

Environmental Justice for All: Tracking and Valuing Africa's Natural Capital using Modern Technology and Artificial Intelligence Tools

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Environmental Justice for All: Tracking and Valuing Africa's Natural Capital Using Modern Technology and Artificial Intelligence Tools

Kariuki Muigua*

Abstract

This paper critically examines how modern technology and Artificial Intelligence (AI) tools can be harnessed to promote environmental justice for all in Africa. The paper posits that securing environmental justice in Africa is vital in light of the disproportionate impacts the continent faces from environmental threats including the triple planetary crisis of climate change, biodiversity loss and pollution. Despite its role in protecting people and planet towards Sustainable Development, the paper notes that achieving environmental justice for all in Africa remains an elusive dream. The paper argues that failure to foster environmental justice in Africa undermines sustainability. In light of underlying environmental justice concerns in the continent, the paper notes that modern technology and AI provides vital solutions towards protecting people and planet for Sustainable Development. Due to their advantages, the paper discusses how modern technology and AI tools can be appropriately harnessed and utilised to track and value Africa's natural capital towards environmental justice for all.

1.0 Introduction

Promoting environmental justice is crucial in the quest for Sustainable Development. In particular, environmental justice provides a framework towards protecting people and planet from mounting environmental threats including the triple planetary crisis of climate change, biodiversity and ecosystem loss, and pollution¹. It has been observed that environmental threats including the triple planetary crisis undermine the enjoyment and protection of human rights and fuel environmental injustices, disproportionately affecting the most vulnerable, marginalized and excluded people and communities².

At its core, environmental justice involves protecting people and planet from disproportionate exposure to environmental hazards, addressing unequal access to environmental benefits, and tackling concerns about the uneven implications of environmental laws and policies³. This concept seeks to ensure that every person regardless of race, colour, nationality, gender, origin, or income

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¹ United Nations Development Programme., 'Environmental Justice' Available at <https://www.undp.org/geneva/environmental-justice> (Accessed on 04/05/2026)

² Ibid

³ Organisation for Economic Co-operation and Development., 'Environmental Justice: Context, Challenges and National Approaches' Available at https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/05/environmental-justice_466cb9e2/57616eb4-en.pdf (Accessed on 04/05/2026)

has the right to the same environmental protection and benefits, as well as meaningful involvement in environmental decision-making processes⁴. Environmental justice highlights the plight of vulnerable people and communities who bear the most burden when it comes to environmental damage and seeks to give them a voice through access to environmental information, participation in environmental decision-making processes and access to justice in order to ensure sustainable and equitable development⁵.

It has been argued that environmental justice is at the heart of Sustainable Development since it provides a framework for addressing environmental inequities, disparate impact of environmental crises, and unequal protection in environmental matters⁶. By fostering environmental justice, it is possible to tackle environmental threats including climate change, pollution and biodiversity loss while ensuring equity, justice, fairness and human rights for every person⁷. With countries bolstering their efforts to tackle environmental threats including environmental degradation, resource depletion, biodiversity loss, pollution and climate change, achieving environmental justice has become more relevant than ever since this concept ensures fairness, equity, human rights and non-discrimination in all environmental policies, actions and decision-making processes⁸. Promoting environmental justice is therefore key towards Sustainable Development.

This paper critically examines how modern technology and Artificial Intelligence (AI) tools can be harnessed to promote environmental justice for all in Africa. The paper posits that securing environmental justice in Africa is vital in light of the disproportionate impacts the continent faces from environmental threats including the triple planetary crisis of climate change, biodiversity loss and pollution. Despite its role in protecting people and planet towards Sustainable Development, the paper notes that achieving environmental justice for all in Africa remains an elusive dream. The paper argues that failure to foster environmental justice in Africa undermines sustainability. In light of underlying environmental justice concerns in the continent, the paper notes that modern technology and AI provides vital solutions towards protecting people and planet for Sustainable Development. Due to their advantages, the paper discusses how modern technology and AI tools can be appropriately harnessed and utilised to track and value Africa's natural capital towards environmental justice for all.

