Conservation

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The biodiversity of our planet is under threat, with approximately one million species expected to become extinct within decades. The reason: negative human actions, which include hunting, overfishing, pollution, and the conversion of land for urbanisation and agricultural purposes. Despite significant investment from charities and governments for activities that benefit nature, global wildlife populations continue to decline. Local wildlife guardians have historically played a critical role in global conservation efforts and have shown their ability to achieve sustainability at various levels.

conservation biodiversity guardians wildlife

1. Introduction

Our planet is a diverse and complex ecosystem that is home to approximately 8.7 million unique species [1]. The United Nations Sustainable Development Goals report revealed that one million of these species will become extinct within decades [2]. While the situation is critical, the report emphasises that we can still make a difference if we coordinate efforts at a local and global level. Humans have played a major role in every mammal extinction that has occurred over the last 126,000 years [3]. This is due to hunting, overharvesting, the introduction of invasive species, pollution, and the conversion of land for crop harvesting and urban construction [4]. The illegal wildlife trade, fuelled by the promotion of medicinal myths and the desire for luxury items, has also become a significant contributor to the decline in biodiversity [5][6]. According to the United Nations Environment Programme, the illegal wildlife trade is estimated to have an annual value of USD 8.5 billion [7][8]. The white rhinoceros commands the highest price at USD 368,000, with the tiger close behind at USD 350,193 [9]. Animal body parts that are highly sought after, such as rhinoceros horns, can fetch up to USD 65,000 per kilogram, making them more valuable than gold, heroin, or cocaine [10]. Pangolins are the most trafficked mammal in the world, and although the value of their scales is significantly less than rhinoceros horn (between USD 190/kg and USD 759.15/kg) they are traded by the ton [11]. In 2015, 14 tons of pangolin scales, roughly 36,000 pangolins, was seized at a Singapore port with a black market value of USD 39 million [12].

Charities, governments, and NGOs protect wildlife and their habitats by raising money, developing policies and laws, and lobbying the public to fund conservation projects worldwide [13]. In 2019, the total funding for biodiversity preservation was between USD 124 and USD 143 billion [14]. The funds were split with 1% towards nature-based solutions and carbon markets [15], 2% for philanthropy and conservation NGOs [16], 4% for green financial products [17], 5% for sustainable supply chains [18], 5% for official development assistance [19], 6% for biodiversity offsets (in

agriculture, infrastructure, and extractive industries that unavoidably and negatively impact nature) [20], 20% for natural infrastructure (such as reefs, forests, wetlands, and other natural systems that provide habitats for wildlife and essential ecosystem services such as watersheds and coastal protection) [21], and finally, 57% for domestic budgets and tax policy (to direct and influence the economy in ways that increase specific revenue types and discourage activities that harm nature) [22].

2. A Brief History of Conservation

Conservation is a multi-dimensional movement that involves political, environmental, and social efforts to manage and protect animals, plants, and natural habitats [23][24]. During the “Age of Discovery” in the 15th to 17th century [25], sport hunters in the US formed conservation groups to combat the massive loss of wildlife caused by European settlers [26]. As local policies emerged, people living close to areas where biodiversity was protected lost property, land, and hunting rights [27]. Settlers criminalised poaching, which was associated with local people who often hunted and fished for their survival [28]. Widespread laws led to the creation of protected areas and national parks [29], which were established within the context of colonial subjugation [30], economic deprivation [31], and systematic oppression of local communities [32].

As a result, local people engaged in “illegal” hunting to meet subsistence needs [33], earn income or status [34], pursue traditional practices of cultural significance [35], or address contemporary and historical injustices linked with conservation [34]. They viewed settlers (including sport hunters) as unwanted interlopers who stole their lands [28]. The industrial revolution in the 19th and early 20th centuries [36], marked by larger populations and working communities, further escalated the demand for natural resources, resulting in increased biodiversity loss [37][38]. Today, many local communities in ecologically unique and biodiversity-rich regions of the world still perceive conservation as a Western construct created by non-indigenous peoples who continue to exploit their lands and natural resources [39].

