.worldagroforestry.org/about/agroforestry> accessed 15 September 2021.

[78] Barlagne, C., Bézard, M., Drillet, E., Larade, A., Diman, J.L., Alexandre, G., Vinglassalon, A. and Nijnik, M., 'Stakeholders' Engagement Platform to Identify Sustainable Pathways for the Development of Multi-Functional Agroforestry in Guadeloupe, French West Indies' [2021] Agroforestry Systems.

[79] Ibid

[80] 'What Is Agroforestry?' (*World Agroforestry | Transforming Lives and Landscapes with Trees*) <https://www.worldagroforestry.org/about/agroforestry> accessed 15 September 2021.

[81] Montagnini F, 'Integrating Landscapes: Agroforestry for Biodiversity Conservation and Food Sovereignty' (2017) 12 Advances in agroforestry (ISSN 1875-1199.

5. Conclusion

It has been observed that more than 1.6 billion people all over the world depend on forests for food, medicine and livelihoods, with the forests preserving soil and supporting 80% of the world's biodiversity, and they also produce oxygen and purify the air, making them essential for mitigating climate change as they absorb up to 30% of Green House Gas Emissions.[82]

Thus, forests have increasingly been associated with global sustainability, with them re-taking centre stage in global conversations about sustainability, climate and biodiversity.[83] Arguably, there is a need for countries to adopt approaches in combating deforestation which involve public resources and governance reforms if the hard and soft infrastructure for controlling deforestation and the scale required is to work effectively, and these approaches should include observation, monitoring, definition and enforcement of property rights, legal and administrative reform, among others, at the country level.[84] Indeed, the *COP26 Glasgow Leaders Declaration on Forests and Land Use* acknowledges that there is a need for the empowerment of local communities, including indigenous peoples, which are often negatively affected by the exploitation and degradation of forests.[85]

There is no meaningful progress that can be made in achieving biodiversity conservation through sustainable forests management if communities are not

[82] 'COP26: EU Announces €1 Billion Pledge to Protect Forests' (*European Commission - European Commission*) <https://ec.europa.eu/commission/presscorner/detail/en/IP_21_5678> accessed 12 November 2021.

[83] Oldekop JA and others, 'Forest-Linked Livelihoods in a Globalized World' (2020) 6 Nature Plants 1400; 'World Leaders, Corporations at COP26, Take Major Step to Restore and Protect Forests' (*UN News*, 2 November 2021) <https://news.un.org/en/story/2021/11/1104642> accessed 12 November 2021.

[84] Masundire HM, 'Achieving Sustainable Development and Promoting Development Cooperation–Dialogues at the ECOSOC' (New York: United Nations, 2008),28.

[85] 'World Leaders, Corporations at COP26, Take Major Step to Restore and Protect Forests' (*UN News*, 2 November 2021) <https://news.un.org/en/story/2021/11/1104642> accessed 12 November 2021.

actively and meaningfully involved in such efforts, through Environmental Democracy.

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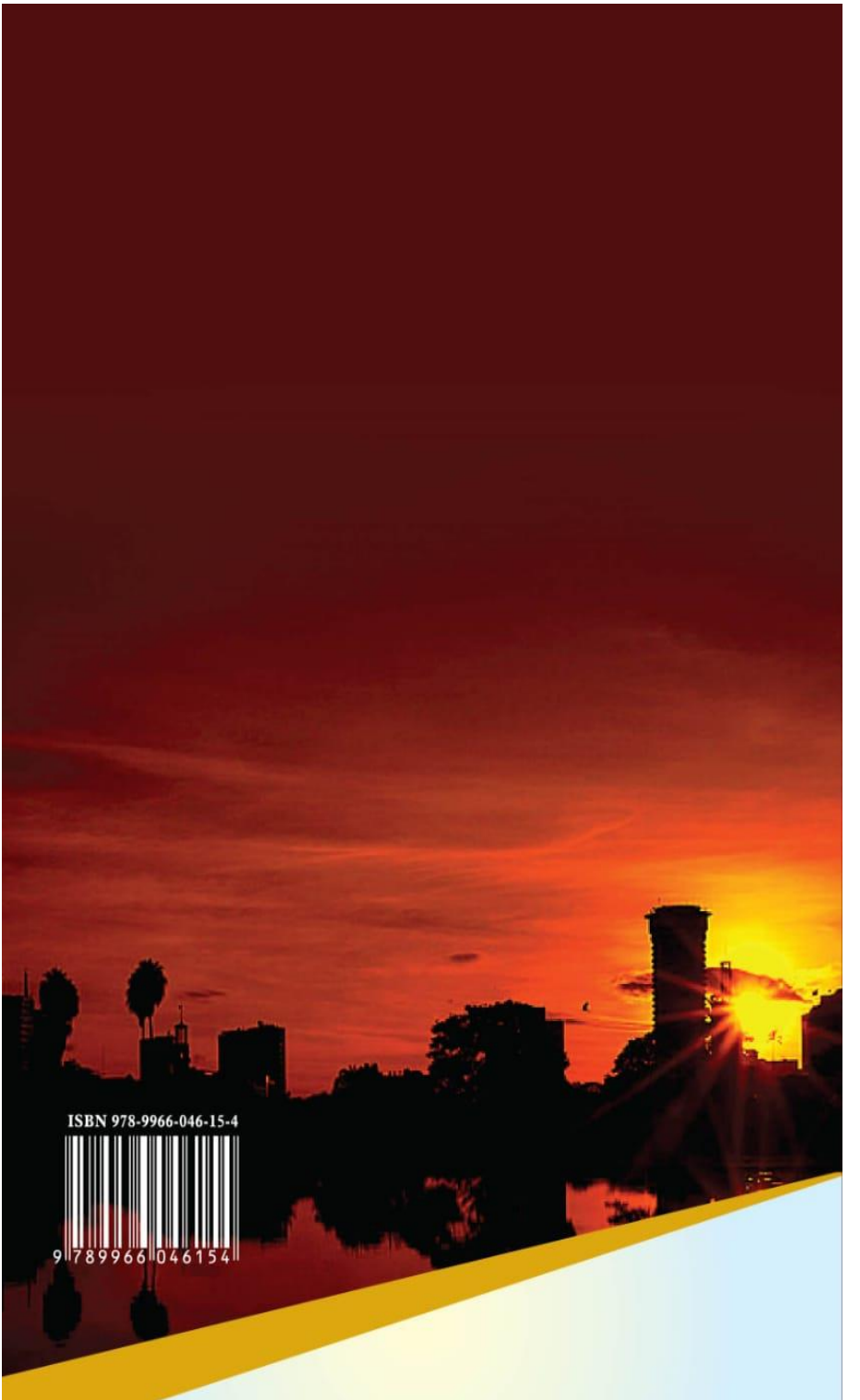
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