The Race to Zero Emissions from an African Perspective

Kariuki Muigua

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Kariuki Muigua*

Abstract

This paper discusses the efforts towards achieving zero carbon emissions in the context of the African continent owing to its unique circumstances. As the rest of the world aims to achieve the race to zero by 2030, the African countries, which are also expected to achieve the same by at least 2040, must work harder against the challenges of poverty, slower development pace and the rapidly increasing population, as a way of overcoming climate change for sustainable development. The paper offers some viable recommendations on some of the most important issues that the African governments must address. The main argument is that countries must strive to build low to zero carbon infrastructure as well as empowering their people to afford them the sustainable alternatives.

1. Introduction

Greenhouse Gases (GHGs) effect emitted by human activities, is considered to be among the greatest contributors to climate change, one of the biggest threats of the 21st century as far as sustainability is concerned.[1] Indeed, climate change has been termed as the 'biggest threat modern humans have ever faced'.[2] Economic and industrial activities have adverse carbon impacts on the environment and climate change mitigation activities must focus on such activities too, if these challenges are to be addressed.[3] Notably, the principal greenhouse gases whose concentrations have increased over the industrial period are carbon dioxide (CO_2), methane (CH_4), nitrous oxide

**PhD in Law (Nrb), FCIArb (Chartered Arbitrator), LL. B (Hons) Nrb, LL.M (Environmental Law) Nrb; Dip. In Law (KSL); FCPS (K); Dip. In Arbitration (UK); MKIM; Mediator; Consultant: Lead expert EIA/EA NEMA; BSI ISO/IEC 27001:2005 ISMS Lead Auditor/ Implementer; Advocate of the High Court of Kenya; Senior Lecturer at the University of Nairobi, School of Law [October 2021].*

[1] Mora, C., Spirandelli, D., Franklin, E.C., Lynham, J., Kantar, M.B., Miles, W., Smith, C.Z., Freel, K., Moy, J., Louis, L.V. and Barba, E.W., 'Broad Threat to Humanity from Cumulative Climate Hazards Intensified by Greenhouse Gas Emissions' (2018) 8 Nature Climate Change 1062.

[2] 'Climate Change "Biggest Threat Modern Humans Have Ever Faced", World-Renowned Naturalist Tells Security Council, Calls for Greater Global Cooperation | Meetings Coverage and Press Releases' <https://www.un.org/press/en/2021/sc14445.doc.htm> accessed 23 September 2021.

[3] Zaman K and Moemen MA, 'Energy Consumption, Carbon Dioxide Emissions and Economic Development: Evaluating Alternative and Plausible Environmental Hypothesis for Sustainable Growth' (2017) 74 Renewable and Sustainable Energy Reviews 1119; Mgbemene CA, Nnaji CC and Nwozor C, 'Industrialization and Its Backlash: Focus on Climate Change and Its Consequences.' (2016) 9 Journal of Environmental Science and Technology 301.

(N_20), and chlorofluorocarbons CFC-11 ($CC1_3F$) and CFC-12 ($CC1_2F_2$).[4] Arguably, most of these carbon emissions come from development projects as well as burning fuels for energy.[5]

The Race To Zero is a global campaign to rally leadership and support from businesses, cities, regions, investors for a healthy, resilient, zero carbon recovery that prevents future threats, creates decent jobs, and unlocks inclusive, sustainable growth.[6] The Race to Zero was initiated by the adoption of the *Paris Agreement*, a legally binding international treaty on climate change which was adopted by 196 Parties at Conference of Parties (COP) 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016.[7] The Paris Agreement was adopted with the goal of limiting global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels whereby to achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century.[8] This binding agreement is meant to combat climate change and adapt to its effects.[9]

This paper discusses the special circumstances and effects of climate change in the African continent and how these affect the people's and countries' response to the international calls for eliminating GHG emissions. This is in acknowledgement of the fact that the African continent must come up with its own unique custom- tailored responses to these efforts as it has to contend with challenges that may not necessarily be an issue to the rest of the world, and especially the developed world.

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[4] Change C and others, 'Greenhouse Gases and Their Effect on the Earth-Atmosphere Energy Balance' 1 < https://ntrs.nasa.gov/api/citations/19990109667/downloads/19990109667.pdf> accessed 23 September 2021.

[5] US EPA O, 'Sources of Greenhouse Gas Emissions' (29 December 2015) <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions> accessed 15 October 2021; 'Building Sector Emissions Hit Record High, but Low-Carbon Pandemic Recovery Can Help Transform Sector – UN Report' (*UN Environment*, 16 December 2020) <http://www.unep.org/news-and-stories/press-release/building-sector-emissions-hit-record-high-low-carbon-pandemic> accessed 15 October 2021; 'New Report: The Building and Construction Sector Can Reach Net Zero Carbon Emissions by 2050' (*World Green Building Council*) <https://www.worldgbc.org/news-media/WorldGBC-embodied-carbon-report-published> accessed 15 October 2021; 'Low-Carbon Infrastructure: An Essential Solution to Climate Change?' <https://blogs.worldbank.org/ppps/low-carbon-infrastructure-essential-solution-climate-change> accessed 15 October 2021.

[6] 'Race To Zero Campaign | UNFCCC' <https://unfccc.int/climate-action/race-to-zero-campaign> accessed 23 September 2021.

[7] 'The Paris Agreement | UNFCCC' <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement> accessed 24 September 2021.

[8] Ibid.

[9] Ibid.