For decades, conservationists have debated whether it is human activity or climate change that has driven species extinctions and whether the loss of biodiversity is a recent phenomenon [3]. Studies have provided compelling evidence to show that it is, in fact, humans who are responsible for the wave of extinctions that have occurred since the Late Pleistocene, 126,000 years ago [40]. For example, toward the end of the Rancholabrean faunal age around 11,000 years ago, a substantial number of large mammals vanished from North America, which included woolly mammoths [41], giant armadillos [42], and three species of camel [43]. Similar extinctions were seen in New Zealand when the *Dinornithiformes* (Moa) became extinct about 600 years ago [44][45] and in Madagascar where the *Archaeoindris fontoynontii* (giant lemur) disappeared between 500 and 2000 years ago [46]. Many believe that species and population extinction is a natural phenomena [47], but the evidence suggests that human activity is accelerating species extinction and biodiversity loss [48].

Despite the efforts to protect biodiversity and natural habitats, we are sleepwalking ourselves into a sixth mass extinction [49]. Economic systems driven by limitless growth continue to negatively impact conservation efforts [50]. Rapid development and industrial expansion is depleting natural resources [51] and intensifying the conversion of

large stretches of land for human use [52]. The Earth's forests and oceans are persistently exploited by major corporations who view the planet's natural resources as capital stock [53][54]. Economic models and financial markets treat natural systems as assets to be used immediately, leading to the abuse of nature for short-term profits with little regard for the long-term costs to society and the environment [55]. While The Economics of Ecosystems and Biodiversity (TEEB) attempt to hold large corporations to account [56], many believe we need nothing short of a redesign of corporations themselves if we are to successfully enable a transition to a 'Green Economy' [57]. Conservationists agree that biodiversity and natural systems are essential for human survival and economic prosperity but criticise the big corporations and political systems that prioritise immediate economic gains at the expense of the prosperity and well-being of both current and future generations [58].

The importance of involving local stakeholders as essential contributors in biodiversity monitoring and conservation efforts is emphasized in current perspectives [59]. Recognizing their role as capable natural resource managers, equitable schemes have been introduced to promote their engagement in locally grounded social impact assessments that consider the diverse implications of human activities in biodiversity-rich areas [60]. These efforts are largely driven by the Durban Accord led by the International Union for Conservation of Nature (IUCN) [61], which advocates for new governance approaches in protected areas to promote greater equity in local systems [62][63]. This necessitates a fresh and innovative strategy that upholds conservation objectives while inclusively integrating the interests of all stakeholders involved. This integrated approach aims to foster synergy between conservation, the preservation of life support systems, and sustainable development.

References

1. Mora, C.; Tittensor, D.P.; Adl, S.; Simpson, A.G.; Worm, B. How many species are there on Earth and in the ocean? PLoS Biol. 2011, 9, e1001127.
2. United Nations Development Programme. UN Report: Nature's Dangerous Decline 'Unprecedented'; Species Extinction Rates 'Accelerating'. In Sustainable Development Goals; United Nations Development Programme: New York, NY, USA, 2019.
3. Andermann, T.; Faurby, S.; Turvey, S.T.; Antonelli, A.; Silvestro, D. The past and future human impact on mammalian diversity. Sci. Adv. 2020, 6, eabb2313.
4. Pereira, H.M.; Navarro, L.M.; Martins, I.S. Global biodiversity change: The bad, the good, and the unknown. Annu. Rev. Environ. Resour. 2012, 37, 25–50.
5. Ellis, R. Tiger Bone & Rhino Horn: The Destruction of Wildlife for Traditional Chinese Medicine; Island Press: Washington, DC, USA, 2013.
6. Weru, S. Wildlife Protection and Trafficking Assessment in Kenya: Drivers and Trends of Transnational Wildlife Crime in Kenya and Its Role as a Transit Point for Trafficked Species in East Africa (PDF, 3.5 MB) 2016. Available online:

http://www.trafficj.org/publication/16_Wildlife_Protection_and_Trafficking_Assessment_Kenya.pdf (accessed on 11 April 2023).