⁴ The Environmental Justice Movement., Available at <https://www.nrdc.org/stories/environmental-justice-movement> (Accessed on 04/05/2026)

⁵ Muigua. K., Wamukoya. D., & Kariuki. F., 'Natural Resources and Environmental Justice in Kenya.' Glenwood Publishers Limited, 2015

⁶ Ekhatior. E., & Agbaitoro. G., 'The Role of Environmental Justice in Promoting the Rule of Law in Natural Resource Conflict Resolution in Africa: A Case Study of Nigeria' Available at https://www.researchgate.net/publication/366640118_The_Role_of_Environmental_Justice_in_Promoting_the_Rule_of_Law_in_Natural_Resource_Conflict_Resolution_in_Africa_A_Case_Study_of_Nigeria (Accessed on 04/05/2026)

⁷ Ibid

⁸ Organisation for Economic Co-operation and Development., 'Environmental Justice: Context, Challenges and National Approaches' Op Cit

2.0 The State of Environmental Justice in Africa

Achieving environmental justice is a fundamental goal for Africa. It has been observed that attaining environmental justice in Africa is necessary since the continent faces disproportionate environmental burdens including climate change, pollution, biodiversity loss and unsustainable resource extraction⁹. For example, despite Africa's negligible contribution to the climate crisis, it stands out unfairly as the most vulnerable region in the world to climate change and its impacts¹⁰. Adverse climatic events including rising temperatures, droughts and floods are worsening in Africa with severe consequences for the continent's population especially the poor, marginalized and vulnerable¹¹. These events have adverse impacts on food security, water availability, energy, education, infrastructure and public health in Africa threatening Sustainable Development¹².

The ongoing loss of Africa's biodiversity is also fuelling environmental injustices. Africa is one of the most biodiverse regions on Earth, hosting nearly a quarter of global biodiversity¹³. The continent is home to critical ecosystems including mangroves, peatlands, freshwater ecosystems, coral reefs, deserts, tropical forests, grasslands, savannahs and ice-capped mountains which are crucial in biodiversity conservation efforts¹⁴. Africa is also home to unique, diverse and rich plant and animal species making the continent a global biodiversity hotspot¹⁵. Despite being a biodiversity hotspot, it has been observed that Africa's biodiversity is declining with ongoing losses of species and habitats undermining Sustainable Development efforts¹⁶. In particular, biodiversity loss in Africa raises environmental injustices since it affects millions of livelihoods in the continent especially in rural areas, increases food and water insecurity, fuels conflicts over

⁹ Hope for Environmental Justice in Africa., Available at https://dialogue.earth/en/justice/hope-for-environmental-justice-in-africa#:~:text=Other%20challenges%20include:%20*%20**Competent%20judiciary**%20Courts.awareness%20of%20environmental%20rights%20among%20the%20public. (Accessed on 05/05/2026)

¹⁰ United Nations Environment Programme., 'Responding to Climate Change' Available at <https://www.unep.org/regions/africa/regional-initiatives/responding-climate-change> (Accessed on 05/05/2026)

¹¹ United Nations Climate Change., 'Africa is particularly vulnerable to the expected impacts of global warming' Available at https://unfccc.int/files/press/backgrounders/application/pdf/factsheet_africa.pdf (Accessed on 05/05/2026)

¹² World Meteorological Organization., 'Africa faces disproportionate burden from climate change and adaptation costs' Available at <https://wmo.int/news/media-centre/africa-faces-disproportionate-burden-from-climate-change-and-adaptation-costs> (Accessed on 05/05/2026)

¹³ Biodiversity loss in Africa: A critical risk and opportunity for impact., Available at https://www.controlrisks.com/our-thinking/insights/biodiversity-loss-in-africa-a-critical-risk-and-opportunity-for-impact?utm_referrer=https://www.google.com (Accessed on 05/05/2026)

¹⁴ UNEP-WCMC (2016) The State of Biodiversity in Africa: A mid-term review of progress towards the Aichi Biodiversity Targets. UNEP-WCMC, Cambridge, UK., Available at <https://www.cbd.int/gbo/gbo4/outlook-africa-en.pdf> (Accessed on 05/05/2026)

¹⁵ African Development Bank Group., 'Biodiversity' Available at <https://www.afdb.org/en/topics-and-sectors/topics/biodiversity#:~:text=Africa%20is%20one%20of%20the.%2C%20savannas%2C%20and%20coral%20reefs> (Accessed on 05/05/2026)

¹⁶ UNEP-WCMC (2016) The State of Biodiversity in Africa: A mid-term review of progress towards the Aichi Biodiversity Targets. UNEP-WCMC, Op Cit

land and dwindling natural resources, and can lead to the transmission of zoonotic diseases undermining human health and well-being¹⁷.