2. Greenhouse Gases Emissions and Climate Change: The Link

The World Meteorological Organisation (WMO) attributes the build-up of greenhouse gases in the atmosphere during the 20th century to 'the growing use of energy and expansion of the global economy.'[10] The build-up of greenhouse gases in the atmosphere alters the radiative balance of the atmosphere and the net effect is to warm the Earth's surface and the lower atmosphere because greenhouse gases absorb some of the Earth's outgoing heat radiation and re-radiate it back towards the surface.[11] The Greenhouse gases (GHGs) warm the surface and the atmosphere with significant implications for rainfall, retreat of glaciers and sea ice, sea level, among other factors (the greenhouse effect).[12] The greenhouse effect involves:

> 'infrared (IR) active gases, principally water vapor (H2O), carbon dioxide (CO2), and ozone (O_3), naturally present in the Earth's atmosphere, absorb thermal IR radiation emitted by the Earth's surface and atmosphere. The atmosphere is warmed by this mechanism and, in turn, emits IR radiation, with a significant portion of this energy acting to warm the surface and the lower atmosphere. As a consequence, the average surface air temperature of the Earth is about 30° C higher than it would be without atmospheric absorption and re-radiation of IR energy'.[13]

Arguably, continuous emissions of GHGs are simultaneously shifting many elements of Earth's climate beyond thresholds that can impact humanity, whereby these gases affect the balance between incoming solar radiation and outgoing infrared radiation, thus increasing the Earth's energy budget, ultimately leading to warming and also affecting other aspects of the Earth's climate system.[14]

Notably, carbon emissions affect the guarantee to a right to Clean and Healthy Environment, and this must be safeguarded considering that the UN Human Rights Council recently recognised the human right to a clean, healthy, and sustainable environment.[15] It is expected that "it will spark

[10] UNFCC, 'Fact Sheet: Climate Change Science-the Status of Climate Change Science Today', *United Nations Framework Convention on Climate Change* (2011).
[11] Ibid.
[12] Ramanathan V and Feng Y, 'Air Pollution, Greenhouse Gases and Climate Change: Global and Regional Perspectives' (2009) 43 Atmospheric environment 37.
[13] Ledley TS and others, 'Climate Change and Greenhouse Gases' (1999) 80 Eos, Transactions American Geophysical Union 453.
[14] Mora, C., Spirandelli, D., Franklin, E.C., Lynham, J., Kantar, M.B., Miles, W., Smith, C.Z., Freel, K., Moy, J., Louis, L.V. and Barba, E.W., 'Broad Threat to Humanity from Cumulative Climate Hazards Intensified by Greenhouse Gas Emissions' (2018) 8 Nature Climate Change 1062.
[15] 'OHCHR | UN Recognition of Human Right to Healthy Environment Gives Hope for Planet's Future – Human Rights Expert' <https://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=27633&LangID=E> accessed 17 October 2021.

constitutional changes and stronger environmental laws, with positive implications for air quality, clean water, healthy soil, sustainably produced food, green energy, climate change, biodiversity and the use of toxic substances."[16] The World Health Organization (WHO) estimates that 24 per cent of all global deaths, roughly 13.7 million deaths a year, are linked to the environment due to risks such as air pollution and chemical exposure.[17] Notably, most of these environmental-related deaths are witnessed in developing countries.[18] This, therefore, informs this paper's call for developing countries in Africa to do towards more to addressing the areas that contribute greatest to GHGs emissions as part of addressing climate change.

3. International Regulatory Framework on Carbon Emissions

This section highlights the main legal and institutional framework on regulation of carbon emissions that guides countries in their efforts towards reduction of carbon emissions.

3.1. Conference of Parties 26 (COP 26)

UNFCCC established Conference of the Parties (COP), as the supreme body of the Convention, and it is empowered to keep under regular review the implementation of the Convention and any related legal instruments that the Conference of the Parties may adopt, and should make, within its mandate, the decisions necessary to promote the effective implementation of the Convention.[19]

The Parties to the Convention meet every year (with the exception of 2020 due to Covid-19) at the Conference of the Parties (COP), the meeting of the UNFCCC in Glasgow in November 2021 being COP26.[20]

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[16] Ibid.

[17] 'Landmark UN Resolution Confirms Healthy Environment Is a Human Right' (*UNEP*, 14 October 2021) <http://www.unep.org/news-and-stories/story/landmark-un-resolution-confirms-healthy-environment-human-right> accessed 17 October 2021.

[18] 'Air Pollution Hurts the Poorest Most' (*UNEP*, 9 May 2019) <http://www.unep.org/news-and-stories/story/air-pollution-hurts-poorest-most> accessed 17 October 2021; 'WHO | Environment and Health in Developing Countries' (*WHO*) <https://www.who.int/heli/risks/ehindevcoun/en/> accessed 17 October 2021; Manisalidis I and others, 'Environmental and Health Impacts of Air Pollution: A Review' (2020) 8 Frontiers in Public Health 14; Nations U, 'The Health Effects Of Global Warming: Developing Countries Are The Most Vulnerable' (*United Nations*) <https://www.un.org/en/chronicle/article/health-effects-global-warming-developing-countries-are-most-vulnerable> accessed 17 October 2021.

[19] Article 7.

[20] 'What Is COP26, Who Will Attend It and Why Does It Matter?' (*Energy & Climate Intelligence Unit*) <https://eciu.net/analysis/briefings/international-perspectives/what-is-cop26-who-will-attend-it-and-why-does-it-matter> accessed 13 October 2021.

The COP26 Summit is meant to bring parties together to accelerate action towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change.[21] The goals of COP26 include to: secure global net zero by mid-century and keep 1.5 degrees within reach; adapt to protect communities and natural habitats; mobilise finance; and work together to deliver.[22] At COP 26, countries are expected to commit to: come forward with ambitious 2030 emissions reductions targets that align with reaching net zero by the middle of the century, where they will consequently need to: accelerate the phase-out of coal, curtail deforestation, speed up the switch to electric vehicles, and encourage investment in renewables; protect and restore ecosystems and build defences, warning systems and resilient infrastructure and agriculture to avoid loss of homes, livelihoods and even lives; International financial institutions must play their part and we need work towards unleashing the trillions in private and public sector finance required to secure global net zero; and finalise the Paris Rulebook (the detailed rules that make the Paris Agreement operational), and accelerate action to tackle the climate crisis through collaboration between governments, businesses and civil society.[23]

3.2. Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.[24] It was created to provide policymakers with regular scientific assessments on climate change, through comprehensive Assessment Reports about the state of scientific, technical and socio-economic knowledge on climate change, its impacts and future risks, and options for reducing the rate at which climate change is taking place as well as special Reports on topics agreed to by its member governments, and Methodology Reports that provide guidelines for the preparation of greenhouse gas inventories.[25] They thus act as an updated source of information for the countries.