7. UNEP INTERPOL. UNEP-INTERPOL report: Value of environmental crime up 26%. In Environmental Rights AND Governance; UNEP INTERPOL: Nairobi, Kenya, 2016.
8. Gonzalez Estrada, A.J. The Influence of Illicit Wildlife Trafficking in Security Matters. The Case of Illicit Trafficking of Elephant Ivory and Rhino Horn in Africa. Master's Thesis, UiT Norges Arktiske Universitet, Tromsø, Norway, 2022.
9. McClenachan, L.; Cooper, A.B.; Dulvy, N.K. Rethinking trade-driven extinction risk in marine and terrestrial megafauna. Curr. Biol. 2016, 26, 1640–1646.
10. Eikelboom, J.A.; Nuijten, R.J.; Wang, Y.X.; Schroder, B.; Heitkönig, I.M.; Mooij, W.M.; van Langevelde, F.; Prins, H.H. Will legal international rhino horn trade save wild rhino populations? Glob. Ecol. Conserv. 2020, 23, e01145.
11. Sharma, S.; Sharma, H.P.; Katuwal, H.B.; Chaulagain, C.; Belant, J.L. People's knowledge of illegal Chinese pangolin trade routes in central Nepal. Sustainability 2020, 12, 4900.
12. McKirdy, E. Record Haul of Pangolin Scales Highlights Chinese and Vietnamese Demand for Endangered Species. CNN News. April 2019, 12, 2019.
13. Raustiala, K. States, NGOs, and international environmental institutions. Int. Stud. Q. 1997, 41, 719–740.
14. White, T.B.; Petrovan, S.O.; Christie, A.P.; Martin, P.A.; Sutherland, W.J. What is the Price of Conservation? A Review of the Status Quo and Recommendations for Improving Cost Reporting. BioScience 2022, 72, 461–471.
15. Girardin, C.A.; Jenkins, S.; Seddon, N.; Allen, M.; Lewis, S.L.; Wheeler, C.E.; Griscom, B.W.; Malhi, Y. Nature-based solutions can help cool the planet—if we act now. Nature 2021, 593, 191–194.
16. Holmes, G. Biodiversity for billionaires: Capitalism, conservation and the role of philanthropy in saving/selling nature. Dev. Chang. 2012, 43, 185–203.
17. Wang, Y.; Zhi, Q. The role of green finance in environmental protection: Two aspects of market mechanism and policies. Energy Procedia 2016, 104, 311–316.
18. Linton, J.D.; Klassen, R.; Jayaraman, V. Sustainable supply chains: An introduction. J. Oper. Manag. 2007, 25, 1075–1082.
19. Blunt, P.; Turner, M.; Hertz, J. The meaning of development assistance. Public Adm. Dev. 2011, 31, 172–187.