In addition, Africa's natural capital has been a source of environmental injustices for many decades. Africa is rich in natural resources including arable land, extractives such as minerals, oil and gas, forests, large rivers and lakes and wildlife¹⁸. With the right policies, adequate investments and equitable benefit-sharing arrangements, Africa's natural capital can spur the continent's development agenda¹⁹. However, it has been observed that Africa loses a large share of its natural capital through illegal activities such as illegal mining, illegal logging, the illegal trade in wildlife, unregulated fishing and environmental degradation and loss²⁰. The loss of Africa's natural capital causes environmental injustices since it prevents the effective and sustainable use of the continent's natural resources for the benefit of all including local communities where such resources are located²¹. In addition, it has been observed that unsustainable extraction of Africa's natural capital is leading to a dramatic transformation of landscapes in Africa, pressures on arable land, destruction of ecosystems critical to rural livelihoods, and pollution of air and water impacting human health and ecosystem services²². Further, the extraction of Africa's natural capital by Multinational Corporations especially those in the extractive sector is undermining the continent's development due to poor policies and inequitable benefit-sharing arrangements²³.

In light of the foregoing concerns, fostering environmental justice is a key priority for Africa's development. It has been observed that environmental justice in Africa focuses on addressing the disproportionate burdens the continent faces due to environmental threats such as climate change, unsustainable extraction of natural resources by foreign companies, pollution, and biodiversity loss²⁴. By promoting environmental justice for all in Africa, it is possible to protect vulnerable individuals and groups including indigenous peoples, local communities, women and the youth who are adversely impacted by environmental threats while also safeguarding Africa's biodiversity, ecosystems and natural capital²⁵. Ensuring environmental justice for all in Africa is therefore a key continental priority for Sustainable Development.

¹⁷ Africa Center for Strategic Studies., 'African Biodiversity Loss Raises Risk to Human Security' Available at <https://africacenter.org/spotlight/african-biodiversity-loss-risk-human-security/> (Accessed on 05/05/2026)

¹⁸ United Nations Environment Programme., 'Our work in Africa' Available at <https://www.unep.org/regions/africa/our-work-africa> (Accessed on 05/05/2026)

¹⁹ Ibid

²⁰ Ibid

²¹ Ibid

²² United Nations Development Programme., 'Environmental Justice: Comparative Experiences in Legal Empowerment' Available at <https://www.undp.org/sites/g/files/zskgke326/files/publications/Environmental-Justice-Comparative-Experiences.pdf> (Accessed on 05/05/2026)

²³ Ajibade, L.T & Awomuti, A.A. 'Petroleum Exploitation or Human Exploitation? An Overview of Niger Delta Oil Producing Communities in Nigeria' *African Research Review* Vol. 3 (1), 2009. Pp. 111-124

²⁴ Mahadew. B., 'Can the African Human Rights System be an Effective Environmental Justice System in Africa?' Available at https://www.pulp.up.ac.za/images/edocman/edited-collections/environmental_justice_in_africa/Chapter%2011%20EJ.pdf (Accessed on 05/05/2026)

²⁵ Ibid

3.0 Tracking and Valuing Africa's Natural Capital Using Modern Technology and Artificial Intelligence Tools towards Environmental Justice for All

Modern technology and AI tools provide appropriate solutions in the pursuit of environmental justice in Africa. For example, by enhancing data collection, policy enforcement, and environmental monitoring, modern technology and AI tools are enabling the world to tackle threats such as climate change, pollution, biodiversity loss and environmental degradation towards environmental justice²⁶. In particular, it has been observed that modern technologies including AI, big data analytics, geographic information systems (GIS), and remote sensing are enhancing data collection, tracking and monitoring of environmental changes thus improving environmental governance by providing a basis for sound decision-making²⁷.

With Africa facing environmental injustices, modern technology and AI can provide a basis to improve environmental monitoring, tackle environmental threats and ensure inclusive and sound environmental decision-making processes towards securing environmental justice for people and planet. Modern technology and AI provide tools and systems that can support climate action, biodiversity conservation, sustainable waste management, and ecosystem monitoring²⁸.

Using modern technology and AI tools can therefore improve environmental governance outcomes in Africa. In particular, modern technology and AI tools can be used to track and value Africa's natural capital for environmental justice. For instance, AI tools including remote sensing and analysis platforms can operate continuously and across a broader area of ecosystems providing accurate data on threats such as habitat degradation, illegal logging, illegal hunting, human-wildlife conflict, and species migration therefore informing sound biodiversity conservation and resource management approaches²⁹. In addition, it has been observed that hard technologies such as drones can help to effectively track Africa's natural capital by detecting illegal logging, illegal mining or hunting in protected areas towards effective environmental protection while soft technologies including AI can be used to analyse satellite images and detect changes in land or water quality towards strengthening conservation efforts³⁰.