[21] 'UN Climate Change Conference (COP26) at the SEC – Glasgow 2021' (*UN Climate Change Conference (COP26) at the SEC – Glasgow 2021*) <https://ukcop26.org/> accessed 13 October 2021.
[22] 'COP26 Goals' (*UN Climate Change Conference (COP26) at the SEC – Glasgow 2021*) <https://ukcop26.org/cop26-goals/> accessed 15 October 2021.
[23] Ibid.
[24] 'IPCC — Intergovernmental Panel on Climate Change' <https://www.ipcc.ch/> accessed 17 October 2021.
[25] Ibid.

3.3. The United Nations Framework Convention on Climate Change 1992

The United Nations Framework on Climate Change Convention (UNFCCC)[26] was adopted in 1992, entered into force on 21 March 1994 and its ultimate objective and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.[27] Notably, such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.[28] In implementing the UNFCCC, the Parties are to be guided, *inter alia*, by the following principles: Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities; specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change, and of those Parties, especially developing country Parties, that would have to bear a disproportionate or abnormal burden under the Convention, should be given full consideration; Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects; Parties have a right to, and should, promote sustainable development; and Parties should cooperate to promote a supportive and open international economic system that would lead to sustainable economic growth and development in all Parties, particularly developing country Parties, thus enabling them better to address the problems of climate change.[29]

These principles are an acknowledgement that any activities or actions geared towards climate change mitigation including the efforts in the race to zero emissions must take account of the differences between developed countries and developing regions such as Africa. It also follows that African countries must be allowed to come up with tailor made responses to carbon emissions, based on the current challenges and needs. Notably, as they are the source of most past and current

[26] UN General Assembly, *United Nations Framework Convention on Climate Change: resolution / adopted by the General Assembly*, 20 January 1994, A/RES/48/189.
[27] Ibid, Article 2.
[28] Ibid.
[29] Ibid, Article 3.

greenhouse gas emissions, industrialized countries are expected to do the most to cut emissions on home ground.[30]

3.4. Vienna Convention for the Protection of the Ozone Layer (1985)

The Vienna Convention is a framework convention that lays out principles agreed upon by many parties which does not, however, require countries to take control actions to protect the ozone layer unlike the Montreal Protocol.[31] The Convention requires Parties to take appropriate measures in accordance with the provisions of the Convention and of those protocols in force to which they are party to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer.[32]

The Convention also requires that the Parties should co-operate, consistent with their national laws, regulations and practices and taking into account in particular the needs of the developing countries, in promoting, directly or through competent international bodies, the development and transfer of technology and knowledge. Such co-operation should be carried out particularly through: Facilitation of the acquisition of alternative technologies by other Parties; Provision of information on alternative technologies and equipment, and supply of special manuals or guides to them; The supply of necessary equipment and facilities for research and systematic observations; and appropriate training of scientific and technical personnel.[33]

3.5. Montreal Protocol on Substances that Deplete the Ozone Layer, 1987 and the Kigali Amendment of 2016

The 1987 Montreal Protocol is a global agreement to protect the Earth's ozone layer though a phase-out plan which includes both the production and consumption of ozone-depleting substances, which was signed in 1987 and entered into force in 1989.[34] The Protocol has been termed as a success especially in reduction and elimination of anthropogenic emissions of ozone

[30] 'What Is the United Nations Framework Convention on Climate Change? | UNFCCC' <https://unfccc.int/process-and-meetings/the-convention/what-is-the-united-nations-framework-convention-on-climate-change> accessed 14 October 2021.
[31] 'The Vienna Convention for the Protection of the Ozone Layer | Ozone Secretariat' <https://ozone.unep.org/treaties/vienna-convention> accessed 17 October 2021.
[32] Vienna Convention for the Protection of the Ozone Layer, Article 2.1.
[33] Ibid, Article 4.2.
[34] 'The Montreal Protocol on Substances That Deplete the Ozone Layer | Ozone Secretariat' <https://ozone.unep.org/treaties/montreal-protocol> accessed 14 October 2021.

depleting substances (ODSs), primarily responsible for stratospheric ozone depletion since around the 1960s.[35] The nearly 100 man-made chemicals referred to as ozone depleting substances (ODS), when released to the atmosphere, damage the stratospheric ozone layer, Earth's protective shield that protects humans and the environment from harmful levels of ultraviolet radiation from the sun.[36]

In recognition of the special situation of developing countries, Montreal Protocol provides that 'the Parties undertook to facilitate access to environmentally safe alternative substances and technology for Parties that are developing countries and assist them to make expeditious use of such alternatives'.[37] In addition, 'the Parties undertook to facilitate bilaterally or multilaterally the provision of subsidies, aid, credits, guarantees or insurance programmes to Parties that are developing countries for the use of alternative technology and for substitute products'.[38]

The Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer which was adopted in Kigali, Rwanda on 15 October 2016 and came into force 1st January 2019 (provided it would have been ratified by at least 20 parties)[39] at the Twenty-Eighth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer, held in Kigali from 10 to 15 October 2016.[40] The Kigali Amendment to the Montreal protocol is expected to reduce the projected production and consumption of hydrofluorocarbons (HFCs) by more than 80 per cent over the next 30 years.[41] The Kigali Amendment is also expected to avoid up to 0.4°C of global

[35] Banerjee A and others, 'A Pause in Southern Hemisphere Circulation Trends Due to the Montreal Protocol' (2020) 579 Nature 544.
[36] Environment UN, 'About Montreal Protocol' (*Ozonaction*, 29 October 2018) <http://www.unep.org/ozonaction/who-we-are/about-montreal-protocol> accessed 14 October 2021.
[37] Article 5(2).
[38] Article 5 (3).
[39] 'United Nations Treaty Collection' <https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-2-f&chapter=27&clang=_en> accessed 17 October 2021.
[40] Ibid.
[41] 'World Takes a Stand against Powerful Greenhouse Gases with Implementation of Kigali Amendment' (*UN Environment*, 3 January 2019) <http://www.unep.org/news-and-stories/press-release/world-takes-stand-against-powerful-greenhouse-gases-implementation> accessed 17 October 2021.