20. Bull, J.W.; Suttle, K.B.; Gordon, A.; Singh, N.J.; Milner-Gulland, E. Biodiversity offsets in theory and practice. Oryx 2013, 47, 369–380.
21. da Silva, J.M.C.; Wheeler, E. Ecosystems as infrastructure. Perspect. Ecol. Conserv. 2017, 15, 32–35.
22. Pretty, J.; Brett, C.; Gee, D.; Hine, R.; Mason, C.; Morison, J.; Rayment, M.; Van Der Bijl, G.; Dobbs, T. Policy challenges and priorities for internalizing the externalities of modern agriculture. J. Environ. Plan. Manag. 2001, 44, 263–283.
23. Escobar, A. Whose knowledge, whose nature? Biodiversity, conservation, and the political ecology of social movements. J. Political Ecol. 1998, 5, 53–82.
24. Chesson, P. Mechanisms of maintenance of species diversity. In Annual Review of Ecology and Systematics; Annual Reviews: San Mateo, CA, USA, 2000; pp. 343–366.
25. Parry, J.H. The Age of Reconnaissance: Discovery, Exporation and Settlement, 1450–1650, 1st ed.; University of California Press: Berkeley, CA, USA, 2010.
26. Dunlap, T.R. Sport Hunting and Conservation, 1880–1920. Environ. Rev. ER 1988, 12, 51–60.
27. Shaw, C. Indigenous and Community Conserved Areas. In Environmental Defenders: Deadly Struggles for Life and Territory; Taylor and Francis: Boca Raton, FL, USA, 2021; p. 80.
28. Hernandez, J. Fresh Banana Leaves: Healing Indigenous Landscapes through Indigenous Science; North Atlantic Books: Berkeley, CA, USA, 2022.
29. Runte, A. National Parks: The American Experience; University of Nebraska Press: Lincoln, NE, USA, 1997.
30. Oguamanam, C. Indigenous peoples rights in equitable benefit-sharing over genetic resources: Digital sequence information (DSI) and a new technological landscape. In Research Handbook on the International Law of Indigenous Rights; Edward Elgar Publishing: Cheltenham/Camberley, UK, 2022; pp. 354–375.
31. Cornell, S.E.; Kalt, J.P. What Can Tribes Do? Strategies and Institutions in American Indian Economic Development; American Indian Studies Center, University of California: Los Angeles, CA, USA, 1992.
32. Domínguez, L.; Luoma, C. Decolonising conservation policy: How colonial land and conservation ideologies persist and perpetuate indigenous injustices at the expense of the environment. Land 2020, 9, 65.
33. Cooney, R.; Roe, D.; Dublin, H.; Booker, F. Wild Life, Wild Livelihoods: Involving communities on Sustainable Wildlife Management and Combating illegal Wildlife Trade; UNEP: Nairobi, Kenya, 2018.

34. Cooney, R.; Challender, D.W. Engaging local communities in responses to illegal trade in pangolins: Who, why and how? In Pangolins; Elsevier: Amsterdam, The Netherlands, 2020; pp. 369–383.
35. Lyver, P.; Timoti, P.; Davis, T.; Tylianakis, J. Biocultural hysteresis inhibits adaptation to environmental change. Trends Ecol. Evol. 2019, 34, 771–780.
36. Ashton, T.S. The Industrial Revolution 1760–1830; Oxford University Press: Oxford, UK, 1997.
37. Hawken, P.; Lovins, A.B.; Lovins, L.H. Natural Capitalism: The Next Industrial Revolution; Routledge: Boca Raton, FL, USA, 2013.
38. Roser, M.; Ritchie, H.; Ortiz-Ospina, E. World population growth. Our World in Data. 2013. Available online: https://ourworldindata.org/ (accessed on 11 April 2023).
39. Schmink, M.; Wood, C.H. The “political ecology” of Amazonia. In Lands at Risk in the Third World: Local-Level Perspectives; Routledge: Boca Raton, FL, USA, 2019; pp. 38–57.
40. Tilman, D.; May, R.M.; Lehman, C.L.; Nowak, M.A. Habitat destruction and the extinction debt. Nature 1994, 371, 65–66.
41. Nogués-Bravo, D.; Rodríguez, J.; Hortal, J.; Batra, P.; Araújo, M.B. Climate change, humans, and the extinction of the woolly mammoth. PLoS Biol. 2008, 6, e79.
42. Martin, P.S. Twilight of the Mammoths: Ice Age Extinctions and the Rewilding of America; University of California Press: Berkeley, CA, USA, 2005; Volume 8.
43. Heintzman, P.D.; Zazula, G.D.; Cahill, J.A.; Reyes, A.V.; MacPhee, R.D.; Shapiro, B. Genomic data from extinct North American Camelops revise camel evolutionary history. Mol. Biol. Evol. 2015, 32, 2433–2440.
44. Diamond, J.M. The present, past and future of human-caused extinctions. Philos. Trans. R. Soc. Lond. B Biol. Sci. 1989, 325, 469–477.
45. Anderson, A. Mechanics of overkill in the extinction of New Zealand moas. J. Archaeol. Sci. 1989, 16, 137–151.
46. Perez, V.R.; Godfrey, L.R.; Nowak-Kemp, M.; Burney, D.A.; Ratsimbazafy, J.; Vasey, N. Evidence of early butchery of giant lemurs in Madagascar. J. Hum. Evol. 2005, 49, 722–742.
47. Ceballos, G.; García, A.; Ehrlich, P.R. The sixth extinction crisis: Loss of animal populations and species. J. Cosmol. 2010, 8, 31.
48. Cowie, R.H.; Bouchet, P.; Fontaine, B. The Sixth Mass Extinction: Fact, fiction or speculation? Biol. Rev. 2022, 97, 640–663.
49. Barnosky, A.D.; Matzke, N.; Tomiya, S.; Wogan, G.O.; Swartz, B.; Quental, T.B.; Marshall, C.; McGuire, J.L.; Lindsey, E.L.; Maguire, K.C.; et al. Has the Earth’s sixth mass extinction already