²⁶ The Role of Technology in Environmental Governance., Available at <https://www.igi-global.com/chapter/the-role-of-technology-in-environmental-governance/363225> (Accessed on 05/05/2026)

²⁷ Jha. M.K et al., 'The Role of Technology in Environmental Governance' Available at <https://www.igi-global.com/chapter/the-role-of-technology-in-environmental-governance/363225> (Accessed on 05/05/2026)

²⁸ United Nations Educational, Scientific and Cultural Organization., 'AI for Environment and Ecosystems Toolkit for Policymakers' Available at <https://www.unesco.org/ethics-ai/en/node/288#:~:text=While%20AI%20can%20support%20climate.dynamics%20is%20no%20longer%20optional.> (Accessed on 05/05/2026)

²⁹ United Nations Development Programme., 'People-Centric AI for Conserving Biodiversity' Available at <https://www.undp.org/sites/g/files/zskgke326/files/2025-12/people-centric-ai-for-conserving-biodiversity.pdf> (Accessed on 05/05/2026)

³⁰ Technology and the Environment: A Battle between Harm and Benefit., Available at <https://www.telefonica.com/en/communication-room/blog/technology-environment-a-battle-between-harm-benefit/> (Accessed on 05/05/2026)

In addition to tracking Africa's natural capital, modern technology and AI tools provide a basis through which these resources can be effectively valued towards environmental justice. It has been observed that Africa's natural capital is undervalued a situation that contributes to underdevelopment while also fuelling loss and plunder of the continent's natural resources³¹. For example, failure to properly value Africa's natural capital has resulted in environmental injustices including inequitable benefits-sharing arrangements, embezzlement of profits from resource extraction and tax evasion to the benefit of multinational corporations, and land injustices including the use of the continent's land for carbon projects with little benefits in return³². In light of these concerns, it has been observed that by appropriately valuing Africa's natural capital, countries can maximize and harness full benefits from these resources for Sustainable Development³³.

Modern technology and AI can be used to appropriately value Africa's natural capital for environmental justice and Sustainable Development. For example, modern technologies and AI tools including satellite imagery, predictive modelling and data analytics can lead to new discoveries of Africa's natural capital including mineral wealth, strengthen monitoring and governance of Africa's natural resources towards minimizing losses and enable sustainable extraction of the continent's natural capital for economic growth³⁴.

Adopting modern technology and AI tools is therefore important towards appropriately tracking and valuing Africa's natural capital for environmental justice. However, it has been observed that challenges such as inadequate investment and funding, inadequate human and institutional capacity, and ineffective government policies are hindering the effective application of modern technology and AI tools in the pursuit of sound environmental governance and environmental justice in Africa³⁵. It is imperative to tackle these threats in order to appropriately harness modern technology and AI tools for environmental justice in Africa.

³¹ African Development Bank Group., 'African leaders want continent's natural assets worth trillions of dollars to be part of measuring GDP of countries' Available at <https://www.afdb.org/en/news-and-events/press-releases/african-leaders-want-continent-natural-assets-worth-trillions-dollars-be-part-measuring-gdp-countries-78566> (Accessed on 05/05/2026)

³² Capital flight from Africa: Resource Plunder and the Poisoned Paradises in Tax Havens., Available at <https://taxjustice.net/2021/03/24/capital-flight-from-africa-resource-plunder-and-the-poisoned-paradises-in-tax-havens/#:~:text=In%20a%20world%20with%20weak,what%20to%20do%20about%20it> (Accessed on 05/05/2026)

³³ African Development Bank Group., 'African leaders want continent's natural assets worth trillions of dollars to be part of measuring GDP of countries' Op Cit

³⁴ Artificial Intelligence in Natural Resources Management: Selected Case Studies from Africa., Available at <https://ideas.repec.org/p/zbw/itsb24/302527.html> (Accessed on 05/05/2026)

³⁵ United Nations., 'Science, Technology and Innovation for Sustainable Development in the Global Partnership for Development Beyond 2015.' Available at https://www.un.org/en/development/desa/policy/untaskteam_undf/thinkpieces/28_thinkpiece_science.pdf (Accessed on 05/05/2026)

4.0 Conclusion

In light of mounting environmental injustices in Africa, harnessing modern technology and AI is vital towards protecting people and planet for Sustainable Development. In particular, with Africa's natural capital being lost, depleted and degraded due to threats such as illegal mining, illegal logging, the illegal trade in wildlife, unregulated fishing, unsustainable resource extraction and inequitable benefit-sharing regimes, modern technology and AI tools can improve tracking and valuing of the continent's natural capital for environmental justice³⁶. It is therefore imperative to harness modern technology and AI including through integrating them in environmental governance frameworks, bolstering human and institutional capacity on technology and AI and strengthening technology development and transfer in order to effectively and adequately track and value Africa's natural capital for environmental justice³⁷. Tracking and valuing Africa's natural capital using modern technology and AI tools is an ideal worth pursuing towards environmental justice for all.

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