Addition of *Article 2J*

The following Article shall be inserted after Article 2I of the Protocol:

"***Article 2J: Hydrofluorocarbons***
1. Each Party shall ensure that for the twelve-month period commencing on 1 January 2019, and in each twelve-month period thereafter, its calculated level of consumption of the controlled substances in Annex F, expressed in CO2 equivalents, does not exceed the percentage, set out for the respective range of years

warming this century while continuing to protect the ozone layer, thus substantively contributing to the goals of the Paris Agreement.[42]

While hydrofluorocarbons (HFCs), given their zero impact on the depletion of the ozone layer, are currently used as replacements of hydrochlorofluorocarbons (HCFCs) and chlorofluorocarbons (CFCs), they are extremely potent greenhouse gases with global warming potentials that can be many times higher than carbon dioxide, hence the need to phase them out in efforts towards climate change mitigation.[43] Key elements of the Kigali Amendment include: Innovative and flexible structure; Ambitious phasedown schedule; Incentive for early action; Broad participation; Enforcement and accountability; and Multiple opportunities to increase ambition.[44]

3.6. Kyoto Protocol to the United Nations Framework Convention on Climate Change (1997)

The Kyoto Protocol[45] was adopted at the third session of the Conference of the Parties (COP 3) to the 1992 United Nations Framework Convention on Climate Change ("the Convention"), held at Kyoto (Japan) from 1 to 11 December 1997.[46] It applies the principle of common but differentiated responsibilities and sets binding targets for reducing greenhouse gas emissions for industrialized

specified in subparagraphs (a) to (e) below, of the annual average of its calculated levels of consumption of Annex F controlled substances for the years 2011, 2012 and 2013, plus fifteen per cent of its calculated level of consumption of Annex C, Group I, controlled substances as set out in paragraph 1 of Article 2F, expressed in CO2 equivalents:
(a) 2019 to 2023: 90 per cent
(b) 2024 to 2028: 60 per cent
(c) 2029 to 2033: 30 per cent
(d) 2034 to 2035: 20 per cent
(e) 2036 and thereafter: 15 per cent

[42] Ibid.

[43] 'The Montreal Protocol Evolves to Fight Climate Change | UNIDO' <https://www.unido.org/our-focus-safeguarding-environment-implementation-multilateral-environmental-agreements-montreal-protocol/montreal-protocol-evolves-fight-climate-change> accessed 17 October 2021.

[44] US EPA O, 'Recent International Developments under the Montreal Protocol' (15 July 2015) <https://www.epa.gov/ozone-layer-protection/recent-international-developments-under-montreal-protocol> accessed 17 October 2021.

[45] United Nations, *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, Kyoto, 11 December 1997, United Nations, Treaty Series, vol. 2303, p. 162.

[46] 'United Nations Treaty Collection' <https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-7-a&chapter=27&clang=_en> accessed 17 October 2021.

countries, recognizing them as those primarily responsible for the high levels of emissions currently present in the atmosphere.[47]

4. Domestic Regulatory Framework on Carbon Emissions: The Case of Kenya

This section highlights the main regulatory legal instruments that the country can build on in its race towards zero emissions.

4.1. The Constitution of Kenya 2010

Article 10 of the Constitution outlines the principle of sustainability as one of the national values and principles of governance that must bind of policy and law makers.[48] Article 42 thereof guarantees every person's right to a clean and healthy environment, which includes the right- to have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and to have obligations relating to the environment fulfilled under Article 70.[49] Article 69(1) requires the State to: ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits; work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya; encourage public participation in the management, protection and conservation of the environment; establish systems of environmental impact assessment, environmental audit and monitoring of the environment; and eliminate processes and activities that are likely to endanger the environment.[50]

4.2. *Sessional Paper No. 3 of 2016 on National Climate Change Framework Policy*

Kenya's *Sessional Paper No. 3 of 2016 on National Climate Change Framework Policy*[51] was formulated to enhance adaptive capacity and resilience to climate change, and promote low carbon development for the sustainable development of Kenya.[52] Its main objectives of this Policy are to: establish and maintain an effective and efficient institutional framework to mainstream climate change responses across relevant sectors and into integrated planning, budgeting, decision-making

[47] 'Kyoto Protocol [Framework Convention on Climate Change] | Observatory on Principle 10' <https://observatoriop10.cepal.org/en/treaties/kyoto-protocol-framework-convention-climate-change> accessed 17 October 2021.
[48] Article 10, Constitution of Kenya 2010.
[49] Ibid, Art. 42.
[50] Ibid, Art.69(1).
[51] Republic of Kenya, *Sessional Paper No. 3 of 2016 on National Climate Change Framework Policy.*
[52] Goal 3.1.