arrived? Nature 2011, 471, 51–57.

50. Wiedmann, T.; Lenzen, M.; Keyßer, L.T.; Steinberger, J.K. Scientists' warning on affluence. Nat. Commun. 2020, 11, 3107.
51. Brown, P.M.; Cameron, L.D. What can be done to reduce overconsumption? Ecol. Econ. 2000, 32, 27–41.
52. Opoku, A. Biodiversity and the built environment: Implications for the Sustainable Development Goals (SDGs). Resour. Conserv. Recycl. 2019, 141, 1–7.
53. Almond, R.E.; Grooten, M.; Peterson, T. Living Planet Report 2020-Bending the Curve of Biodiversity Loss; World Wildlife Fund: Gland, Switzerland, 2020.
54. Welford, R. Hijacking Environmentalism: Corporate Responses to Sustainable Development; Routledge: Oxfordshire, UK, 2013.
55. Helm, D. Natural Capital: Valuing the Planet; Yale University Press: London, UK, 2015.
56. Kumar, P. The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations; Routledge: Oxfordshire, UK, 2012.
57. Sukhdev, P.; Wittmer, H.; Miller, D. The economics of ecosystems and biodiversity (TEEB): Challenges and responses. In Nature in the Balance: The Economics of Biodiversity; Oxford University Press: Kettering, UK, 2014; pp. 135–152.
58. Lubchenco, J. Entering the century of the environment: A new social contract for science. Science 1998, 279, 491–497.
59. Wells, M.P.; McShane, T.O. Integrating protected area management with local needs and aspirations. AMBIO A J. Hum. Environ. 2004, 33, 513–519.
60. Parks, L.; Tsioumani, E. Transforming biodiversity governance? Indigenous peoples' contributions to the Convention on Biological Diversity. Biol. Conserv. 2023, 280, 109933.
61. Brosius, J.P. Indigenous peoples and protected areas at the World Parks Congress. Conserv. Biol. 2004, 18, 609–612.
62. Zurba, M.; Beazley, K.F.; English, E.; Buchmann-Duck, J. Indigenous protected and conserved areas (IPCAs), Aichi Target 11 and Canada's Pathway to Target 1: Focusing conservation on reconciliation. Land 2019, 8, 10.
63. C IP. WWF Gef Project Document, White Paper; World Wildlife Fund: Gland, Switzerland, 2021.