and implementation, at both the national and county levels; reduce vulnerability to the impacts of climate change by building adaptive capacity, enhancing climate change resilience and strengthening capacities for disaster risk reduction; catalyse Kenya's transition to cleaner, lower emission and less carbon intensive development; incentivize private sector involvement in building climate change resilience and engaging in low carbon development opportunities; facilitate widespread public awareness, participation, ownership and oversight of Kenya's climate change response efforts and Action Plans; provide a framework to mobilise resources for Kenya's climate change response and ensure effective and transparent utilisation of the resources; adopt intergenerational, special needs and gender mainstreaming approaches across all aspects of Kenya's climate change response; provide the policy framework to facilitate effective implementation of regularly updated and scientifically informed Climate Change Action Plans; and enhance research and use of science and technology in policy decisions and sustainable management of resources.[53]

The implementation of this Policy will be guided by the following principles: Common but differentiated responsibilities and respective capabilities; Right to a clean and healthy environment; Right to Sustainable Development; Partnership; Cooperative government; Equity and social inclusion; Special needs and circumstances; Avoiding maladaptation; Integrity and transparency; and cost effectiveness.[54]

The Climate Change Policy 2016 calls for low carbon climate resilient development through a number of actions: Enhancing Climate Resilience and Adaptive Capacity where the Government will: Put in place mechanisms for sustainable utilisation of natural resources to enhance climate resilience and adaptive capacity to protect the natural capital of Kenya; Mainstream climate resilience into national and county government development plans, processes and implementation; Ensure integration of climate change risk and vulnerability assessment in environment impact assessment and strategic environmental assessment; Develop incentives to promote climate resilient actions among public, private and other actors; Identify and implement priority adaptation actions across key social, environmental and economic sectors under the framework of a National Adaptation Plan; Promote public and stakeholder consultation and participation, including with

[53] Goal 3.2.
[54] Goal 3.3.

vulnerable groups, to enhance adaptive capacity and climate resilience; and Develop mechanisms to build capacity to mainstream climate change into disaster risk reduction and management programmes;[55] Towards Low Carbon Growth-although Kenya currently contributes very little to global GHG emissions, a significant number of priority development initiatives outlined in Vision 2030 and regular Medium Term Plans (MTPs) will impact on Kenya's levels of GHG emissions. As such, the Government will: Identify and implement fiscal, taxation and other policy options in priority areas with high GHG emission abatement potential that enhance sustainable development; Mainstream low carbon growth options into the planning processes and functions of the national and county governments; Put in place mechanisms to establish a GHG emissions inventory to achieve efficient and effective collection, recording, sharing and utilisation of GHG emissions data; In view of strategic national interests, consider participating in voluntary emission reduction programmes when they support the country's sustainable development goals and achieve co-benefits; Put in place mechanisms to develop and promote clean technologies in all sectors of economic development; and Promote the creation of green jobs by establishing an enabling policy framework for investment, and creating business friendly regulatory environments in key areas such as renewable energy, efficient transport, clean manufacturing and sustainable agriculture.[56]

4.3. Climate Change Act 2016

The Climate Change Act 2016[57] was enacted to provide for a regulatory framework for enhanced response to climate change; to provide for mechanism and measures to achieve low carbon climate development, and for connected purposes.[58]

The Act is to be applied for the development, management, implementation and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya.[59] The Act is to be applied in all sectors of the economy by the national and county governments to: mainstream climate change responses into development planning, decision making and implementation; build resilience and enhance adaptive capacity to the impacts of climate change; formulate programmes and plans to enhance the resilience and adaptive capacity

[55] Goal 4.1.
[56] Goal 4.2.
[57] Climate Change Act, No. 11 of 2016, Laws of Kenya.
[58] Ibid, Preamble.
[59] Ibid, sec. 3(1).

of human and ecological systems to the impacts of climate change; mainstream and reinforce climate change disaster risk reduction into strategies and actions of public and private entities; mainstream intergenerational and gender equity in all aspects of climate change responses; provide incentives and obligations for private sector contribution in achieving low carbon climate resilient development; promote low carbon technologies, improve efficiency and reduce emissions intensity by facilitating approaches and uptake of technologies that support low carbon, and climate resilient development; facilitate capacity development for public participation in climate change responses through awareness creation, consultation, representation and access to information; mobilize and transparently manage public and other financial resources for climate change response; provide mechanisms for, and facilitate climate change research and development, training and capacity building; mainstream the principle of sustainable development into the planning for and decision making on climate change response; and integrate climate change into the exercise of power and functions of all levels of governance, and to enhance cooperative climate change governance between the national government and county governments.[60]

5. The Race to Zero Emissions: The Challenges

In accordance with the Paris Agreement, every country agreed to communicate or update their emissions reduction targets – their Nationally Determined Contribution (NDC) – every five years to reflect their highest possible ambition and a progression over time, where the targets set out how far countries plan to reduce emissions across their entire economy and/or in specific sectors.[61]

Kenya's *Sessional Paper No. 3 of 2016 on National Climate Change Framework Policy* identifies the following challenges as far as climate change mitigation is concerned: fossil fuel based electricity generation and consumption, and increases in fossil fuel use in the transportation sector contribute significantly to GHG emissions; agricultural sector is the largest contributor of GHGs emissions in the country mainly from livestock methane emissions and land-use change; deforestation and forest degradation in search for fuel wood, charcoal production and creation of agricultural land; transport sector in Kenya contributes to GHG emissions through the use of more fossil fuel and increases local air pollution, which has serious health implications; and industrial processing in Kenya are some of the main challenges that are likely to affect any efforts towards

[60] Ibid, sec. 3(2).

[61] 'COP26 Goals' (*UN Climate Change Conference (COP26) at the SEC – Glasgow 2021*) <https://ukcop26.org/cop26-goals/> accessed 15 October 2021.

achieving zero emissions.[62] Arguably, these challenges are a reflection of what is happening across the African continent. There is thus a need to address these challenges as part of the race towards zero carbon emissions.

6. The Race to Zero Emissions from an African Perspective: Way Forward

In line with the principle of common but differentiated responsibilities under the international environmental law, this section offers some recommendations on some viable steps that African States can take to address climate change through reduced carbon emissions.

6.1. Clean Development Mechanism

Carbon or emissions trading works by limiting the amount of carbon dioxide that entities such as companies, municipalities or countries can release into the atmosphere, creating competition to encourage them to become more energy efficient and adopt cleaner technology whereby companies aiming to reduce their carbon output can sell unused pollution allowances and those that exceed their allocated emissions allowance may have to buy more emissions permits, or be subject to monetary fines.[63]

African countries should invest in and explore more clean development mechanisms not only as way of raising funds but also climate change mitigation. Kenya should make more use of the Green Bond Programme - Kenya, which aims to promote financial sector innovation by developing a domestic green bond market.[64]

6.2. Transition from Fuel-Based Transport to Electric Vehicles in Africa

It has been observed that 'today's transport sector accounts for around a quarter of energy-related CO2 emissions globally since it is almost completely dependent on fossil fuels and, therefore, decarbonizing the sector is crucial to achieving the temperature goals of the Paris Agreement.[65]

[62] *Sessional Paper No. 3 of 2016 on National Climate Change Framework Policy,* Goal 4.2.
[63] Amesheva I, 'The Road to Net-Zero Is Paved with Good Intentions', 3 < https://www.arabesque.com/wp-content/uploads/2021/09/The-Road-to-Net-Zero_Part-One_FINAL.pdf> Accessed 24 September 2021.
[64] 'Kenya Green Bonds Programme' (*greenbondskenya*) <https://www.greenbondskenya.co.ke> accessed 17 October 2021.
[65] 'Advancing Electric Mobility in Africa | UNFCCC' <https://unfccc.int/news/advancing-electric-mobility-in-africa> accessed 13 October 2021.

Notably, in Africa and South Asia, the transition to low-carbon vehicles is vital in mitigating climate change.[66]

While improved and expanded physical infrastructure through investment in roads and rail lines is an important and necessary enabler of socio-economic development, countries must start moving towards environmental friendly means of transport such as electric vehicles, through financial incentives as has been witnessed in Rwanda where the country's leadership has unveiled incentives meant to encourage the citizenry to embrace electric cars.[67]

6.3. Role of the Private Sector in Reducing Emissions

Notably, the Paris Agreement underscores the important role of Non-State Actors (NSAs), particularly the private sector in the implementation of the key provisions the landmark Pact adopted in 2015, such as the Nationally Determined Contributions, adaptation, mitigation and finance.[68]

Arguably, in addition to top-down national or international policy instruments that aim to regulate the amount and flow of global emissions, the private sector is rising as a potent force for change.[69] It has been observed that the private sector is a key stakeholder in both urban and economic development, being a major contributor to national income and the principal job creator and employer, where it provides around 90% of employment in the developing world (including formal and informal jobs), delivers critical goods and services and contributes to tax revenues and the efficient flow of capital.[70] The private sector is considered to be an important player in creating innovative and technological solutions, as well as providing resources to meet our global environmental challenges.[71]

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[66] Collett, Katherine A., Maximus Byamukama, Constance Crozier, and Malcolm McCulloch. "Energy and Transport in Africa and South Asia." *Energy and Economic Growth* (2020), 2.

[67] 'Rwanda Unveils New Incentives to Drive Electric Vehicle Uptake' (*The New Times | Rwanda*, 16 April 2021) <https://www.newtimes.co.rw/news/rwanda-unveils-new-incentives-drive-electric-vehicle-uptake> accessed 17 October 2021.

[68] PACJA, 'The role of the African private sector in the transition to low-emission, climate-resilient, green growth and NDCs implementation,' *9th Conference On Climate Change and Development in Africa (CCDA-IX)*, Santa Maria, Sal Island, Cabo Verde, 13-17 September 2021.

[69] Amesheva I, 'The Road to Net-Zero Is Paved with Good Intentions', 6 < https://www.arabesque.com/wp-content/uploads/2021/09/The-Road-to-Net-Zero_Part-One_FINAL.pdf> Accessed 24 September 2021.

[70] 'The Role of the Private Sector' (*GSDRC*) <https://gsdrc.org/topic-guides/urban-governance/elements-of-effective-urban-governance/the-role-of-the-private-sector/> accessed 27 September 2021.

[71] Environment UN, 'Private Sector Engagement' (*UNEP - UN Environment Programme*, 2 June 2021) <http://www.unep.org/about-un-environment/private-sector-engagement> accessed 27 September 2021.

It has been suggested that in order able to make private-sector energy solutions affordable for low-income households, 'private sector financing will be necessary to complement public sector finance in realizing universal energy access in conjunction with renewable energy uptake, which is often prevented by high financing costs as a result of a range of technical, regulatory, financial and informational barriers and their associated investment risks.[72] This is against the background of some studies which have concluded that 'without significant additional investments and dedicated policies, the goal of total rural electrification and universal access to modern cooking fuels and stoves by 2030 is unachievable'.[73]

6.4. Investing in Affordable Energy Technology Innovation in Reducing Greenhouse Gas Emissions

It is estimated that without new policies, by 2050, more disruptive climate change is likely to be locked in, with global greenhouse gas (GHG) emissions projected to increase by 50%, primarily due to a 70% growth in energy-related CO2 emissions.[74]

Most rural area residents have relied on biomass fuels for long due to their relatively cheaper accessibility as lack of financial resources is a key barrier to access to energy in rural Africa.[75] As already highlighted, the combustion of biomass fuels in traditional stoves produces greenhouse gases and aerosols such as black carbon and the extensive use of biomass can also result in forest, land, and soil degradation, leading to net CO2 emissions.[76] As a result, it has been pointed out that

[72] 'Accelerating SDG 7 Achievement: Policy Briefs in Support of the First SDG 7 Review at the UN High-Level Political Forum 2018 | Environmental Migration Portal' 2 <https://environmentalmigration.iom.int/accelerating-sdg-7-achievement-policy-briefs-support-first-sdg-7-review-un-high-level-political> accessed 12 October 2021.
[73] Pachauri, Shonali, Bas J. van Ruijven, Yu Nagai, Keywan Riahi, Detlef P. van Vuuren, Abeeku Brew-Hammond, and Nebojsa Nakicenovic. "Pathways to Achieve Universal Household Access to Modern Energy by 2030." *Environmental Research Letters* 8, no. 2 (May 2013): 024015. https://doi.org/10.1088/1748-9326/8/2/024015.
[74] 'Climate Change Chapter of the OECD Environmental Outlook to 2050: The Consequences of Inaction - OECD' <https://www.oecd.org/env/indicators-modelling-outlooks/climatechangechapteroftheoecdenvironmentaloutlookto2050theconsequencesofinaction.htm> accessed 17 October 2021.
[75] Allet M, 'Solar Loans through a Partnership Approach: Lessons from Africa' [2016] Field Actions Science Reports. The journal of field actions 128.
[76] Pachauri, Shonali, Bas J. van Ruijven, Yu Nagai, Keywan Riahi, Detlef P. van Vuuren, Abeeku Brew-Hammond, and Nebojsa Nakicenovic. "Pathways to Achieve Universal Household Access to Modern Energy by 2030." *Environmental Research Letters* 8, no. 2 (May 2013): 024015. https://doi.org/10.1088/1748-9326/8/2/024015.

governments recognise that scaling up and shifting financial flows to low-emission and resilient infrastructure investments is critical to deliver on climate and sustainable development goals.[77]

As part of reducing GHG emissions, it has been suggested that understanding the influence of energy technology innovation in reducing a country's greenhouse gas emissions requires a systematic review to characterize the existing system.[78] Arguably, technology Platforms unite stakeholders from industry, the research community, public authorities, the financial community, regulators, consumers and civil society around a specific technological challenge, where the key concepts for the Technology platform are: Development of a shared long-term vision; Creation of a coherent, dynamic strategy to achieve the vision; Implementation of an action plan to deliver agreed programmes of activities; and Leading role of the industry.[79]

There is a need for adoption and promotion of low carbon resilient development initiatives.[80] Low-carbon resilience is an agenda that tackles reducing carbon emissions while simultaneously building climate resilience and supporting development in a supposed win-win policy agenda.[81]

6.5. Poverty Eradication

It has been observed that 'climate change is the defining issue of our time, and the world's most vulnerable people are suffering the worst effects of climate change, such as more intense storms, dangerous heat waves, more frequent and longer-lasting droughts, rising seas, while contributing least to the problem'.[82] In addition, the two-way relationship between the lack of access to adequate and affordable energy services and poverty, in many respects, involves a vicious cycle in which people who lack access to cleaner and affordable energy are often trapped in a re-enforcing cycle

[77] 'Achieving Clean Energy Access in Sub-Saharan Africa' (*Green Finance Platform*, 8 April 2019) <https://www.greenfinanceplatform.org/research/achieving-clean-energy-access-sub-saharan-africa> accessed 12 October 2021.
[78] Jordaan, S.M., Romo-Rabago, E., McLeary, R., Reidy, L., Nazari, J. and Herremans, I.M., 'The Role of Energy Technology Innovation in Reducing Greenhouse Gas Emissions: A Case Study of Canada' (2017) 78 Renewable and Sustainable Energy Reviews 1397.
[79] Năstase C and Popescu M, 'Sustainable Development through the Resource Use-Regional Innovation System.', *Proceedings of the 3rd IASME/WSEAS International Conference on energy, environment, ecosystems and sustainable development (EEESD'07), Agios Nikolaos, Crete Island, Greece, 24-26 July, 2007* (World Scientific and Engineering Academy and Society Press (WSEAS Press) 2007).
[80] Fisher, S. "Low-Carbon Resilient Development in the Least Developed Countries: Emerging Issues and Areas of Research. IIED," 2013.
[81] Ibid, 3.
[82] 'Global Conference Aims to Link Climate Action, Sustainable Development Agendas More Closely | UNFCCC' <https://unfccc.int/news/global-conference-aims-to-link-climate-action-sustainable-development-agendas-more-closely> accessed 12 October 2021.

of deprivation, lower incomes and the means to improve their living conditions while at the same time using significant amounts of their very limited income on expensive and unhealthy forms of energy that provide poor and/or unsafe services.[83]

Notably, most people especially in developing world continue to struggle with lack of access to clean energy in what is now commonly referred to as energy poverty. The World Economic Forum 2010 defined energy poverty as *the lack of access to sustainable modern energy services and products*. To be more precise, it is not only a matter of sustainability: energy poverty can be found in all conditions where there is a lack of *adequate, affordable, reliable, quality, safe and environmentally sound energy services to support development*.[84] Notably, 'the concept of "energy poverty" includes "fuel poverty" in the developed world, but is most often used in the context of lack of access in the developing world to electricity, and/ or clean cooking fuels or technologies, where it is also estimated that about 1.2 billion people still lack access to electricity and nearly 40 per cent of the people in the world lack access to clean cooking fuels'.[85]

World Health Organization estimates that indoor pollution causes an estimated 1.3 million deaths per annum in low income countries associated with the use of biomass in inadequate cook stoves.[86] There is a need to continually invest in research and development of newer and cleaner technologies as well as understanding the distribution of current and future energy needs, if the African countries are to overcome energy poverty and also achieve zero emissions from energy sources. It has been observed that 'on the one hand, lack of access to reliable energy is believed to hamper economic growth in poor economies (energy poverty), and on the other hand, energy consumption met with the current fossil fuel based energy mix leads to emissions of greenhouse

[83] Stephen Karekezi and others, 'Energy, Poverty, and Development' in Global Energy Assessment Writing Team (ed), *Global Energy Assessment: Toward a Sustainable Future* (Cambridge University Press 2012) 153 <https://www.cambridge.org/core/books/global-energy-assessment/energy-poverty-and-development/DC1771AD93DD0A5031A07B057CA3A8C7> accessed 12 October 2021.
[84] Habitat for Humanity. "Energy Poverty." Accessed October 12, 2021. https://www.habitat.org/emea/about/what-we-do/residential-energy-efficiency-households/energy-poverty.
[85] 'Accelerating SDG 7 Achievement: Policy Briefs in Support of the First SDG 7 Review at the UN High-Level Political Forum 2018 | Environmental Migration Portal' 2 <https://environmentalmigration.iom.int/accelerating-sdg-7-achievement-policy-briefs-support-first-sdg-7-review-un-high-level-political> accessed 12 October 2021.
[86] González-Eguino, Mikel. "Energy Poverty: An Overview." *Renewable and Sustainable Energy Reviews* 47 (July 1, 2015): 377–85. https://doi.org/10.1016/j.rser.2015.03.013.

gases, which are accumulating in the atmosphere and are the major source of global climate change'.[87]

It has been argued that 'although energy poverty cannot be delinked from the broader, more complex problem of poverty in general, access to energy infrastructures would avoid its most serious consequences and would help to encourage autonomous development'.[88]
Addressing poverty can go a long way in empowering people to not only embrace but also afford alternative and sustainable sources of energy and transport.

6.6. Investing in Off-Grid and Mini-grid Energy Sources: Renewable Energy for Climate Change Mitigation

Arguably, the most cost-effective way to expand household electricity access varies widely, within and between countries.[89] It has been observed that 'in sub-Saharan Africa, two-thirds of the population live in areas that are not linked up with an electrical grid, and arguably, off-grid energy is the only option for these people.[90]

Off-grid energy options have been hailed as viable tools of combating energy poverty especially in Africa. Mini-grids are also considered to be a viable option for those living in the most remote areas, where standalone solar systems operating independently of the grid can meet smaller home electricity needs but may struggle with larger electricity loads such as powering machinery and agricultural equipment, and that is where mini-grids which operate in a space between the two come in; when the population is too small or remote for grid extension and standalone solar systems aren't viable for larger electricity needs.[91]

[87] Shoibal Chakravarty and Massimo Tavoni, 'Energy Poverty Alleviation and Climate Change Mitigation: Is There a Trade Off?' (2013) 40 Energy Economics S67, S67.
[88] González-Eguino, Mikel. "Energy Poverty: An Overview." *Renewable and Sustainable Energy Reviews* 47 (July 1, 2015): 377–85. https://doi.org/10.1016/j.rser.2015.03.013.
[89] Association GO-GL, 'Providing Energy Access through Off-Grid Solar: Guidance for Governments' [2015] Utrecht, the Netherlands, 9.
[90] '3 Reasons Off-Grid Solar Energy Isn't Yet Serving the Poor in Sub-Saharan Africa' (*Sun-Connect-News*) <https://www.sun-connect-news.org/de/articles/market/details/3-reasons-off-grid-solar-energy-isnt-yet-serving-the-poor-in-sub-saharan-africa/> accessed 12 October 2021.
[91] ODI: Think change. "How Solar Mini-Grids Can Bring Cheap, Green Electricity to Rural Africa." Accessed October 12, 2021. https://odi.org/en/insights/how-solar-mini-grids-can-bring-cheap-green-electricity-to-rural-africa/.

There is a need for continued exploration and investments in this sector to empower people regardless of their distance from the main national power grid.

7. Conclusion

It is now an agreed fact that the most commonly considered indicator of climate change is the surface air temperature, mainly attributable to carbon based emissions.[92] Notably, of the several anthropogenic greenhouse gases, Carbon Dioxide is considered to be the most important agent of potential future climate warming because of its large current greenhouse forcing, its substantial projected future forcing, and its long persistence in the atmosphere.[93] It has been argued that the GHG mitigation actions pledged by countries in the Cancún Agreements at the United Nations Climate Change Conference will not be enough to prevent the global average temperature from exceeding the 2°C threshold, unless very rapid and costly emission reductions are realised after 2020.[94] It has also been documented that 'if the current rate of greenhouse gas emissions continue, temperatures will rise to 1.5°C above pre-industrial levels by 2040'.[95] As a result, it has been argued, if this is to be prevented, the greenhouse pollution ought to reduce by 45 percent from 2010 levels by 2030 and completely, that is, by 100 percent, by 2050, where coal use, currently accounting for 40 percent of electrical production, would have to drop to nearly one percent while renewable energy sources, currently supplying 20 percent of electrical production, would have to more than triple.[96]

African countries are already struggling with the current state of energy sector and other areas that contribute to greenhouse gas emissions. If they are to be considered worthy participants in the race to zero emissions, then they must address poverty levels, address pollution, invest in cleaner sources of energy and technologies and involve private sector more, among others. It is time for African countries to ensure that even as they engage in rapid development activities, the same are conscious of Sustainable Development agenda and the race to zero emissions.

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[92] Ledley TS and others, 'Climate Change and Greenhouse Gases' (1999) 80 Eos, Transactions American Geophysical Union 453, 455.
[93] Ibid, 455.
[94] 'Climate Change Chapter of the OECD Environmental Outlook to 2050: The Consequences of Inaction - OECD' <https://www.oecd.org/env/indicators-modelling-outlooks/climatechangechapteroftheoecdenvironmentaloutlookto2050theconsequencesofinaction.htm> accessed 17 October 2021.
[95] 'Climate Change Is The Greatest Threat To Human Health In History | Health Affairs Blog' <https://www.healthaffairs.org/do/10.1377/hblog20181218.278288/full/> accessed 14 October 2021.
[96] Ibid.

The Race to Zero Emissions is one that can be won, in the fullness of time, within Africa and beyond.

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